Tackling Health Inequalities In Europe: An Integrated Approach EUROTHINE

FINAL REPORT

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Foreword

At the start of the 21st century, all developed countries are faced with substantial inequalities in health within their populations. In all European countries with available data, differences in health expectancy between higher and lower socio-economic groups typically amount to 10 years or more, counted from birth. Academic research on this issue has shifted from description to explanation, not only to satisfy scientific curiosities, but also to find entry-points for policies and interventions to reduce health inequalities. As a result, our understanding of the causes of socio-economic inequalities in health has expanded tremendously, and has allowed interested policy makers to start searching for strategies to reduce these inequalities.

This report brings together the results of the results of the Eurothine project, an international collaborative project that aims to substantially increase our understanding of health inequalities in the European Union, and the possibilities to reduce these inequalities at international, national and local levels. The project was funded by the European Commission, through the Public Health Program, grant agreement 2003125. The project started in September 2004 and formally ended in August 2007.

Within the Eurothine project, a number of descriptive and explanatory studies of socio-economic inequalities in health have been conducted, taking advantage of the variation in health, health determinants and socio-economic conditions within Europe. Also, a number of reviews of specific interventions and evaluations of national or regional policies have been carried out.

The present report presents the results of the project. It consists of 33 chapters and 2 appendices. Key chapters in this report are the introductory chapter 1 which describes in detail work methodology and key results and explains how the different chapters of the report relate to the approved objectives and activities of the Eurothine project; the general overview of the descriptive results (chapter 2); and a concluding chapter with a summary of key results and recommendations for monitoring and policies (chapter 33). All other chapters focus on specific topics, and mostly consist of European overviews and cross-national comparisons with regards to socio-economic inequalities in a specific health outcome or health determinant.

This report represents the outcome of a collaborative work in which many partners have participated. For the Eurothine project, three networks have combined their experiences and efforts: (a) the European Working Group on socio-economic inequalities in morbidity and mortality, coordinated in Rotterdam, (b) the European Network on interventions and policies to reduce inequalities in health, also coordinated in Rotterdam, and (c) the European Research Network on social inequalities and health, coordinated in Barcelona. All participants who were actively involved in the Eurothine project are listed at the next page and/or are listed as the main authors to the specific chapters of this report. This list of participants at the next pages includes national representatives who have done the essential work of preparing national data sets on the basis of mortality registries or health interview surveys.

We wish to thank the many other scientists who were involved in the Eurothine project. Our special thanks goes to three international experts, Mel Bartley, Michaela Benzeval, and Eero Lahelma, who attended the second consortium meeting to provide independent advice on the interpretation of the results and on the formulation of policy recommendations. We also wish to acknowledge the national and international organisations, including the national statistical offices from most EU member states, for providing access to data from mortality registries and national health surveys.

For the researchers who collaborated in the Eurothine project, this report represents a milestone, but it does not mark an end. Our work will continue. Most of the individual chapters will be rewritten into papers that are suitable for publication in international scientific journals. In addition, the Eurothine project generated two important data sets containing harmonised data from, respectively, national health surveys and national mortality registries. These data sets are now being used for additional analysis, and are available for a few more years for other cross-national national analyses of inequalities in health and health determinants. We thus wish to continue contributing to European research to support the development of policies to reduce health inequalities at international, national and local levels.

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Summary

Objectives

The Eurothine project is a large international project aimed to improve the description of health inequalities in Europe and to enhance the evidence-base for policies to reduce inequalities in health. Its two principal objectives were:

1. To prepare international overviews that provide bench-marking data on inequalities in mortality, morbidity and health determinants to participating countries;
2. To assess evidence on the effectiveness of policies and interventions to tackle health inequalities, and to make recommendations on strategies for reducing health inequalities in participating countries

Approach

In the Eurothine project, more than 50 researchers from more than 20 European countries participated. Their work was organised in two main strands that corresponded to the two principal objectives. In both strands, the work was organised by means of one generic work package and four specific work packages that focussed on areas such as health-related behaviours, health care utilisation, and labour market and welfare conditions.

The first strand, aimed to describe health inequalities, utilised national health interview surveys or similar surveys, and mortality registries with information on socioeconomic characteristics of deceased. We acquired these data sets in close collaboration with national representatives, and we harmonised the data sets obtained from different countries. This harmonisation process aimed to maximise the international comparability of the available data. In addition, we obtained data from international surveys. All data sets were analyses using up-to-date methods for comparative analyses of health inequalities.

The second strand, aimed to evaluate the effectiveness of interventions and policies, was based on a systematic approach for the identification and assessment scientific evidence. Plans were developed for a number of sample analyses of the effectiveness of recently implemented policies and interventions to reduce health inequalities in various European countries. In most work packages, we performed both national case studies and in addition derived evidence on the effectiveness of national policies by means of international comparative studies.

Main results and implications

A large series of analyses were performed. The results of these analyses are presented in chapters 2 to 32, and the implications of these results are summarised in chapter 33. According to the latter chapter, the main results and their implications are as follows.

Related to strand 1

(1) Socioeconomic inequalities in health are substantial throughout Europe, and represent one of the main challenges for public health policy in all European countries, as well as in the European Union as a whole. Reducing these health inequalities, by improving the health of people with lower levels of education, occupational class or income, will lead to substantial improvements in over-all population health.

(2) Variations in the magnitude of health inequalities between countries, both at the level of general health measures and at the level of specific diseases, strongly suggest that a reduction of health inequalities is feasible. At the same time, the ubiquity of health inequalities even in countries with well-developed social and health care policies warns against too great optimism, and shows that innovative policies and great determination will be required to achieve this goal.

(3) Countries differ strongly in the diseases which make the largest contribution to inequalities in over-all health, as they do in the health determinants which make the largest contribution to the explanation of health inequalities. Policies and interventions to reduce health inequalities deserve special priority in countries with relatively large health inequalities, particularly in Eastern Europe.

Related to strand 2

(4) In order to reduce health inequalities, strategies should be developed which are powerful, sustained and systematic. This requires political will, attainable objectives, effective policies and interventions, effective implementation, and evaluation and monitoring. During the past decade, some European countries have been making important first steps in developing, and sometimes implementing, such strategies but much more needs to be done.

(5) Policies addressing ‘upstream’ determinants of health inequalities, including income and education, are necessary ingredients of strategies to reduce health inequalities, but the persistence of health inequalities in countries with universal welfare systems shows that they are not sufficient to eliminate health inequalities. Policies addressing ‘midstream’ and/or ‘downstream’ determinants are therefore also needed.

(6) Health-related behaviours (particularly smoking and excessive alcohol consumption) represent important entry-points for policies and interventions to reduce health inequalities. The evidence collected in this study suggests that comprehensive approaches, tackling a range of determinants of these behaviours, and including still-to-be-developed innovative methods, are likely to be needed to effectively reduce socioeconomic inequalities in health-related behaviour.

(7) Lack of access to good quality health care is likely to be an important intermediary factor on the causal pathway between low socioeconomic status and ill-health in some countries, particularly in Eastern Europe. Avoiding these inequalities is an important entry-point for policies and interventions to reduce health inequalities, and requires no or few direct payments by consumers, and organizational measures

to improve access for lower socioeconomic groups, including access to prevention programs.

(8) Quantitative target setting is a useful instrument to guide policy making, and to support the evaluation of strategies to reduce health inequalities. Variations between European countries in the magnitude of (disease-specific) health inequalities can be used to find attainable targets for health inequalities. Quantitative targets for inequalities in determinants contributing to health inequalities may help to steer policies in the right direction.

On further research and monitoring

(9) Monitoring of health inequalities should be improved in many countries. All European countries should be able to monitor socioeconomic inequalities in mortality, morbidity and health determinants on a routine basis, following generally accepted monitoring guidelines. The European Union should promote this by including the socioeconomic dimension in its health data collection guidelines. At the European level, a databank should be created which allows comparisons of health inequalities between countries and over time.

(10) Further research is needed to increase knowledge about possible entry-points for policies and interventions to reduce health inequalities, and to evaluate on-going and newly developed policies and interventions. Although most of this research will need to be funded by national funding agencies, the importance of the findings for many other countries justifies considerable investments at the European level too. European funding is essential for studies which want to take advantage of variations in determinants or policies between European countries. A clearing-house should be established to pro-actively identify and assess evidence on the effectiveness of policies and interventions to reduce health inequalities throughout Europe.

Dissemination

The results of this report will be disseminated in various ways, including papers for international journals, a training course, and publication at the project website (www.eurothine.org).

Final conclusion

As chapter 33 concludes, it may not be realistic to eliminate health inequalities in the foreseeable future, but reducing them to more acceptable levels is well within the realm of possibility. What is required is a genuine determination to follow the logic of emerging evidence, and to apply it to the health outcomes of greatest concern in any particular setting. Health inequalities can be reduced if we really choose to.

Part I

Introduction

Chapter 1

The Eurothine project: overview of objectives, activities and key results

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The rationale, objectives and structure of the Eurothine project

Rationale and general objective

Socioeconomic inequalities in health are a major challenge for public health throughout Europe. In all countries with available data health inequalities are found to be substantial: differences in life expectancy typically amount to 5 years or more, and differences in healthy life expectancy to 10 years or more between people with higher and lower educational, occupational or income levels.

There is thus a great need for developing effective strategies to reduce health inequalities. In some countries (United Kingdom, Sweden, Netherlands) understanding of the determinants of health inequalities has improved to the extent that systematic and comprehensive strategies to tackle health inequalities have already been devised, but most countries are in earlier stages of policy development vis-à-vis health inequalities, and some are still in a pre-measurement stage in which even the most elementary data are lacking. This variation not only creates considerable need, but also extensive scope for mutual learning. The over-all aim of this project is to facilitate such mutual learning by collecting and analysing information from different European countries that will help policy-makers at the European and national levels to develop rational strategies for tackling socioeconomic inequalities in health.

The Eurothine project applies an integrated approach by combining two types of scientific analysis. First, it aims to provide international overviews of inequalities for a large series of health outcomes and health determinants and, second, it will assess the scientific evidence on the effectiveness of policies and interventions to tackle the determinants of health inequalities. Together, these two types of analyses will provide the basis for making recommendations on strategies for reducing health inequalities in participating countries. While the international overviews of health inequalities will show what the main entry-points for tackling health inequalities in the participating countries are, the review of evidence on effectiveness will provide guidance as to the specific policies and interventions that can address these entry-points.

Specific objectives and general structure

The specific objectives of the Eurothine project are:
1. To develop health inequalities indicators, and to provide bench-marking data on inequalities in health and health determinants to participating countries
2. To assess evidence on the effectiveness of policies and interventions to tackle the determinants of health inequalities, and to make recommendations on strategies for reducing health inequalities in participating countries
3. To disseminate the results, and to develop a proposal for a permanent European clearing house on tackling health inequalities.

The project had three main strands that correspond to each of its objectives: (a) collection and analysis of data on health inequalities indicators; (b) collection and analysis of evidence on effectiveness of policies and interventions; (c) dissemination and clearing house development. Each of these strands consisted of a number of work-packages to be carried out by either the co-ordinating centre or one of the eight collaborating centers, with inputs from leading experts in the field based in 25 European countries. The first two strands constitute the main body of the Eurothine project. These strands are described below in detail.

Strand 1. International overviews and comparisons of health inequalities

Previous international overviews of health inequalities have been made on the basis of mortality follow-up data linked to national population censuses, and on the basis of morbidity data as measured in national health or multipurpose interviews [1]. These data sources have been available for most EU member countries, and have enabled interesting cross-country comparisons of the size and pattern of health inequalities. These comparisons have not only provided benchmarking data (showing, for example, that the Nordic countries have larger relative inequalities in health than previously thought), but also new insights into the explanation of health inequalities (showing, for example, the importance of smoking as a determinant of health inequalities in the North of Europe).

At the start of the Eurothine project, previous international overviews could be extended in several ways. First, previous overviews did not systematically include new member states from Eastern Europe. Second, previous overviews did not measure inequalities in health determinants, even though data on a number of risk factors by socio-economic status were available in most countries participating in this project. Extending previous comparisons both geographically (towards the East) and thematically (to include determinants) would not only provide the European Commission with a great amount of new and relevant data, but would also provide researchers and policy-makers with exciting new opportunities for comparative research.

While preparing for the project, we had made a preliminary inventory of availability of data on socioeconomic inequalities in health in the participating countries. Data on inequalities in mortality were available in at least 20 countries (including 7 new member states). Data on inequalities in self-reported morbidity were available in at least 24 countries (including 9 new member states). We therefore judged that in this project we could indeed aim for providing a new, more comprehensive overview of health inequalities in Europe. This overview will be used not only to 'bench-mark' each individual country, but also to make interesting cross-national comparisons, including between western and eastern European countries. They would take advantage from existing variations between European countries to study the impact of three groups of factors: health-related behaviours, health care utilization, and labour market and welfare conditions. Most of these determinants were not assessed in detail in previous international overviews, whereas the internationally comparable data were available for at least part of these determinants. It was therefore judged to

[1] Kunst AE, Bos V, Mackenbach JP. Monitoring socio-economic inequalities in health in the European Union: guidelines and illustrations A report for the Health Monitoring Program of the European Commission. Rotterdam: Erasmus University, 2000

be likely that in-depth analyses of these determinants could advance our understanding of the causes of health inequalities in European countries.

New international overviews and comparisons of health inequalities were to be prepared by the co-ordinating centre together with four work package leaders. The task of the co-ordinating centre was to assess the availability of data on inequalities in health and health determinants in Europe, to obtain relevant data, and to provide general descriptive overviews of inequalities in self-reported morbidity, mortality by cause of death, and health determinants around 2000 in a comparable way in as many European countries as possible. The four work-packages would focussed on the specific in-depth analyses: one would compare health inequalities in eastern European countries with those in western European countries, and three would deal with the impact of selected health determinants on the size and pattern of health inequalities in Europe. The selected determinants were: health-related behaviours (known to be important 'downstream' determinants of health inequalities), health care utilization (one of the more easily accessible entry-points for reducing health inequalities), and labour market and welfare conditions (known to be important 'upstream' determinants of health inequalities).

Strand 2. Evaluation of the effectiveness of policies and interventions

Evidence-based policy-making in the field of health inequalities is severely hampered by lack of good evidence on effectiveness of policies and interventions. Because this has now been recognized widely, many new initiatives in this field throughout Europe are being accompanied by evaluation studies of various designs. Because of the complexity of the task, and the practical barriers for conducting evaluation studies, no single country has the capacity to build a comprehensive evidence-base for tackling health inequalities on its own.

We have previously written the first international overview of evidence relating to the effectiveness of policies and interventions to tackle health inequalities[2]. This analysis was based on a preliminary set of criteria for assessing this evidence, and identified a number of 'promising' new approaches that have been very helpful to policy-makers.

The Eurothine aimed to take this previous work one important step further by creating opportunities for mutual learning from each other's evaluation studies. This required the availability of explicit criteria for assessing their internal validity (absence of bias in measuring effect) and external validity (generalizability of effect from one setting to the other). Such criteria were not available at the onset of the project, and therefore would be developed in this project, and be made available in the form of a check-list to the international community. Special attention were to be given to developing criteria for assessing external validity, which would need to take into account the general characteristics of the intervention, the population to which it would have to be transferred, on-going policies and interventions against these determinants, and possibilities for implementation of the new policy or intervention.

[2] Mackenbach JP, Bakker MJ (eds.). Reducing inequalities in health: a European perspective. London: Routledge, 2002.

We aimed to develop a checklist based on these criteria, and apply this checklist to recent intervention studies. We were to apply this approach to evaluations of policies and interventions in three areas: health-related behaviours, health care utilisation, and labour market and welfare conditions. A fourth case study would analyse experiences in this field with using quantitative target setting.

Strand 3. Dissemination of results

We aimed to disseminate the results of this project widely and effectively by the use of a number of formats, including reports, journal papers, a website, and a postgraduate training course. Based on the experiences in this project and similar initiatives, and in order to promote continuity of mutual learning into the future, we would also develop a proposal for a permanent clearing-house on tackling health inequalities in Europe.

Progress and methods

Time schedule, meetings

The table at the next page provides a brief account of the progress of the project between the starting date (September 1, 2004) and final date (August 31, 2007). During this period, two plenary consortium meetings were organised. In-between we organised four meetings of the Steering Committee (SC) which consisted of the co-ordinating centre and work package leaders. Minutes to each meeting are available from the project website (www.eurothine.org).

Strand 1. International overviews and comparisons of health inequalities

A main aim of the Eurothine project was to utilise national data sources for the preparation of harmonised data on health inequalities in Europe. Two types of national data sources were acquired for a many countries as possible: national health interview surveys or similar surveys; and mortality registries with information on socioeconomic characteristics of deceased. During the first 18 months of the project, we identified relevant data sources, we prepared detailed specifications for data sets to be extracted from these sources, we acquired these data sets in close collaboration with national representatives, and we harmonised the data sets obtained from different countries. This harmonisation process aimed to maximise the international comparability of the available data. Detailed descriptions of the harmonised data files are provided at the project website (www.eurothine.org).

In addition to the harmonised data sets, the Eurothine project utilised the opportunities for comparative analyses that were offered by international surveys. Thanks to the application of a common survey design and questionnaire to a large number of countries, international surveys can provide data with a high degree of international comparability. Most international surveys do present important problems in one or more specific areas. These problems may be exclusion of many countries, (e.g. the European Community Household Panel, which excludes eastern European countries), limited information on health and health determinants (e.g. the European Social Survey, with only a few question on health), limited age coverage (e.g. the SHARE baseline survey, which is confined to persons 50 years and older) and the lack of nationally representative samples for many countries (e.g. the MONICA and CINDI surveys, with are often confined to specific cities or regions). Nonetheless, in several chapters, we were able to utilise international surveys to prepare interesting overviews of socioeconomic inequalities in health or health determinants.

Period or meeting	Main activities
01/09/04 – 27/01/05	Preparation of plans of work for all work packages; inventory of data sets on health inequalities
28 January 2005 Rotterdam	**First SC meeting** Discussion of general project; agreement on plans of work; agreement on practical matters
01/03/05 – 07/04/05	Preparation of proposals for general consortium on data to be acquired and on review of interventions
8-9 April 2005 Rotterdam	**First plenary meeting** Agreement on each participant’s contribution to the project, including data to be delivered
10/04/05 – 15/09/05	Acquisition of data sets from over 20 countries; inventory of intervention studies
16 September 2005 Edinburgh	**Second SC Meeting** Review the progress with data acquisition and review of intervention studies; prepare specific plans for further work
17/09/05 – 10/05/06	Further acquisition and harmonisation of data sets; preliminary analyses of data; start with reviews of interventions
11-12 May 2006 Barcelona	**Third SC Meeting** Discussing of preliminary results; review of problems and possibilities; discuss further plans
13/05/06 – 22/11/06	Completion of data analyses and reviews; preparation of preliminary drafts of papers
23-24 Novemb 2006 Rotterdam	**Fourth SC Meeting** Discussion of results; agreement on ways to cope with problems; agreement on plans for further work and publication
25/11/06 – 21/03/07	Completion of analyses and reviews; preparation of draft reports, including a summary paper with recommendations
22-23 March 2007 Rotterdam	**Second plenary Meeting** Discussion of papers; agreement on outstanding issues to be resolved; discussion of policy recommendations
24/03/07 – 28/06/07	Finalisation of papers for final report; writing of concluding chapter with recommendations
29 June 2007 Barcelona	**Fifth SC Meeting** Agreement on contents of final report; evaluation of suitability and editorial comments of submitted papers; agreement on text of recommendations
30/06/07 – 31/08/07	Final revision of papers; preparation of final report

In the analysis of the available data, many decisions had to be made with regards to for example the choice of socioeconomic indicators and statistical measures of health inequalities. There is not one single receipt on these methodological issues that can be applied to all situations. As a result, the chapters in this report display some degree of heterogeneity with regards to the methods that are applied. Nonetheless, the work package leaders agreed on a common approach to the most important methodological issues.

For example, a main question in most analysis was how to deal with large international variations in educational classifications that were applied in national surveys. It was agreed to use a general three-step approach to deal with these international variations. First, the co-ordinating centre validated the educational distributions against existing sources (e.g. Eurostat publications) to verify its plausibility and to make improvements where indicated. Second, in specific analyses, it was recommended to use analytical methods that are least sensitive to these international variations. The recommended approach was to calculate Relative Indices of Inequality (RII) and to present other, simpler statistical measures only if they were to give the same results as the RII. Finally, it was recommended to perform sensitivity analyses in order to assess whether results are sensitive to alternative (e.g. broader) educational classifications.

Another frequently recurring issue related to the question on whether and how countries should be grouped into regions. It was agreed that choices in this regards depend on the objectives of a specific analyses. For example, if the objective were to analyse the association between health inequalities and political traditions, countries might be grouped according to political tradition. If a paper has a purely descriptive purpose, countries might be ordered according to a strictly neutral geographical division, such as North, West, South, Central-Eastern and Baltic. In this report, the term “eastern Europe” commonly refers to new member states in both Central East and the Baltic, while the term “western Europe” commonly refers to all older member states, sometimes including Switzerland and Norway.

The co-ordinating centre had developed standard software to facilitate the application of common statistical methods to the harmonised data bases. These methods include age standardisation, the calculation of Odds Ratios, Mortality Rate Ratios or Prevalence Rate Ratios, and the calculation of the Relative Index of Inequality. Most calculations are based on logistic or loglinear regression analyses. For further information on this software, we refer to www.eurothine.org.

Strand 2. Evaluation of the effectiveness of policies and interventions

Evidence-based policy-making in the field of health inequalities is severely hampered by lack of good evidence on effectiveness of policies and interventions. Because this has now been recognised widely throughout Europe, many new initiatives have aimed to assess the evidence that is available from a wide variety of sources and experiences. Within the Eurothine network, we aimed to contribute to this on-going work by stimulating the optimal use of the scientific evidence that was available from existing intervention studies or scientific assessments of policies. Because of its focus on the evaluation of scientific evidence, the Eurothine project was complementary to many other European initiatives like the EC-funded "Closing the health gap" project, which focussed on the description of ‘best practices’ in various fields of relevance to tackling health inequalities.

We started our work with the development of a systematic 5-step approach for the identification and assessment scientific evidence, focussed on creating “an effective learning exercise”(appendix A). This approach included explicit criteria for assessing the internal validity (absence of bias in measuring effect) and external validity (generalisability of effect from one setting to the other) of evidence. These criteria were later operationalised in an instrument to assess the “transferability” of experiences from one country to another (appendix B).

Using the general framework set by these documents, plans were developed for a number of sample analyses of the effectiveness of recently implemented policies and interventions. Essential for these plans was the availability of published studies on the effectiveness of specific policies or interventions among lower socioeconomic groups. Literature reviews were made to identify such studies, especially in the areas of health behaviours and health care utilisation. Several studies were identified with regards to health care utilisation, especially on cancer screening among lower socioeconomic groups. The latter studies were subject to the systematic review that is reported upon in chapter 29. Studies with regards to other aspects of health care financing and organisation, such as studies on effects of co-payments, are discussed in chapter 30.

Despite the enormous amount of interventions studies in the field of health behaviours, surprisingly few of these studies have been concerned with socioeconomic differences in the effectiveness of interventions and policies. Even when relative low criteria for the internal validity were applied, we identified few useful studies, especially if studies from the United States of America and other overseas areas were to be excluded. We had to conclude that there were too few European studies to provide a basis for systematic review of effectiveness of interventions in the areas of smoking, alcohol consumption, physical activity or nutrition.

Instead of systematic review, and in line with the 5-step approach designed before, we chose to issue a series of case studies. Case studies were carried out with regards to smoking, one using data from a national study (chapter 21), and another study using the opportunities offered by our harmonised international data set (chapter 19). A similar approach was used in the evaluation of policies in the field of labour market and welfare policies, where we performed both national case studies (e.g. chapter 17) and in addition tried to create a learning exercise by means of international comparative studies (e.g. chapter 16). In a similar way, a work package that assessed the experiences with the formulation of quantitative targets for reducing health inequalities, combined an international overview (chapter 31) with an in-depth review of the English experience (chapter 32) in order to arrive at recommendations for the use of quantitative target and monitoring of health inequalities in European countries (chapter 33).

Strand 3. Dissemination of results

Most of the dissemination activities started in the last year of the project. For example, plans for preparation of specific chapters were agreed upon at the fourth meeting of the Steering Committee, while the contents of the final report were determined at the fifth meeting (see table above). The main exception is the project website, which was prepared during the first year of the project, and which served as a means to viewing and downloading of all interim documents. The end of next section will list the different ways in which the final results of the Eurothine project will be made accessible to policy-makers and researchers.

Overview of key results and products

We will summarise below the main results of the Eurothine project. We will follow the structure of the Eurothine project into its three main strands and 11 work packages.

All work packages aimed to contribute to the development of recommendations for monitoring systems and for policies and interventions to reduce inequalities in health. These recommendations are not discussed in relationship to each specific work package individually, but these are summarised in a separate section at the end of this chapter.

Strand 1. International overviews and comparisons of health inequalities

The generic work package under strand one, work package 1, provided the basis for the work of the specific work packages 4 to 7. Below, we will discuss the objectives and results for each work package.

Work package 1. Generic activities

The aims of work package 1 were to assess the current availability of data in applicant and current member states, to collect and analyse these data for as many countries as possible, and to provide bench marking data on socio-economic inequalities in health and health determinants.

The work package achieved these objectives. It has prepared overviews of available data from national and international sources that may be used for the description of health inequalities. Documents with such overviews were presented at the first plenary consortium meeting and they are available at www.eurothine.org. Based on this overview of available data, we have started to collect data for nearly all EU member states. We created harmonised data sets on the basis of national health interview surveys and mortality registries. The documentation of these data sets is also available at the project website.

Using these data, we have prepared a series of overviews on socioeconomic inequalities in health and health determinants. In these overviews, we have aimed to compare countries with regards to the magnitude of health inequalities, thus providing benchmarking data for each EU member state. This task required the preparation of health inequalities estimates that are maximally comparable across countries.

This comparative work is summarised in the chapter 2, which aimed to compare 22 countries in all parts of Europe with regards to the magnitude of inequalities in mortality and self-assessed health. This was the first study to compare health inequalities and their causes between such a large number of countries. It showed that, although health inequalities were present everywhere, there are large variations between countries in the magnitude and pattern of these inequalities. Large inequalities in mortality were observed for Eastern Europe, which suggested that policies tackling ‘upstream’ determinants of health inequalities, e.g. social protection schemes, are necessary to reduce health inequalities. Health inequalities persisted in Northern Europe as they did elsewhere, which suggested that ‘upstream’ policies are not sufficient, and that tackling inequalities in ‘downstream’ determinants like health-related behaviors is essential to eliminate health inequalities.

While work package 1 has provided much of the empirical input to work packages 4 to 7, it also provided a series of descriptive overviews on its own. Most of these overviews concentrated on specific diseases. An example is an overview of inequalities in cancer mortality among men and women in 12 European countries (chapter 4). Large variations in socioeconomic inequalities in cancer mortality were found between the 12 European populations. Inequalities were larger among men, but there were indications for a widening of the gap in cancer mortality among women, mainly due to increasing inequalities in female smoking. Another overview was made of inequalities with regards to diabetes (chapter 9). Important educational inequalities were found in mortality by diabetes, and also in the prevalence of diabetes. Having a disadvantaged socioeconomic position is related to a higher mortality and prevalence of diabetes in most areas of the European Union. It was concluded that the reduction of inequalities in diabetes should be a priority of the policies of health of Europe.

Work package 4. Eastern Europe

The aims of work package 4 were to analyse in detail socioeconomic inequalities in cause-specific mortality and morbidity in about seven new member states from Eastern Europe, and to make comparisons to socioeconomic inequalities observed in the older member states.

The work package achieved these objectives. Overviews have been prepared with regards to socioeconomic inequalities in mortality and morbidity in eastern European countries. In addition, the majority of the other analyses in the Eurothine project were not restricted to western European populations, but also covered eastern countries. At least some of these countries were included in most of the analyses of health behaviours, such as smoking (chapters 19 and 20) and overweight (chapters 23 and 24).

With regards to mortality, the general descriptive overview showed that many countries in the Central East and Baltic regions had much larger inequalities than the European average (chapter 2). Cardiovascular diseases contributed importantly to these variations, and some of the variations appeared to be related to smoking, excessive alcohol consumption, and health care deficiencies. A special analysis was made of trends in inequalities in mortality in four Eastern countries between about

1990 and 2000 (chapter 3). In Hungary and Poland all educational groups experienced health gains to varying degrees whereas in Estonia and Lithuania, socioeconomic transition has been much more detrimental for those with lower education. The differences between these countries in trends in health inequalities were attributed to the differences in socioeconomic development during the 1990s.

With regards to self assessed health, the general overview paper presented results of an analysis of data from national surveys (chapter 2). Inequalities varied substantially between countries, but they were not systematically larger in the East than in the West. The same pattern was observed in a separate analyses based on the European Social Survey, which concluded that inequalities in self reported health were equally large in Eastern Europe as compared to the northern, central and southern parts of Western Europe (chapter 14). The same pattern was observed using both educational level and occupational class as the socioeconomic indicator (chapter 10). Possible explanations of the larger inequalities in mortality, and the lack of corresponding larger inequalities in morbidity, are forwarded in different chapters, especially at the end of chapter 2.

Work package 5. Health-related behaviours

The aims of work package 5 were to describe international patterns of socioeconomic inequalities in health-related behaviour, and to study associations with international patterns of inequalities in associated health outcomes. The emphasis would be on alcohol consumption, smoking or overweight, and on related health problems such as alcohol- and smoking-related causes of death.

This work package achieved its objectives. Extensive descriptions were made of socioeconomic inequalities in smoking, overweight and alcohol, and specific studies aimed to assess the extent to which these inequalities had contributed to inequalities in related health outcomes.

With regards to smoking, three overviews have been made that focussed on educational inequalities in, respectively, smoking prevalence, smoking initiation and smoking cessation (chapters 18, 19, 20). A recurring finding in these analyses is that large inequalities in smoking prevalence have emerged among both men and women in northern European countries, but not yet among women in southern European countries. In most analyses, women in Eastern European countries were found to be in-between the large inequalities in the north and the emerging inequalities in the south. These international patterns were observed especially with regards to smoking initiation, and may be related to both international variations in socioeconomic development and in women’s position in society (chapter 19).

Inequalities in smoking were studied in relationship to lung cancer mortality (chapter 5). There appeared to be a close correlation between inequalities in lung cancer mortality and inequalities in smoking: inequalities in lung cancer mortality were generally larger in populations with relatively large inequalities in smoking. However, some Northern European female populations did not fit into this pattern. These analyses underlined the importance of tackling inequalities in smoking, but also stressed the need to consider the role of other determinants of lung cancer.

With regards to overweight, two international overviews have been made of inequalities in overweight and obesity. The first overview was based on the European Community Household Panel (chapter 22). It showed that across Western Europe overweight was more strongly and more consistently related to educational attainment than to occupational class or household income. The second overview utilized the harmonized data from national surveys and included 19 countries from all parts of the EU (chapter 23). It showed that in nearly all countries the burden of overweight and obesity lied on those with lower educational attainment. When national income levels increased, overweight and obesity became increasingly more common among men of lower education. Among women, substantial inequalities in overweight were observed at all levels of national income.

Inequalities in overweight were studied in relationship to inequalities in diabetes prevalence (chapter 24). Large inequalities in diabetes appeared to go in tandem with similarly large inequalities in obesity. Inequalities in both diabetes and obesity were generally larger in southern European countries. In Europe, inequalities in obesity thus appear to translate in similar-sized inequalities in diabetes. Combating inequalities in obesity prevalence is very likely to also impact inequalities in diabetes, especially in Southern Europe.

With regards to alcohol consumption, descriptive overviews have been prepared on the basis of data from national health surveys. Given the large problems with the international comparability of data on alcohol consumption, these analyses were not completed in the form of a full chapter. The key results, that should be treated with caution, suggest that there are important and systematic variations between countries in the way in which average alcohol consumption varies by socioeconomic group. Higher average alcohol consumption by lower groups is observed only among men in southern and eastern countries, and among women in some eastern countries.

Inequalities in alcohol-related health problems were studied in two papers, both of which utilised mortality data. A general overview paper of inequalities in alcohol-related mortality concluded that educational inequalities in alcohol-related mortality were large in most countries, and that these inequalities contributed to an important extent to inequalities in mortality (chapter 6). The largest inequalities were observed for the East and Baltic region. A further analysis focussed on the contribution of alcohol to inequalities in cancer mortality in southern and northern countries (chapter 7). This study concluded that alcohol consumption substantially influenced inequalities in male cancer mortality in France, Spain and Switzerland but not in Belgium or in the Nordic countries.

Additional analyses were made of some other health-related behaviours, including fruit and vegetable intake, and physical exercise. For example, one analysis of the harmonised data sets provided new evidence on the association between leisure time physical activity (LTPA) and socio-economic status in 15 EU countries (chapter 25). The patterns and size of these socio-economic inequalities in LTPA strongly differ between countries, with the relative inequalities being most marked in northern countries.

Work package 6. Health-care utilisation

The aims of this work package were to describe international patterns of socioeconomic inequalities in the utilisation of health services, and to study associations with international patterns of inequalities in mortality or morbidity from selected diseases. The analysis could focus on inequalities within the general population, but also on few specific patient groups such as heart disease patients or diabetics.

This work package achieved its objectives. Descriptions were made of inequalities in health care utilisation in a large number of European countries. In addition, one analyses described inequalities in “avoidable mortality”, which could be used as a health outcome indicator indicative of problems with access to and quality of health care services.

The harmonised datasets based on national health surveys could be used to study several aspects of health care utilisation. The first paper based on this new dataset is included in this report (chapter 26). An overview was made covering nine countries, including three eastern countries (i.e. Estonia, Latvia and Hungary). The results showed that the frequency of visits to medical specialists increased with increasing educational level of the patient. Health care inequities were also present in specific patients groups (such as patients with diabetes) and they were found in the eastern European countries.

Two analyses were based on the SHARE international survey, which included 15 Western European countries. One study aimed at comparing these countries with regards to inequalities in the use of preventive services such as influenza vaccination and breast cancer screening tests (chapter 28). It observed that inequalities in preventive services are not a generalized phenomenon. The variability in the magnitude of inequalities between countries suggested that these inequalities might be influenced by characteristics of specific national healthcare systems. The second paper focuses on accessibility of care, as measured by people’s own reports of foregoing care due to financial or other reasons (chapter 27). It was found that respondents from low income groups report forgoing of care much more often than those from high income groups. This association was observed in all individual countries, although it was stronger in some countries than in others.

The potential effect of inequalities in health care utilisation on inequalities in mortality was explored by means of an analysis of “avoidable mortality” in 16 countries (chapter 8). Educational inequalities in avoidable mortality were present in all European countries and for most types of avoidable causes of death. Especially large educational inequalities were found for infectious diseases and for acute conditions to be treated by surgery. Inequalities were larger in eastern European countries. Inequalities in avoidable mortality contributed between one sixth and one third to the difference in life expectancy between high and low educated groups, suggesting a large potential contribution of health care to inequalities in mortality.

Work package 7. Labour market and social welfare policies

The principal aim of this work package was to study associations between international variations in socioeconomic inequalities in health and international variations in characteristics of labour market and welfare state arrangements. The work package would also consider the social and political context that is important to the formation of these arrangements.

This work package has achieved its objectives. It started to prepare an international overview of characteristics of labour market and welfare state arrangements that are potentially relevant to inequalities in health. These characteristics were then related to the available information from the international overviews of health inequalities. The latter information was extracted from various sources.

The first analysis utilised information from the SHARE survey that covered 15 Western European countries (chapter 11). It aimed to compare social class inequalities in self-assessed health in nine European countries which were grouped according to political tradition (social democratic, Christian democratic and the "late democracies" Spain and Portugal). Health inequalities by different socioeconomic dimensions were observed in the three political traditions, but these differences are more marked in late democracies. This result was one of the first to suggest an impact of different political traditions on social class inequalities in health.

A subsequent analysis utilised the harmonised dataset based on national health surveys (chapter 12). Educational level inequalities of self-perceived health were observed in all political traditions. As with the first paper, late democracies were found to have the highest inequalities. Contextual factors such as the expansion of welfare state or labour market explained most of the variations between political traditions in health inequalities.

A complementary analysis focussed on variations in health inequalities between countries grouped in terms of "welfare regimes" (chapter 10). The data source is based on the first and second wave of the European Social Survey, comprising 23 countries. South European welfare regimes had the largest health inequalities (with an exception of a smaller rate difference for limiting longstanding illness), while countries with Bismarckian welfare regimes tended to demonstrate the smallest. Although the other welfare regimes ranked relatively close to each other, the Scandinavian welfare regimes were placed less favourably than the Anglo-Saxon and East European. Thus, this study showed an evident patterning of magnitudes of health inequalities according to features of European welfare regimes.

Another study that specifically looked at health inequalities under different welfare regimes focussed on differences between men and women (chapter 13). Using the harmonised data set based on national surveys, this study examined the relationship between gender and self-assessed health in different European countries. In many countries, a higher proportion of women reported that their health was 'bad' or 'very bad' compared to men. However, several countries showed no or opposite gender differences in health. For some countries, the sex differences in health tended to be most prominent in the group with the highest education. Some, but not all of these results, can be explained with reference to variations between countries in types of welfare state regimes.

While the studies above compared countries in order to study the effect of labour market and welfare regimes, additional comparisons could be made between regions within a country, at least for the larger EU member states. An Italian study aimed to identify contextual dimensions that may have contributed to the larger socioeconomic inequalities in health in the Southern regions as compared to the smaller health inequalities in Northern regions (chapter 15). Regional variations in welfare and the economic development appear to be associated with inequalities in physical health, while regional variations in labour market opportunities were related to inequalities in mental health.

Strand 2. Evaluation of the effectiveness of policies and interventions

The generic work package under strand one, work package 2, provided the basis for the work of the specific work packages 8 to 11. Below, we will discuss the objectives and results for each work package.

<u>Work package 2. Generic activities</u>

The main aims of work package 2 were to develop criteria for the assessment of evidence of evaluations of policies and interventions to reduce inequalities in health, and to contribute to the application of these criteria to the evaluation of policies related to health behaviours, health care services and labour and welfare conditions (in work packages 8 to 11).

Two early outcomes of this work package were documents on the assessment of evidence of evaluation of policies and interventions. These documents are given in appendices 1 and 2, and also available at www.eurothine.org. The first of these two documents provides a generalised strategy for creating effective learning experiences that fits the ‘state-of-the-art’ in any area of interest (e.g. health-related behaviours, health care policies, or welfare policies). It proposes a five-step approach that results in the generation of relevant evidence, graded according to quality, and providing the basis for policy recommendations. This strategy aims to include all types of learning exercise, from ‘reviews of reviews’ to describing ‘best practices’ (appendix A).

Criteria were developed to assess evidence on effectiveness of policies and interventions to reduce health inequalities. These criteria related to the theoretical foundation of the interventions, the internal and external validity of the effect estimates, and the potential for reducing health inequalities (appendix A). Given the Eurothine’s general aim to enhance mutual learning from different European countries, particular attention was given to criteria of external validity, i.e. generalisability of the results from the study population to one or more ’transfer’ populations. A key question is whether the degree of effectiveness found for a study population in one country, will also be found if the same intervention or policy will be applied in other countries. For this purpose, we developed a checklist and illustrated this checklist with the example of an evaluation of the transferability of English intervention results towards the Dutch national context (appendix B).

In later work, this generic work package assisted other work package in the evaluation of relevant evidence on interventions to reduce health inequalities. The co-ordinating team made preliminary overviews of the available literature on interventions to improve health related behaviours and health care utilisation among lower socioeconomic groups. In addition, it advised the specific work packages on the choice of specific learning strategies, which in most cases consisted of an international study combined with an in-depth study of the experience of an intervention within a single country.

The final aim of this work package was to develop recommendations for policies and interventions to reduce health inequalities in different European countries, using the results of work packages 7 to 11. It would also develop a proposal for a permanent clearing house on tackling health inequalities in Europe. These activities have been completed with the preparation of a general document on recommendations and further work (chapter 33). The key recommendations will be summarised at the end of the current chapter.

Work package 8. Health behaviours

The main objective of this work package was to review case studies of recent policies and interventions that were potentially relevant for reducing inequalities in, respectively, tobacco use, alcohol abuse, and overweight.

Despite the large number of intervention studies with regards to health behaviours, few of these studies have been concerned with differences in the effectiveness of interventions between high and low socioeconomic groups. Even when we reduced the standards for the strength of evidence, few published studies were found to have the information to generate a useful “learning experience”. A large part of relevant studies in addition came from the United States of America, which is beyond the geographical scope of Eurothine. We had to conclude that there were too few European studies to provide a basis for systematic review in the areas of smoking, alcohol consumption, physical activity or nutrition. Given this paucity of published studies, we decided to perform two case studies that would add important evidence. Both studies focussed on tobacco consumption.

One study consists of an evaluation of the national program of services to help people quitting with smoking in England (chapter 21). These services are expected to play a key part in achieving the life expectancy health inequality target in England by reducing smoking prevalence in deprived areas. It was found that a higher proportion of smokers in the most disadvantaged areas reported success in quitting smoking than in more advantaged areas. The smoking cessation services had probably made a modest contribution to reducing inequalities in smoking prevalence. To increase this contribution, more innovative cessation interventions for the most addicted smokers should be developed.

Another case study utilised the harmonised data set based on national surveys (chapter 20). Our international data set made it possible to make comparisons between countries in which tobacco control policies were developed to different degrees. This study examined whether the intensity of these policies were correlated with national variations in smoking cessation ratios. It was found that countries with more developed tobacco control policies had higher quit ratios than countries with less developed policies. The association of quit ratios with score on TCS did not show consistent differences between high and low educated. Thus, high and low educated smokers benefit about equally from the nation-wide tobacco control policies.

Work package 9. Health care utilisation

This work package aimed to review case studies of recent health care interventions that were potentially relevant for reducing inequalities in mortality and morbidity.

The work in this area started with a broad overview of the potential effect of health care reforms on health inequalities (chapter 30). This chapter presents a conceptual framework which identifies the ways in which health care may affect health inequalities, and which also highlighted entry points for policies and reforms. It uses this framework to identify and assess studies and reviews on the impact of health care policies on health inequalities. A narrative review was made of 27 studies of a generally low quality. Indications were found of an effect of universal coverage on equality in access to health care. Cost-sharing was found to increase inequalities in access to health care. The review indicated a strong need for more and better research on the effect of health care organisation and policies on equity in access to health care services.

In further work, an in-depth review was made on the relatively large number of studies with regards to cancer screening among women (chapter 29). The chapter especially aimed at reviewing the scientific evidence on interventions to promote participation by women in cancer screening programmes. A systematic review of these studies showed that population-based screening programmes may be successful in reducing social inequalities in participation rates. Primary-care physicians were found to play a key role in promoting breast and cervical cancer screening among lower groups, while access could be effectively enhanced through cost-reducing interventions, such as offering free tests and eliminating geographical barriers.

Parallel to these systematic reviews, we performed a case study on inequalities in the use of preventive services in different European countries (chapter 28). International data sets, such as the SHARE survey, make it possible to make comparisons between countries in which potentially relevant health care policies are developed to different degrees. In chapter 28, we observed that inequalities by educational level in the utilization of preventive services seem to be related to characteristics of national healthcare systems. It was concluded that more centralized programs of proactive prevention leave fewer chances for SE inequalities in utilization of preventive services to persist. In addition, cost-sharing not only tended to reduce the overall levels of utilization of preventive services, but also seemed to increase inequalities in utilization.

Work package 10. Labour market and welfare policies

The aim of this work package was to review case studies of policies and interventions in the field of labour market and welfare state. This work package is closely related to work package 7, which performed a series of case studies at international levels. These case studies generated evidences on the extent to which health inequalities were related to international differences in political traditions, welfare regimes, and labour market conditions. A similar analysis was carried out comparing Italian regions. These studies were the first to point to the potentially large effect of labour market and welfare policies on the magnitude of health inequalities.

In work package 10, these comparative studies were supplemented with a series of case studies that focussed on single mothers. The rationale for the focus on this specific group was that policies that may affect health inequalities in general may also affect health differential between lone and couple mothers. Their study can therefore suggest entry points for both targeted and population-wide policy interventions.

A comparative study assessed the health of lone and couple mothers in Italy, Sweden and the United Kingdom (chapter 16). This chapter started to outline the health and health determinants of lone mothers in Italy, Sweden and the UK and investigated how this may be traced back to existing traditions, politics and policies. Lone mothers report worse health, more smoking and higher indications of material disadvantage than couple mothers in all three countries. However, absolute levels varied considerably. The differences between these countries may partly reflect the differing welfare state arrangements and social policies of the three countries. Several possible mechanisms were identified, including socioeconomic policies that affect the living conditions of lone mothers.

A Spanish case study assessed in further depth the health of lone mother in relationship to wider policies (chapter 17). It started with describing the health and health-related behaviour of lone and couple mothers in Spain. Among mothers with high socioeconomic position, few health inequalities appeared between lone mothers and couple mothers. However, among mothers with low socioeconomic status, being a lone mother had a significant negative impact on health outcomes. Lone mothers in the manual class had the worst health and health-related behaviours compared with the other groups of women. Their health situation is likely to be related the underdeveloped welfare state and sober public support for lone mothers in Spain.

Work package 11. Health equity targets

The central aim of this work package was to evaluate the formulation of quantitative targets for the reduction of socioeconomic inequalities in health in different countries. In addition, this work package would evaluate target-oriented monitoring of socioeconomic inequalities in health in countries where health equity targets have been formulated.

The key analysis evaluated the contents of health equity targets that have been formulated in the past years in European countries and to describe target-oriented monitoring practices (chapter 31). Quantitative targets are an important instrument in the formulation of policies and interventions aimed at reducing inequalities in health. However, practices differ widely between European countries, with up to now little or no exchange of experiences. Through contacts with national representatives, descriptions were made of health target formulation and related policy processes in Finland, Ireland, Latvia, Lithuania, the Netherlands, and Scotland.

It was found that ambitious, inspirational targets were applied especially in countries that had a low but increasing awareness of inequalities in health. These countries, including Estonia and Lithuania, have been less considerate about feasibility and attainability of targets. However, the translation of inspirational targets into indicators to be monitored did improve the specificity and measurability of most of the targets, as in Finland. Realistic, operational targets were applied especially in the British Isles, where some governments had started comprehensive policies to tackle health inequalities. The formulation of realistic targets was based on country-specific empirical evidence on health inequalities, including trends in the past and possible scenarios for the future. Monitoring of health inequalities was carried out to some extent in most countries.

The experience with health equity targets in the UK was subject to an in-depth review (chapter 32). A description was first made of the UK policy context and compared with the approaches to setting health inequalities targets in the four home countries (England, Scotland, Wales and Northern Ireland). Next, it used England and Scotland as examples of contrasting approaches to target setting and it described progress towards meeting targets in each. Finally, key emerging issues in relation to developing targets and measuring progress were outlined, including conceptual dilemmas, biased reporting, statistical fallacy and implementation failure. These issues could be considered in such a way as to win greater public confidence in the process of setting targets for reducing health inequalities.

From the international and UK reviews, it was concluded that health equity targets may be useful to stimulate and facilitate the development of policies to reduce health inequalities. Realistic targets will only make a difference if they were based on scientific evidence, translated into policies to reduce health inequalities, and supported by continuous monitoring systems.

Strand 3. Dissemination of results (Work package 3)

This strand is comprised of the generic work package 3. This package made special efforts to ensure that the results of this project will be disseminated widely and effectively in a number of formats. The emphasis is on the use of various outlets of information that all can help policy-makers at the European, national and local levels to obtain the information that they need to identify priority areas for tackling health inequalities, and to develop rational strategies. These outlets include a website, publications, and a training course. The activities in these three areas are listed below.

A website was created at the start of the project. During the project, it served for internal communication with the project group, and in addition it provided general information on the project for a broader audience. Among others topics, the website provided relevant documents, including all interim reports and all information needed to obtain and analyse the data sets that were prepared during the project. A frequent newsletter directed project participants to the updated website contents. Finally, the website will serve as a documentation centre that presents for a broad audience all publications that have resulted from this project.

The key publication of the Eurothine project is the present report, which will be made accessible through the website. In addition, most of the chapters in this report will be prepared for submission to international peer-reviewed scientific journals. Some chapters have already been submitted to journals, and some of these have been accepted for publication. Chapter 7 has already been published [3]. Summaries of the experience of the Eurothine project will be disseminated by means of presentations at international conferences, communications through the media, and summaries for journals or newsletters that have maximal reach among policy-makers at the European, national and local levels.

We have made an inventory of specific needs for the training course on inequalities in health and available course materials. During the project, we started with the development and improvement of the training course. Material is ready for a face-to-face presentation in short courses. This course focuses on the measurement of socioeconomic inequalities in health, using both lectures and numerical exercises. Students will be introduced to relevant concepts and methods for measuring health inequalities. The methods will be applied in a number of comparative analyses, both historical (on changes in health inequalities over time) and geographical (on variations in health inequalities between countries). Most illustrations will be drawn from the Eurothine project. Prof. Mackenbach and Dr. Kunst in Barcelona will give the first course of this type in November 2007 (organised by the Johns Hopkins School of Public Health) followed by a similar course in Florence in June 2008 (in the framework of the European Educational Programme in Epidemiology).

Finally, the relevant data presented in this report will serve as an input to the EU health information system. Contacts have been established with the coordinators of the EUPHIX project. In addition, preliminary results from Eurothine data have been used in a recent report that aimed to estimate the economic consequences of health inequalities in the EU [4].

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[3] Menvielle G et al. Socioeconomic inequalities in alcohol related cancer mortality among men: to what extent do they differ between Western European populations? Int J Cancer. 2007 Aug 1;121(3):649-55.

[4] Mackenbach JP, Meerding JWW, Kunst AE. Economic implications of socioeconomic inequalities in health in the European Union. Report to the EC. Rotterdam: Erasmus MC, 2007

Recommendations

The ultimate aim of the Eurothine project and its individual work packages were to develop recommendations for monitoring and policies. Strand 1 aimed to develop recommendations for monitoring and reporting of inequalities in health and health determinants in Europe, whereas strand 2 aimed to develop recommendations for policies and interventions to reduce socioeconomic inequalities in health in different European countries. Finally, strand 3 aimed to develop a proposal for a permanent clearing-house for collecting and disseminating information on the effectiveness of policies and interventions to reduce health inequalities in Europe.

Instead of providing isolated recommendation in different work packages and strands, we decided to combine the experience throughout the entire Eurothine project into one consistent document that provides recommendations in all above-mentioned areas (chapter 33). This chapter presents the lessons learned in the Eurothine project, within a general framework based on the necessary ingredients of strategies to tackle health inequalities. These ingredients include: political commitment; attainable objectives; package of effective policies and interventions; effective implementation; evaluation and monitoring.

From the extensive descriptions of inequalities in mortality and morbidity, we identified a series of opportunities and priorities for reducing health inequalities in Europe. The large inequalities in mortality in Eastern European countries suggested that tackling health inequalities is a particularly urgent priority for public health policy in Eastern Europe. In addition, variations in the magnitude of health inequalities between countries strongly suggest that a reduction of health inequalities is feasible. At the same time, the ubiquity of health inequalities even in countries with well-developed social and health care policies warns against too great optimism, and shows that innovative policies and great determination will be required to achieve this goal.

From the new international overviews of inequalities in health-related behaviours and health care, we provided some important suggestions with regard to entry-points for policies to reduce health inequalities in Europe. Important entry-points to reduce health inequalities, at least in some countries, are interventions and policies with regards to, respectively, smoking, excessive alcohol consumption, and obesity. Further, it was concluded that improvements in the health care system can play a role in reducing health inequalities in many countries, and that policies to promote financial, geographical and cultural access to good quality health care services for people with low socioeconomic status should be a priority for health care policy in all European countries.

Finally, the Eurothine evaluated policies and interventions in different fields. From these evaluations, specific recommendations were formulated for labour market and welfare policies, health care organisation, interventions and policies to improve health-related behaviours, and health equity targets. We wish to refer the reader to conclusions 5, 6, 7 and 8 of the final section of chapter 33. As the chapter concludes, it may not be realistic to eliminate health inequalities in the foreseeable future, but reducing them to more acceptable levels is well within the realm of possibility. Health inequalities can be reduced if we really choose to.

Policies to reduce health inequalities should be supported by continued monitoring and research. All European countries should be able to monitor socioeconomic inequalities in mortality, morbidity and health determinants on a routine basis, following generally accepted monitoring guidelines. The European Union should promote this by including the socioeconomic dimension in its health data collection guidelines. At the European level, a databank should be created which allows comparisons of health inequalities between countries and over time. In addition, research is needed to increase knowledge about possible entry-points for policies and interventions to reduce health inequalities, and to evaluate on-going and newly developed policies and interventions. European funding is essential for studies which want to take advantage of variations in determinants or policies between European countries. A clearing-house should be established to pro-actively identify and assess evidence on the effectiveness of policies and interventions to reduce health inequalities throughout Europe.

Chapter 2

Socio-economic inequalities in mortality and morbidity: a cross-European perspective

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Abstract

Rationale
Socioeconomic inequalities in health have been reported from many countries, and it is unknown to what extent they are modifiable. International comparisons can help to identify opportunities for reduction of health inequalities. We therefore compared the magnitude of inequalities in mortality and self-assessed health between 22 countries in all parts of Europe, and studied some immediate causes of variations between countries.

Data and methods
Mortality data for men and women aged 30-74, total and by cause of death, were obtained from longitudinal and cross-sectional mortality studies. Data on self-assessed health for men and women aged 30-69 were obtained from health interview or multipurpose surveys. These surveys also provided data on selected risk factors for mortality and morbidity. Level of education, occupational class (for mortality among men only) and income level (for morbidity only) were used as socioeconomic indicators. Measures for both relative and absolute inequalities were calculated. All data apply to the 1990’s or early 2000’s, and were adjusted for age.

Results
Although rates of mortality and less good self-assessed health were almost always substantially higher among men and women with lower socioeconomic positions, large variations in the magnitude of health inequalities were found between countries. For mortality, relative and absolute inequalities varied up to twenty-fold, with some Southern European populations having smaller inequalities, and many countries in the East and Baltic regions having much larger inequalities than the European average. Cardiovascular diseases contributed importantly to these variations, and some of the variations appeared to be related to smoking, excessive alcohol consumption, and health care deficiencies. For self-assessed health, inequalities also varied substantially between countries, but in a different and less easily interpretable pattern. We found no evidence for systematically smaller health inequalities in Northern Europe.

Conclusions
This is the first study to compare health inequalities and their causes between such a large number of countries. It shows that, although health inequalities are present everywhere, there are enormous opportunities for reducing them in many countries. The emergence of large inequalities in mortality in Eastern Europe suggests that policies tackling ‘upstream’ determinants of health inequalities, e.g. social protection schemes, are necessary to reduce health inequalities. The persistence of large health inequalities in Northern Europe, on the other hand, suggests that ‘upstream’ policies are not sufficient, and that tackling inequalities in ‘downstream’ determinants like health-related behaviors is essential to eliminate health inequalities.

Introduction

Inequalities in health between socioeconomic groups (distinguished by level of education, occupational class, or income) are one of the main challenges for public health world-wide [1], but it is unknown to what extent these health inequalities are actually modifiable. Because international-comparative studies can help to identify the scope for reduction of health inequalities, we have conducted a study which aimed at measuring variations in the magnitude of health inequalities between 22 European countries, and at identifying some of the immediate causes of these variations. Europe offers excellent opportunities for doing this type of research. European countries have very different political, cultural, economic, and epidemiological histories, and variations in the magnitude of health inequalities are therefore to be expected..

In a previous study we compared socioeconomic inequalities in mortality and morbidity between 10 countries in Western Europe during the 1980s. This study challenged conventional expectations on the between-country pattern of inequalities in health, and showed that countries in Northern Europe, such as Norway, Sweden and Finland, did not have smaller health inequalities than other Western European countries, despite long and successful histories of political engagement with reducing socioeconomic inequalities in their populations [3-7]. In this paper we report on an in-depth study of the magnitude of socioeconomic inequalities in mortality and morbidity in a much larger number of countries in both Western and Eastern Europe during the 1990s and early 2000s.

After the Second World War, countries in Eastern Europe have had very different political histories, which have been reflected in different cultural, economic, and epidemiological developments. After the fall of the ‘Berlin Wall’ in 1989, and the dissolution of the Soviet Union in the early 1990s, these countries have gone through a turbulent period of political, economic and health care reform. Income inequality and rates of poverty rose rapidly, indicators of psychosocial stress suggested high strains particularly among those not able to keep up with developments, and alcohol-related problems increased in many countries, particularly in the former Soviet Union [11,12]. Evidence from some countries shows that socio-economic inequalities in mortality increased rapidly during the 1990s [13-15]. It is unknown, however, whether health inequalities are generally larger in Eastern Europe than elsewhere in Europe.

A comparison of the magnitude of health inequalities between countries provides benchmark data and shows to what extent health inequalities may be modifiable. It becomes even more useful, when one can study possible causes of variations between countries, because these provide entry-points for policies. In the study to be reported here, we have therefore also studied the role of between-country variations in cause-of-death patterns and a few risk factors for mortality and morbidity.

Data and methods

For each of the countries included in our study, we collected data on mortality, causes of death, self-reported morbidity and/or risk factors for mortality and morbidity, by socioeconomic status, among adult men and women (table 1). Data on socioeconomic inequalities in mortality are available for 16 countries, cover the age-range 30-74 years at start of follow-up, and are based on almost 3.5 million deaths occurring among more than 54 million European citizens. All data cover whole national populations, with the exceptions of mortality data for England and Wales and France (representative samples of 1% of the population), Italy (data for the city of Turin only) and Spain (data for the Madrid, Barcelona and Basque regions only).

In addition to total mortality, we also obtained data on mortality by cause of death. We did two analyses: one focusing on the main causes of death (cancers, cardiovascular diseases, other diseases, and injuries), and one focusing on causes of death pointing to specific determinants (smoking-related causes of death, alcohol-related causes of death, and causes of death amenable to medical intervention [16,17]). Code numbers of the International Classification of Diseases (ninth or tenth revision) are given in an appendix to this paper.

All self-reported morbidity and risk factor data come from health or multipurpose surveys that also included self-reported socioeconomic data. These data cover 19 countries, the age-range of 30-64 or 30-69 years, and a total of almost 350,000 respondents throughout Europe. All data are nationally representative. For self-reported morbidity, our study focuses on the single item question on self-assessed health with five answer categories (from ‘very good’ to ‘bad’) which is included in most European health surveys. In order to make use of the full range of levels of self-assessed health, we calculated the estimated burden of disease associated with each level on the basis of the number of chronic conditions reported by respondents to these surveys.

Only a few health risk factors were available in a comparable form for a sufficiently large number of countries: smoking (self-reported current tobacco smoking), and obesity (Body Mass Index above 30 kg/m^2, based on self-reported weight and height).

We used three different indicators of socioeconomic status: level of education, occupational class, and income level. For level of education we used national education schemes reclassified into 4 categories of the International System of Classification of Educations (ISCED): primary or no education; lower secondary education; higher secondary education; tertiary education. Educational level was available in a comparable form for the largest number of countries, and for both mortality and self-reported morbidity and risk factors. For occupational class we used national occupational classification schemes reclassified into a simple scheme of ‘manual’ and ‘non-manual’ occupations. Occupational class data were available for mortality among middle-aged men, and for a limited number of countries only. For income level we used a classification in quintiles of equivalent net household income. Self-reported incomes of all household members, net of taxes and including benefits, were added, and corrected for household size (divided by household size to the power 0.36). National distributions of equivalent net household income were used to construct quintiles. Income data were available for self-reported morbidity, and for a limited number of countries only.

All measures were adjusted for age (in five-year age-groups). Because both relative and absolute measures of health inequalities are important, we present both the Relative Index of Inequality (RII) and the Slope Index of Inequality (SII) [20,21]. The RII regresses the rate of mortality, morbidity or risk factor prevalence on a rank measure of education, occupation or income, where the rank is calculated as the mean proportion of the population having a higher level of education, occupation or income. The RII can be interpreted as the ratio between the rate of mortality, morbidity or risk factor prevalence at the lower end of the social hierarchy, and the rate at the higher end [21]. The RII was calculated by Poisson regression, which also generated 95% Confidence Intervals. The SII measures absolute rate differences (e.g. in deaths per 100,000 person-years) between the lower and the higher end of the educational, occupational, or income hierarchy. The SII was derived from the RII and the age-adjusted over-all rate (MR) by the following formula: SII=2*MR*(RII-1)/(RII+1) [20].

Results

Relative inequalities in total mortality by educational and occupational group are shown in figures 1a and 1b. Countries have been arranged in an anti-clockwise fashion, starting with Finland, traversing the North, West, Continental, South, East and Baltic regions, and ending with Estonia. The Relative Index of Inequality (RII) is higher than 1 in all countries, for both men and women, indicating that mortality is always higher in the lower as compared to the higher socioeconomic groups. The magnitude of these inequalities varies substantially between countries, however. For both men and women, the smallest educational inequalities are found in the Basque Country, while the largest inequalities are found in the Czech Republic and Lithuania, respectively. All Southern European populations included in this analysis have smaller-than-average, and most countries in the East and Baltic regions have larger-than-average educational inequalities in mortality. Educational inequalities tend to be smaller among women than among men, but roughly the same international patterns are found for both genders. Data on occupational inequalities in mortality among middle-aged men (figure 1c) confirm that relative inequalities in mortality tend to be smaller in Southern European populations than in most other Western European countries. Some notable differences between countries in the same region are found. Sweden, for example, has smaller educational (but not occupational) inequalities in total mortality than other Northern European countries.

Table 2 shows that the international pattern observed for relative inequalities in mortality, mostly also applies to absolute inequalities in mortality, as represented by the Slope Index of Inequality (SII) for total mortality. For men and women, the smallest absolute inequalities are found in the Basque Country, while the largest inequalities are found in Hungary (a seven-fold difference) and Lithuania (a twenty-one-fold difference), respectively. In Europe as a whole (represented in the bottom row of table 2), all causes of death have higher mortality rates among the lower educated than among the higher educated, with the exception of breast cancer. Inequalities in mortality from cardiovascular disease account for 33% (442/1328) of educational inequalities in total mortality among men, and 50% (246/489) of those among women. Inequalities in cancer and injury mortality make a much more important contribution to inequalities in mortality among men than among women. Although most causes of death are more frequent in the lower educational groups, the range of variation for a single cause of death sometimes includes both ‘reverse’ inequalities (higher in higher educational groups) and ‘regular’ inequalities (higher in lower educational groups).

These data help to understand how smaller inequalities in total mortality in Southern European populations, and larger inequalities in the East and Baltic regions arise. Among men and women, smaller inequalities in total mortality in the South are largely due to smaller inequalities in cardiovascular disease mortality. For example, among men in the Basque Country the SII for cardiovascular disease mortality is only 16 per 100,000 person-years, while it is 442 per 100,000 person-years in Europe as a whole. This accounts for 45% ((442-16)/(1328-384)) of the smaller-than-average inequalities in total mortality in this population. Larger inequalities in cardiovascular disease make an important contribution to larger inequalities in total mortality in the East and Baltic regions, but cancer is more important in the East region, and injuries are more important in the Baltic region. Among Lithuanian men, injuries are the most important contributor to this country’s larger-than-average inequalities in total mortality ((643-147)/(2536-1328)=41%).

In Europe as a whole, inequalities in mortality from smoking-related conditions account for 21% of inequalities in total mortality among men, and 6% of those among women (table 2). There are large variations between countries in inequalities in smoking-related mortality: these tend to be larger than average in the East and Baltic regions (among men only), and smaller than average (or even ‘reverse’) in the South. In Europe as a whole, inequalities in mortality from conditions directly related to excessive alcohol consumption account for 11% of inequalities in total mortality among men, and 6% of those among women. Here again, there are large variations between countries, suggesting, for example, that larger inequalities in excessive alcohol consumption and its consequences contribute to the larger inequalities in total mortality in Hungary (among men and women) and the Baltic region (among men only). In Europe as a whole, mortality from conditions amenable to medical intervention accounts for only a small proportion of inequalities in total mortality (5% among men and women). These inequalities are clearly larger than average in Lithuania and Estonia, however, where they account for part of the larger inequalities in total mortality (among men only).

Figure 2 presents relative inequalities in levels of self-assessed health (calibrated on the basis of chronic disease burden) by educational and income level. The Relative Index of Inequality (RII) is higher than 1 in all countries represented in this analysis, including some countries for which no mortality data were available, indicating worse health in lower socioeconomic groups throughout the European continent. The range of variation between countries is considerably smaller than in the case of total mortality (cf. figure1). The international pattern also tends to be different from that observed in the mortality analysis. In Italy and Spain, educational inequalities in self-assessed health are smaller than the European average, which mirrors the smaller educational inequalities in total mortality observed in Turin, Barcelona, Madrid and the Basque Country. In the Baltic region, on the other hand, educational inequalities in self-assessed health are smaller than the European average, while inequalities in mortality are larger than average. In contrast to mortality, self-assessed health can also be differentiated according to net household income. These data, which are available for a limited number of countries only, confirm that socioeconomic inequalities in self-assessed health are *not* larger in the East and Baltic regions than in other parts of Europe. Income-related inequalities in self-assessed health are remarkably large in the North and West regions, particularly England.

Figure 3 presents data on relative inequalities in current smoking and in obesity by educational level. In Europe as a whole, both smoking and obesity are more common in lower educational groups, with inequalities in smoking being larger among men, and those in obesity being larger among women. There are striking differences between countries in the magnitude and even direction of these inequalities, however. Large inequalities in smoking are seen in the North, West and Continental regions, and small (even ‘reverse’, among women) inequalities in smoking are seen in the South region. In the East and Baltic regions the pattern is inconsistent. Large inequalities in obesity are seen in the South region, particularly among women, while inequalities in obesity tend to be smaller than the European average in the East and Baltic regions.

Discussion

Main findings

Although rates of mortality and less good self-assessed health were almost always substantially higher among men and women with lower socioeconomic positions, large variations in the magnitude of health inequalities were found. For mortality, inequalities varied up to twenty-fold, with some Southern European populations having smaller inequalities, and most countries in the East and Baltic regions having larger inequalities than the European average. Cardiovascular diseases contributed importantly to this international pattern, and sometimes cancer and injuries contributed as well. Data on inequalities in mortality from certain ‘tracer’ conditions suggested that some of these variations may be attributable to variations in the social patterning of smoking, excessive alcohol consumption, and health care deficiencies. We also found large between-country variations in the magnitude of inequalities in self-assessed health, but in a different and less easily interpretable pattern. The only consistent finding was that inequalities in both mortality and self-assessed health were smaller than average in some Southern European populations, suggesting that these populations may have smaller health inequalities in general. We found no evidence for systematically larger inequalities in self-assessed health in the East and Baltic regions, which precludes a generalization from larger inequalities in mortality in these countries to larger inequalities in over-all health.

Limitations

International comparability of data on socioeconomic inequalities in health is still imperfect, and the degree of perfection is likely to decline with increasing geographical coverage. There certainly are between-country differences in various aspects of data collection (cf. table 1). While some differences are of minor significance, others might affect the size of health disparities as we have shown elsewhere [19]. Until further harmonization of national health information systems in Europe has occurred, it therefore remains important to carefully evaluate all the main findings against possible data problems.

We found smaller inequalities in mortality in some Southern European populations. All these are urban and relatively prosperous, and not necessarily representative for the whole of Italy or Spain. Some studies have actually shown, however, that health inequalities tend to be larger in urban than in rural areas [23]. Our previous study for the 1980s, which used national data for Italy and Spain coming from methodologically less refined sources, also showed smaller inequalities in mortality in these countries [4,5]. We found larger inequalities in mortality in the East and Baltic regions. All these except Slovenia, which has smaller inequalities in mortality, are characterized by the use of a cross-sectional unlinked study design. While this may be taken to suggest bias caused by differences in study design, it is also possible that Slovenia, which is close to Italy, shares some of the favorable characteristics of the South region. Nevertheless, the possibility remains that inequalities in mortality are overestimated in some countries in the East and Baltic regions where we had to rely on cross-sectional unlinked data, as shown by a direct comparison of the two designs in Lithuania [24].

The analysis of variations in self-assessed health is notoriously difficult, because of cultural differences between countries and socioeconomic groups in reporting, for example reflected in different thresholds for assigning a less-than-‘good’ label to various states of ill-health [22,25]. We have therefore avoided using a single cut-off point, but due to this unconventional analysis, our results are not directly comparable with those of other international-comparative studies [6,7,26-30]. The over-all impression from this literature is that there is little consistency between studies in international patterns of inequalities in self-assessed health. Further advances in data collection (e.g. higher and more uniform response rates, use of anchoring vignettes for self-assessed health, inclusion of comparable measurements for other health aspects in surveys) may be needed. Inequalities in mortality do not necessarily reflect inequalities in morbidity in the population: mortality is a function of the occurrence of morbidity *and* of the latter’s case-fatality. The use of self-reports introduces yet another component which may lead to differences between patterns of mortality and of morbidity [22]. This may explain why the international pattern of inequalities in self-assessed health was different from that seen for mortality.

Possible explanations

Unfortunately, internationally comparable data on inequalities in specific determinants of mortality and morbidity are very scarce, and the only data which passed our comparability criteria *and* were available for most countries included in this study were on smoking and obesity. Inequalities in other relevant factors, such as alcohol consumption, health care utilization, working conditions, and psychosocial stressors could not directly be studied. Both smoking and obesity have been shown to contribute to the explanation of health inequalities in individual level studies in a small number of European countries, mostly in the West and North regions [31-33]. Our data showed that both smoking and obesity are strongly socially patterned in many countries, and therefore potentially relevant for explaining international variations in health inequalities. However, because there are long time-lags between exposure and health outcomes, and because the social patterning of both smoking and obesity may have changed over time, one should not naively correlate current inequalities in smoking and obesity with current inequalities in mortality and morbidity. Over the past decades, both smoking and obesity have become more prevalent in the lower socioeconomic groups in many countries, sometimes with transitions from ‘reverse’ inequalities (higher rates in higher socioeconomic groups) to ‘regular’ inequalities (higher rates in lower socioeconomic groups) [33-37].

It has been well documented that countries in the South region are in an earlier stage of the smoking epidemic than countries in the North, West and Continental regions [33,34]. We still found ‘reverse’ inequalities in smoking among women, and small inequalities among men, and this is entirely consistent with their smaller inequalities in mortality, particularly from conditions wholly or partly linked to smoking (such as cardiovascular disease). The history of the smoking epidemic is much less well documented for the East and Baltic regions. Smoking has been highly prevalent among men for decades, and although smoking rates have traditionally been low among women, they have increased strongly in the 1990s [38,39]. Good historical data on the social patterning of smoking in these countries are lacking, but it is likely that smoking rates have been higher in the lower socioeconomic groups, which is consistent with the larger inequalities in mortality from smoking-related conditions (table 2). In order to explain the discrepancy with the current social patterning of smoking (figure 3), one would have to assume that inequalities in smoking rates have recently changed (e.g. that smoking rates have increased more among the upper than among the lower socioeconomic groups), or that mortality from smoking-related conditions in lower socioeconomic groups in these countries is partly determined by other risk factors (occupational exposures, lack of access to medical care).

The role of hazardous drinking (daily consumption of high amounts of alcohol-containing beverages, binge drinking, or consumption of surrogate alcohols) in generating high mortality rates in Eastern Europe, particularly among men, has been reasonably well documented [40-42]. Hazardous drinking does not only affect mortality from directly alcohol-related causes, but also increases the risk of death from various injuries (accidents, suicide), cardiovascular diseases (ischemic heart disease, stroke), and pneumonia. We have not been able to find comparable survey data on socioeconomic inequalities in alcohol consumption in Eastern Europe, but our analysis of cause-specific mortality suggests that rates of hazardous drinking are substantially higher in the lower than in the higher socioeconomic groups, particularly among men (table 2). Low levels of social support, lack of control over one’s life, and material hardship, combined with a culture approving of excessive alcohol consumption, are all likely to be involved [11,12].

While the role of health care deficiencies in generating high mortality in Eastern Europe has been pointed out before [43,44], this is the first study to show the magnitude of socioeconomic inequalities in mortality from conditions amenable to medical intervention in this part of Europe. It suggests that inequalities in access to good quality health care do play a role in generating inequalities in mortality, but that this role is modest, and does not contribute to larger inequalities in total mortality, with the exception of men in the Baltic region (table 2).

Smoking, obesity, excessive alcohol consumption, and health care deficiencies represent only some of the immediate or ‘downstream’ causes of health inequalities, and both life-style choices and health care utilization patterns are likely to be constrained by inequalities in general living conditions, as structured by political, economic, cultural and other ‘upstream’ factors. Within Western Europe, there is little evidence that variations between countries in magnitude of health inequalities are related to variations in policies. For example, it is unlikely that the smaller inequalities in mortality in some Southern European populations reflect the impact of policies aimed at creating greater equality in access to material resources in these countries. Italy and Spain have similar ‘welfare regimes’, which are less generous and less universal than those of Northern Europe, as reflected in their larger income inequalities and higher rates of poverty [45,46]. Both countries are characterized, however, by a different epidemiological regime, which is due to the partial survival of a cardioprotective culture, including the Mediterranean diet and a traditional reluctance of women to take up the smoking habit [8, 47]. The prevalence of risk factors for heart disease and the actual rates of heart disease are still low, and as we have seen above inequalities in these risk factors and in heart disease mortality are still modest in size (with the exception of obesity). It is as if cultural factors have prevented differences in access to material and other resources in these populations to translate themselves into inequalities in smoking, excessive alcohol consumption and other lifestyle related risk factors for mortality.

We also found no evidence for systematically smaller health inequalities in countries in Northern Europe, although relative and absolute educational inequalities in mortality were smaller than the European average in Sweden, and although the size of the lower socioeconomic groups is generally smaller in the North than in e.g. the South region. This is a surprising finding because the Nordic countries are characterized by long histories of egalitarian policies, reflected, among other things, in a specific ‘welfare regime’. This ‘social-democratic’ regime (mainly found in the Nordic countries: Sweden, Norway, Finland, Denmark) provides a high level of social security protection to all residents of the country and is reflected in smaller income inequalities and lower poverty rates than in other Western European countries [45,46,48]. Despite this, these countries have far from eliminated inequalities in mortality and self-assessed health. In the case of mortality, our analysis suggests that the emergence of inequalities in ‘new’, lifestyle-related risk factors is part of the explanation for this persistence. In view of the important role of these lifestyle-related risk factors in generating premature mortality in high-income countries [49], it is clear that inequalities in these risk factors contribute to the persistence of inequalities in mortality in the North region as in other parts of Europe [50].

One could hypothesize, however, that the larger inequalities in mortality in the East and Baltic regions are related to variations in policies. These countries have for decades lived under communist rule, in the case of the Baltic Republics as part of the Soviet Union, and have gone through a turbulent period of political and economic reform during the 1990’s [12]. Inequalities in mortality have widened, and to the extent that larger inequalities in mortality in the East and Baltic regions reflect these recent increases, one could argue that they are explained by the failure of politicians to implement adequate social protection mechanisms. It is important to note, however, that inequalities in mortality in some of these countries (Estonia, Hungary) were already larger than those in Western Europe around 1990 [51].

Implications

Our study shows that although health inequalities are present everywhere, their magnitude is highly variable, particularly where mortality is concerned. This implies that there are enormous opportunities for reducing inequalities in mortality, if we would know how to reduce inequalities in cardiovascular disease, cancer and injury to the lowest observed levels. Inequalities in smoking, excessive alcohol consumption and lack of access to good quality health care are among the obvious entry-points for policy in many countries [52].

Developing interventions which effectively target these and other ‘downstream’ determinants of health inequalities is an urgent priority for public health research. This applies particularly to countries which have already achieved a reasonable degree of equality in access to material resources and other ‘upstream’ determinants of health inequalities, such as countries in the North region of Europe. It is difficult to see the political feasibility of reducing income inequalities below the level in Finland – the lowest level observed in Europe as a whole [53]. In order to fully realize the potential health gains of improved material living standards in lower socioeconomic groups, greater investments in health promotion and other approaches to reduce exposure to unfavourable consumption patterns are needed.

This applies less to countries in the East and Baltic regions of Europe, where larger inequalities in income as well as in many other unfavourable social and economic conditions go together with larger inequalities in mortality. It is likely that redressing these unfavourable social and economic conditions is necessary before substantial progress in tackling health inequalities can be made, and will with some delay translate into smaller inequalities in mortality.

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Table 1 Countries included in the analysis, with some information on data sources

European region	Country	Mortality data [additional note]				Morbidity data		
		Nature of study	Years	Person-years of follow-up	Number of deaths	Name of survey and responsible institute	Year(s) of survey	N
North	Finland (FIN)	National census-linked mortality follow-up	1990-2000	25874201	269781	Finbalt Health Monitor. National Public Health Institute, Helsinki	1994, 1998, 2000, 2002, 2004	16,963
	Sweden (SWE)	National census-linked mortality follow-up	1991-2000	43537681	404151	Swedish Survey of Living Conditions (ULF). Statistics Sweden, Stockholm	2000-2001	9,918
	Norway (NOR)	National census-linked mortality follow-up	1990-2000	19956767	213022	Norwegian Survey of Living Conditions. Statistics Norway, Oslo	2002	5,918
	Denmark (DEN)	National census-linked mortality follow-up	1996-2000	13926291	136065	Danish Health and Morbidity Survey (DHMS/SUSY). Danish National Institute of Public Health, Copenhagen	2000	14,503
West	England (ENG)	National census-linked mortality follow-up for a representative sample of 1% of population (incl. Wales)	1991-1999	445568	3867	Health Survey for England (HSE). Department of Health, London	2001	13,960
	Ireland (IRE)	n.a.				Living in Ireland Panel Survey. Economic and Social Research Institute (ESRI), Dublin	1995-2002	5,294
Continental	Netherlands (NET)	n.a.				General social survey (POLS) Statistics Netherlands, Voorburg	2003-2004	13,782
	Belgium (BEL)	National census-linked mortality follow-up	1991-1995	24861015	283349	Health Interview Survey. Institute of Public Health (IPH), Brussels	1997-2001	16,268
	Germany (GER)	n.a.				German National Health Examination and Interview Survey. Robert Koch Institute (RKI), Berlin	1998	6,403
	Switzerland[a] (SWZ)	National census-linked mortality follow-up	1990-2000	27910587	255251	n.a.		
	France[b] (FRA)	National census-linked mortality follow-up for a representative sample of 1% of population	1990-1999	2404246	20465	French Health, Health Care and Insurance Survey (ESPS). Institut de Recherche et Documentation en économie de la santé (IRDES), Paris	2004	14,727
South	Italy (TUR/ITA)	Urban census-linked mortality follow-up for the city of Turin	1991-2001	4873109	50621	Health conditions and use of health services. National Institute of Statistics (ISTAT), Rome Multipurpose Family Survey. Aspects of daily living.	1999-2000 2000	102,832 43,011
	Spain (BAR/MAD/BSQ/SPA)	- Urban census-linked mortality follow-up for the city of Barcelona - Regional census-linked mortality follow-up for the region of Madrid - Regional census-linked mortality follow-up for the Basque Country	1992-2001 1996-1997 1996-2001	8151810 3663333 6098485	77101 22585 41704	National Health Survey. Ministry of Health and Consumption (MSC), Madrid	2001	17,517
	Portugal (POR)	n.a.				National Health Survey. Instituto Nacional de Saude Dr Ricardo Jorge (INSARJ), Lisbon	1998-1999	34,840
East	Slovenia (SLO)	National census-linked mortality	1991-	9647452	101557			

		follow-up	2000					
	Hungary (HUN)	National unlinked cross-sectional mortality	1999-2002	21031348	363508	National Health Interview Survey Hungary. National Public Health and Medical Officer Service (NPHMOS), Budapest	2000-2003	9,179
	Czech Republic (CZR)	National unlinked cross-sectional mortality	1999-2003	25759210	344973	Health Interview Survey. Institute of Health Information and Statistics of the Czech Republic	2002	2,028
	Slovakia (SLV)	n.a.				Health Monitor Survey. Public Health Institute of Slovak Republic, Bratislava	2002	1,200
	Poland (POL)	National unlinked cross-sectional mortality	2001-2003	54883245	717743	n.a.		
Baltic	Lithuania (LIT)	National unlinked cross-sectional mortality	2000-2002	5156703	78399	Finbalt Health Monitor[c]	1994, 1998, 2000, 2002, 2004	10,336
	Latvia (LAT)	n.a.				Finbalt Health Monitor[c]	1998, 2000, 2002, 2004	6,779
	Estonia (EST)	National unlinked cross-sectional mortality	1998-2002	3435255	60794	Health Behavior among Estonian Adult Population. National Institute for Health Development, Tallinn	2002, 2004	3,525
Total	Europe (EUR)			301690841	3444686			348,983

n.a. = not available

Additional note: In longitudinal or census-linked mortality mortality follow-up studies, socioeconomic status as determined during a census has been linked to mortality during a follow-up period after the census. In unlinked cross-sectional mortality studies, socioeconomic data as mentioned on death certificates and as elicited during the census has been used to classify the numerator and denominator of mortality, respectively.

[a] excluding non-Swiss nationals

[b] excluding overseas territories, military, and students

[c] Prättälä R, Helasoja V, and the Finbalt group. (1999). Finbalt Health Monitor: feasibility of a collaborative system for monitoring health behaviour in Finland and the Baltic countries.
Helsinki: National Public Health Institute.

Table 2 Absolute inequalities in total and cause-specific mortality by level of education in 18 populations, (a) men, (b) women (SII's in deaths per 100,000 person-years)

a. Men

	Total mortality	All cancer mortality	Breast cancer	Lung cancer	All cardio-vascular diseases	Ischemic heart disease	Cerebro-vascular disease	Injuries	All other diseases	*Causes related to alcohol [a]*	*Causes related to smoking [b]*	*Causes amenable to medical intervention [c]*
FIN	***1255***	213	-	135	533	393	94	143	347	*101*	*215*	*88*
SWE	***625***	90	-	37	309	229	50	52	175	*50*	*71*	*26*
NOR	***980***	169	-	95	434	307	78	70	305	*62*	*166*	*49*
DEN	***828***	126	-	75	235	157	39	89	363	*23*	*60*	*44*
ENG	***529***	184	-	92	189	132	6	9	157	*39*	*154*	*n.a.*
BEL	***915***	274	-	179	233	99	55	64	340	*36*	*302*	*28*
SWZ	***1012***	283	-	136	291	132	61	91	348	*117*	*260*	*61*
FRA	***1044***	333	-	71	232	67	68	109	357	*196*	*204*	*114*
TUR	***639***	232	-	107	140	57	52	23	243	*63*	*177*	*24*
BAR	***662***	230	-	90	88	26	40	38	304	*77*	*218*	*36*
MAD	***530***	181	-	56	38	-16	11	26	278	*75*	*170*	*34*
BSQ	***384***	107	-	39	16	- 6	3	63	177	*46*	*107*	*24*
SLO	***1439***	303	-	124	405	67	219	203	482	*224*	*327*	*83*
HUN	***2580***	666	-	260	1003	482	385	222	671	*420*	*508*	*66*
CZR	***2130***	676	-	247	825	472	259	138	489	*146*	*364*	*73*
POL	***2192***	589	-	260	750	295	223	187	637	*145*	*408*	*75*
LIT	***2536***	383	-	197	807	505	159	643	677	*304*	*424*	*195*
EST	***2349***	355	-	191	929	610	263	436	618	*286*	*323*	*162*
EUR	***1328***	326	-	152	442	229	127	147	425	*142*	*285*	*72*

a. cancer of buccal cavity, pharynx, and oesophagus; cancer of larynx; cancer of trachea, bronchus, and lung; chronic obstructive pulmonary disease
b. alcoholic psychosis, dependence, and abuse; alcoholic cardiomyopathy; alcoholic cirrhosis of liver and pancreas; accidental poisoning by alcohol
c. tuberculosis; other infectious and parasitic diseases; cancer of cervix uteri; cancer of breast; Hodgkin's disease and leukaemia; hypertension; cerebrovascular disease; pneumonia/influenza; appendicitis, hernia and peptic ulcer; cholelithiasis and –cystitis; maternal deaths

Code numbers of the International Classification of Diseases (ninth or tenth revision) are given in an appendix to this paper.

b. Women

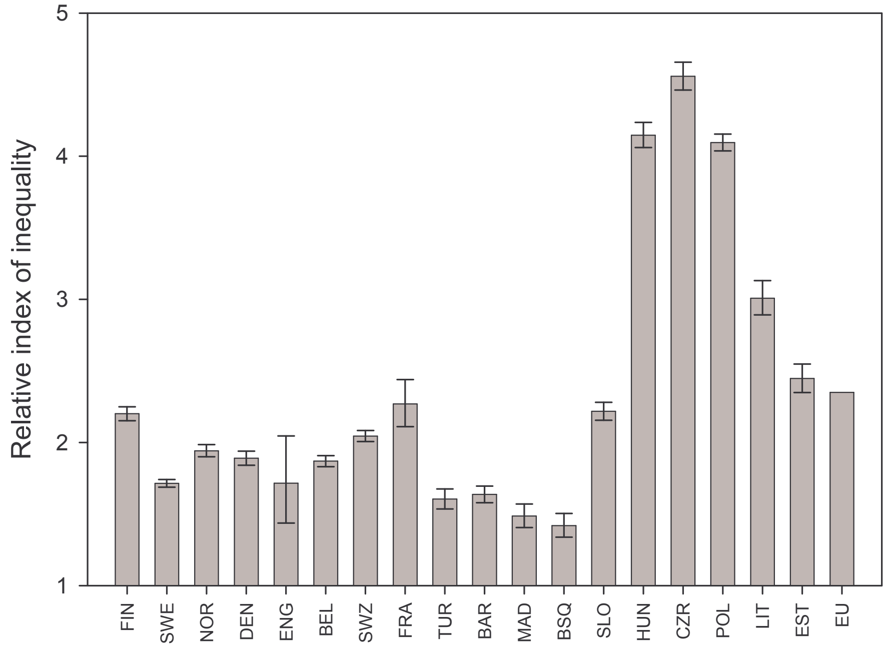
	Total mortality	All cancer mortality	Breast cancer	Lung cancer	All cardio-vascular diseases	Ischemic heart disease	Cerebro-vascular disease	Injuries	All other diseases	*Causes related to alcohol[a]*	*Causes related to smoking [b]*	*Causes amenable to medical intervention [c]*
FIN	***483***	49	-8	14	262	168	72	25	161	*31*	*28*	*42*
SWE	***381***	73	-6	20	172	104	44	8	128	*15*	*39*	*18*
NOR	***518***	103	-14	44	239	141	62	5	169	*16*	*79*	*30*
DEN	***511***	103	-12	63	160	90	42	22	230	*9*	*70*	*27*
ENG	***315***	42	-8	50	115	66	85	-9	146	*20*	*98*	*n.a.*
BEL	***417***	47	-11	11	198	77	55	11	163	*6*	*29*	*10*
SWZ	***337***	53	-3	10	158	74	46	5	120	*10*	*21*	*22*
FRA	***375***	50	35	6	130	33	44	36	163	*30*	*17*	*82*
TUR	***197***	15	-17	-9	94	34	34	-3	94	*8*	*-4*	*11*
BAR	***236***	7	-12	-14	103	36	34	5	126	*7*	*-14*	*12*
MAD	***175***	-12	-29	-17	96	30	29	-1	94	*-3*	*-17*	*9*
BSQ	***51***	-76	-19	-20	56	23	17	7	74	*3*	*-24*	*2*
SLO	***459***	-13	-21	-18	263	62	127	28	180	*44*	*-3*	*33*
HUN	***948***	120	-17	20	511	237	216	51	258	*82*	*61*	*26*
CZR	***726***	144	10	17	356	182	134	26	203	*23*	*33*	*32*
POL	***750***	139	6	10	356	117	142	29	222	*23*	*28*	*27*
LIT	***1099***	130	7	7	535	297	162	178	251	*87*	*39*	*51*
EST	***851***	7	-5	4	493	273	187	109	252	*101*	*16*	*48*
EUR	***489***	54	-8	8	246	117	86	30	173	*30*	*28*	*27*

For notes see table 1a.

Figure 1 Relative inequalities in Total mortality (a) by level of education among men in 18 populations, (b) by level of education among women in 18 populations, (c) by occupational class [a] among men in 8 populations.

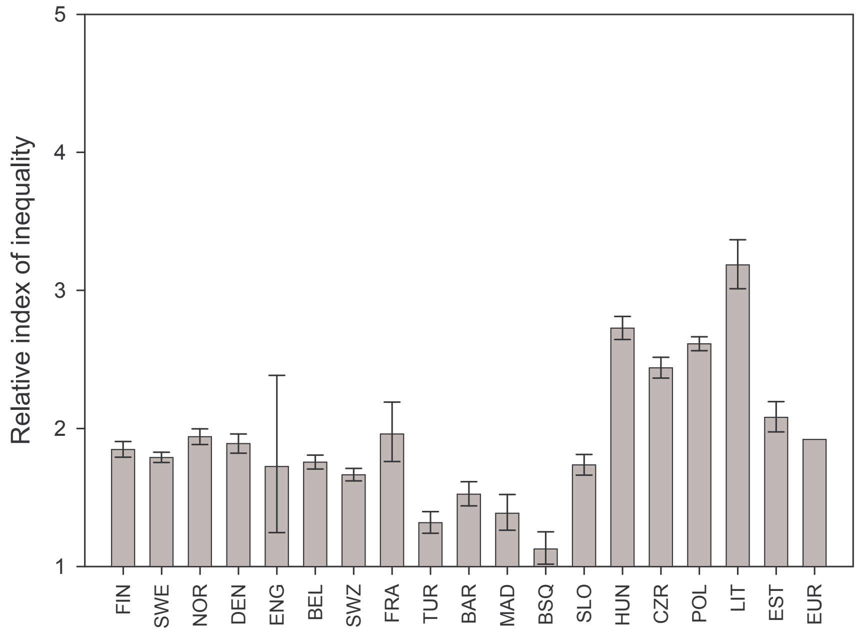
a.

Relative inequalities in total mortality by level of education among men in 18 populations



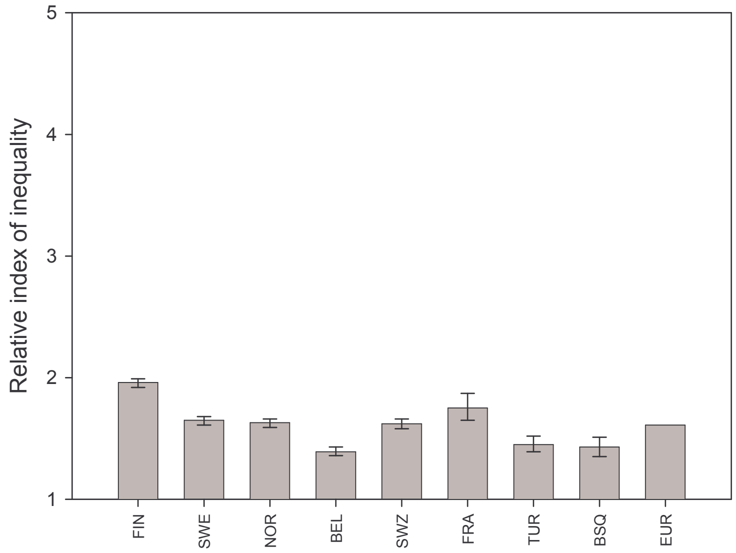
b.

Relative inequalities in total mortality by level of education among women in 18 populations



c.

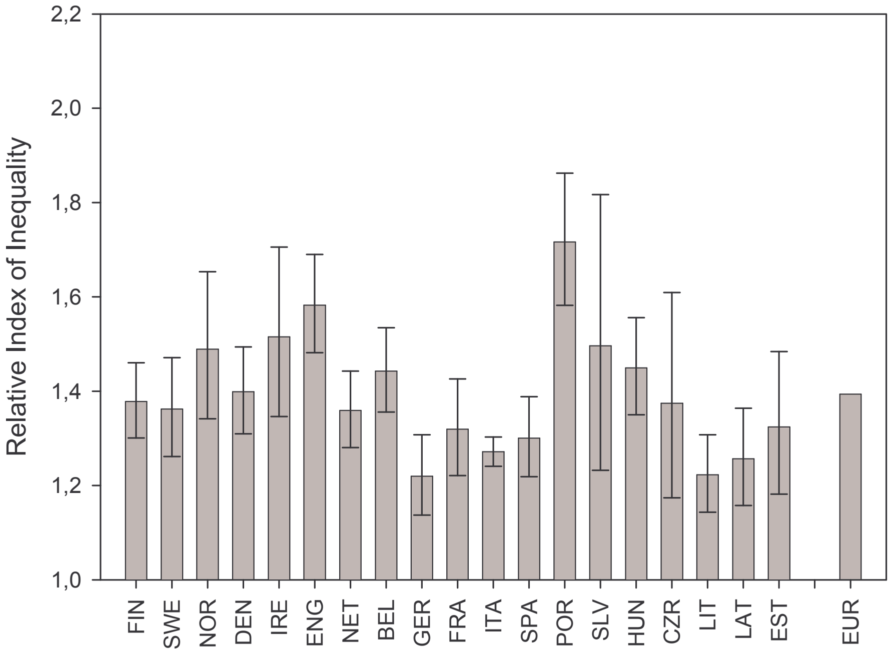
Relative inequalities in total mortality by occupational class among men in 8 populations



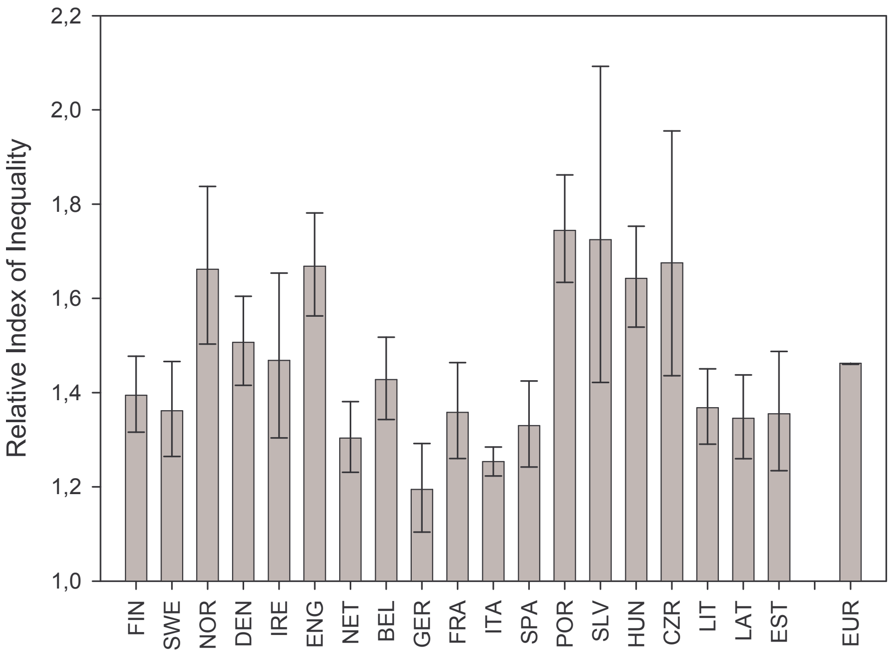
a. Economically inactive men for whom a last occupation was unknown had to be excluded from the analysis. Because their exclusion may lead to underestimation of mortality differences between occupational classes, we applied an adjustment procedure which was developed and tested in a previous European comparative study on mortality inequalities, and which is based on national estimates of the proportion of economically inactive men in each occupational class, and of the mortality rate ratio of inactive as compared to active men in each occupational class [19].

Figure 2 Relative inequalities in self-assessed health [a] (a) by level of education among men, (b) by level of education among women, (c) by income level among men, (d) by income level among women, by country and gender (RII's with 95% CI's)

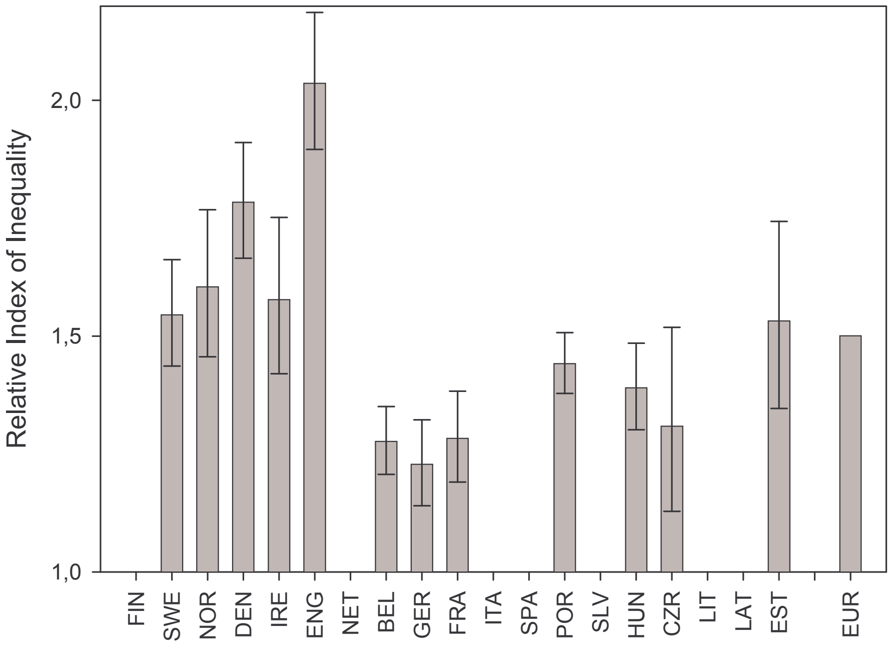
a. Education, men



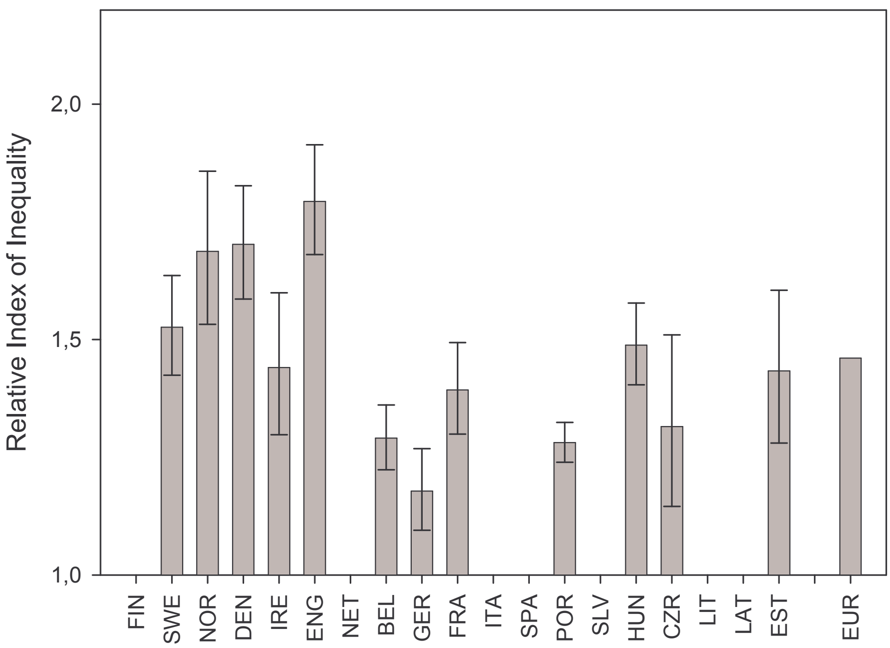
b. Education, women



c. Income, men

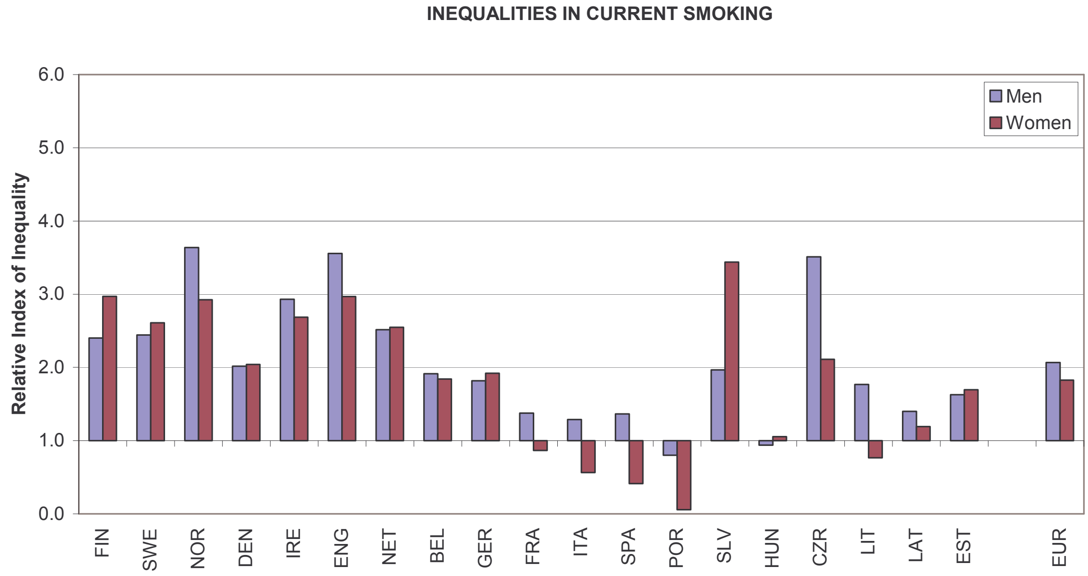


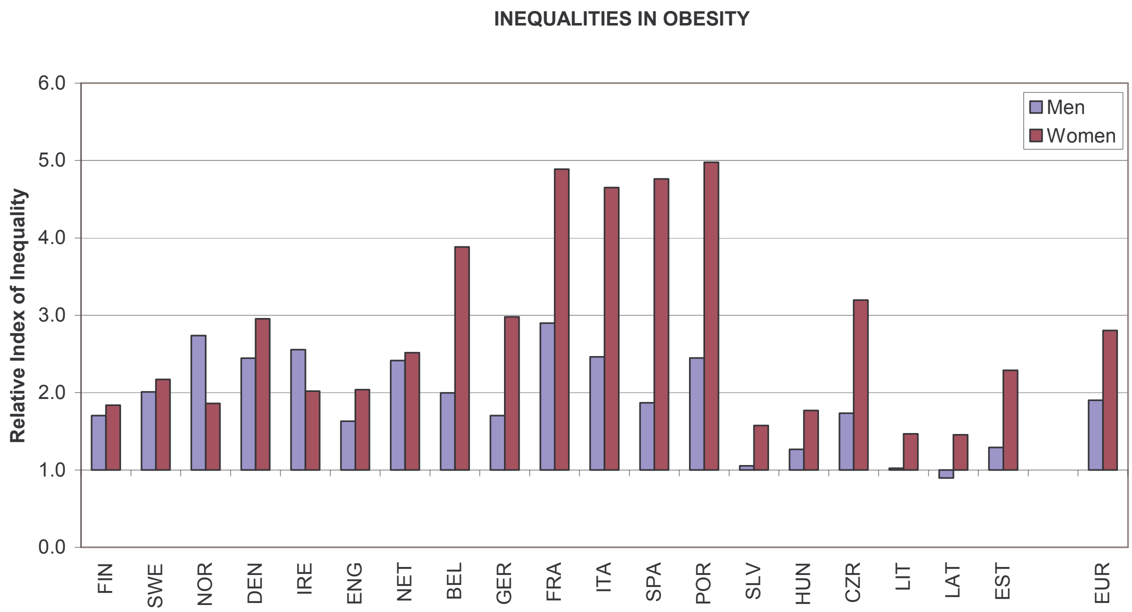
d. Income, women



a. In order to make use of the full range of levels of self-assessed health, we calculated the estimated burden of disease associated with each level on the basis of the number of chronic conditions reported by respondents to these surveys. Relative differences in self-reported chronic conditions between answer categories of the self-assessed health question were remarkably similar between countries, and varied only marginally around a multiplicative factor of 1.85 (i.e., each step 'down' on the self-assessed health scale was found to be associated with 1.85 times more chronic conditions). On the basis of this analysis we gave the following burden of disease weights to each of the answer categories: 'very good' = $1.85^0 = 1$, 'good' = $1.85^1 = 1.85$, 'fair' = $1.85^2 = 3.42$, 'poor' and 'very poor' = $1.85^3 = 6.33$). Sensitivity analyses showed that the ranking of countries on their magnitude of inequalities in self-assessed health did not change when these weights were varied within the range of observed values [17].

Figure 3. Relative inequalities by level of education in (a) current smoking, and (b) obesity in 19 countries, by gender





Appendix: ***List of causes of death***

Cause of death	ICD 9 codes	ICD 10 codes
1. Tuberculosis	010-018,137	A15-19, B90
2. Other infectious and parasitic diseases	Rest (001-139)	Rest (A00-B99)
3. Cancer of buccal cavity, pharynx and oesophagus	140-150	C00-C15
4. Cancer of stomach	151	C16
5. Cancer of colorectum	153-154	C18-C21
6. Cancer of liver	155	C22.0, C22.1, C22.9
7. Cancer of pancreas	157	C25
8. Cancer of larynx	161	C30-32
9. Cancer of trachea, bronchus, lung	162-163; 165	C33-C34; C39
10. Cancer of breast	174-175	C50
11. Cancer of cervix uteri	180	C53
12. Cancer of prostate	185	C61
13. Cancer of testis	186	C62
14. Cancer of kidney and bladder	188-189	C64-C68
15. Hodgkin’s disease and leukemia	201, 204-208	C81, C91-C95
16. Other neoplasms	Rest (140-239)	Rest (C00-D48)
17. Diabetes Mellitus	250	E10-E14
18. Alcoholic psychosis, dependence, abuse	291, 303, 305.0	F10
19. Epilepsy	345	G40-G41
20. Hypertension	401-405	I10-I15
21. Ischaemic heart disease	410-414	I20-I25
22. Alcoholic cardiomyopathy	425.5	I42.6
23. Chronic rheumatic heart disease	390-398	I00-I09
24. Other heart disease	416; 420-429	I26-I52; I98
25. Cerebrovascular disease	430-438	I60-I69
26. Other circulatory diseases	Rest (390-459)	Rest (I00-I99)
27. Pneumonia/influenza	487; 480-486	J10-J18
28. Asthma	493	J45-J46
29. Other COPD	490-494; 496	J40-J44; J47
30. Appendicitis, hernia, and peptic ulcer	531-534, 540-543, 550-553, 560	K25-K28, K35-K38; K40-K46; K56
31. Alcoholic cirrhosis of liver and pancreas	571.0-571.3, 577.0-577.1	K70, K85-K86.0
32. Cholecystitis and lithiasis	574-576	K80-K83
33. Other liver and gall bladder diseases	Rest (570-577)	Rest (K70-K87)
34. Prostate hyperplasia	600	N40
35. Maternal deaths	630-677	O 00-99
36. Symptoms and ill defined conditions	780-799	R00-R99
37. Road traffic accidents	E800-E829	V01-V89, Y85
38. Other traffic accidents	E830-E848	V80-V99
39. Accidental poisoning by alcohol	E860	X45
40. Accidental fall	E880-888	W00-W19
41. Suicide	E950-959	X60-X84, Y87.0
42. Homicide	E960-E969	X85-Y09, Y87.1
43. Injuries, unknown whether intentional	E980-989	Y10-Y24
44. Other external causes	Rest (E800-999)	Rest (V01-Y98)

Part II

Mortality; Causes of death

Chapter 3

Increasing educational differences in mortality in four Eastern European countries during the post-communist transition period

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Abstract

Background
This study examined the changes in educational differences in mortality in four Eastern European countries during the post-communist transition period.

Methods
Cross-sectional data were used to examine educational differences in total mortality and in cause-specific mortality around 1990 and 2000 in Estonia, Lithuania, Poland and Hungary. Cause-of-death analysis was limited to five broad groups: infectious diseases, neoplasms, circulatory diseases, other diseases and external causes of death. Age-standardized mortality rates and mortality rate ratios were calculated for men and women in three educational categories in the 35-64 age group. Educational differences in total mortality were also analyzed for the 35-49 and 50-64 age groups.

Results
Educational differences in total mortality increased in all the countries between 1990 and 2000. In Hungary and Poland mortality rates decreased in all educational groups, while in Estonia and Lithuania the mortality rates decreased only among graduates (among Lithuanian women also for those with upper secondary education).

A much larger increase was observed in the educational differences in total mortality in the younger age group in Estonia and Lithuania, due to an enormous increase in mortality for the lowest educated group not seen in Hungary and Poland. In the older age group educational differences among men tended to be larger in Hungary and Poland.

Educational differences in mortality by causes of death showed considerable variation, though relative differences increased for all cause-of-death groups in all countries. In Baltic countries, the external causes and circulatory diseases contributed the most to the increasing educational gap in total mortality whereas in Poland and Hungary the largest contribution was made by neoplasms.

Conclusions
A clear differentiation in educational differences in mortality occurred during the post-communist transition between the Baltic countries and the countries in Central Eastern Europe. In Hungary and Poland all educational groups experienced health gains to varying degrees whereas in Estonia and Lithuania, socioeconomic transition has been much more detrimental for those with lower education. The observed differences can be related to the differences in socioeconomic development during the 1990s.

Introduction

Socioeconomic differences in mortality have been well documented in the Western Europe. Mortality tends to be higher among less advantaged for most cause-of-death groups with the exception of few cancer sites.[1,2,3] The last decades have witnessed an increase in relative differences in mortality in many Western European countries, although the absolute differences have remained fairly stable.[4,5,6,7] In northern part of Europe cardiovascular diseases have contributed about half to the widening relative gap in total mortality.[7]

Socioeconomic differences in mortality have been increasingly reported also in the Eastern parts of Europe.[8,9,10,11] Educational differences in mortality at the end of the communist era were at least as big as in the West.[8] There is also evidence of sharply increasing educational differences in mortality in some Eastern European countries over the last decade.[9,10,11,12]

Though East-West disparities in mortality have received considerable attention among researchers,[13,14,15, 29] much less attention has been paid to the mortality differences between Eastern European countries. This study focuses on four former communist countries: Estonia, Lithuania, Poland and Hungary. The collapse of the communist system and the following transition period changed radically political, economic and social realities in all four countries, although the impact of transition varied substantially between the countries. The economic performance in transition economies depended not only from the extent of the reforms but also from the initial conditions in each country.[16] Baltic countries, which were previously part of the Moscow-directed structure of production and distribution, experienced a total rupture of their economic systems in contrast to Central Eastern European countries.[17] Central Eastern European countries, on the other hand, afforded much more generous social safety nets by spending larger proportions of GDP on social transfers.[18] In 1991, the average life expectancy in Poland has raised about 2-3 years above that in Lithuania and Estonia, whereas in Hungary, the life expectancy remained lower than in Lithuania.[19]

This is the first study that compares the changes in educational differences in mortality in a broader range of countries in Eastern Europe. We analyze the change of educational differences in total mortality in Estonia, Lithuania, Poland and Hungary over the period of post-communist transition to evaluate the extent of the change as well as the direction of the change at each educational level. We also analyze educational differences by five broad cause-of-death groups to evaluate their contribution to the change of educational differences in total mortality.

Data and methods

The dataset used in this study has been collected within the framework of the EUROTHINE project. Unlinked cross-sectional mortality analyses have been performed for Estonia, Lithuania, Poland and Hungary around 1990 and 2000. Population denominators by educational categories come from population censuses and corresponding national death data cover two to five years around censuses (Table 1). For Poland, the population denominators for years 1990-1991 have been estimated on the basis of 1988 census. In order to diminish the possible numerator denominator bias we limited analyses to 35-64 age group because misreporting of education on death certificates can be particularly large for older people.[20] Educational differences in total mortality were also analyzed for the 35-49 and 50-64 age groups. All analyses were performed separately for men and women.

National educational schemes have been reclassified in comparable way into three categories corresponding broadly to the International Standard Classification of Education: lower secondary education or less (ISCED categories 0-2), upper secondary education (3-4) and higher education (5-6). The percentage of cases with missing information on education was relatively low both on death records and on census records in 35-64 age group (Table 1). All cases with missing education were excluded from the analysis. In Poland, the registration of education on death certificates was started only in 1990 which explains the higher percentage of missing education in Poland in the first study period. However, as this can be related to the introduction period of the new practice, it is less probable that misreporting can be attributed to any particular educational category. We corrected the Polish data for earlier period by increasing the mortality rates by six percent (see below and table 1) for all educational categories.

Data analysis was performed for total mortality and for cause-specific mortality. In all countries, the ninth revision of International Classification of Diseases (ICD) was used during the first study period (in Estonia and Lithuania, the abbreviated version of ICD-9 with 175 categories) and the tenth revision of ICD during the second study period. In order to increase comparability between countries and over the study periods, the cause-specific analysis was limited to five broad cause-of-death groups: infectious and parasitic diseases (corresponding ICD-10 categories A00-B99), neoplasms (C00-D48), circulatory diseases (I00-I99), other diseases (the rest of the A00-U89 categories) and external causes of death (V01-Y89).

Age-standardized mortality rates were calculated to evaluate absolute differences between educational categories and between two periods. Combined dataset for 25 EU member states was used as a standard population. The relative differences between educational groups were assessed by age adjusted (5-year age groups) mortality rate ratios with 95% confidence intervals, using Poisson regression. SPSS (version 13.0) statistical package was used to calculate age-standardized mortality rates and STATA (version 9) was used to perform regression analysis.

Results

Table 2 presents the results for educational differences in total mortality for age group 35-64. At both study periods the differences were larger among men compared to women. Around 1990, the relative and absolute differences in total mortality were rather similar in all countries. However, the mortality rate ratios were somewhat lower in Estonia and Lithuania, and so was the rate differences between the lowest and the highest educated groups among men. Among women the absolute differences were somewhat smaller in Estonia and in Poland.

From 1990 to 2000, educational differences in total mortality increased in all countries, though the increase in both absolute and relative terms was larger in Estonia and Lithuania. In Hungary and Poland mortality rate decreased in all educational groups, whereas in Estonia and Lithuania the mortality rate decreased only in the highest educational group (in Lithuania also among women with upper secondary education). By 2000, the absolute differences were much larger in the Baltic countries. The relative differences across countries were remarkably similar among men, but among women somewhat higher in Estonia and Lithuania.

Relative educational differences in total mortality were universally larger in younger age group (Table 3). In 35-49 age group, around 1990, the relative differences were rather similar in all countries (somewhat lower among Estonian men). The absolute differences were highest in Lithuania and Hungary. From 1990 to 2000, absolute and relative differences in 35-49 age group increased in all countries and both genders, with the exception of Polish men for whom the absolute differences decreased. Due to an enormous increase in mortality for the lowest educated group in Estonia and Lithuania, the absolute and relative differences around 2000 were much higher in Baltic countries than in Poland and Hungary.

In 50-64 age group, around 1990, both absolute and relative educational differences in mortality tended to be higher in Central Eastern European countries (except for relative differences among women in Hungary). From 1990 to 2000, absolute and relative differences in 50-64 age group increased in all countries and for both genders. The mortality rate decreased among graduates in all countries, but in the Baltic countries, a considerable increase was observed among the lowest educated group (among men also for those with upper secondary education). In 2000, the relative differences in mortality remained higher in Hungary and Poland among men but not among women, whereas absolute differences were caught up or exceeded by Baltic countries.

Educational differences in mortality by causes of death showed considerable variation between countries (Table 4). In 1990, for circulatory diseases the absolute and relative differences were highest in Hungary and lowest in Lithuania. For infectious diseases and external causes of death the absolute differences were higher in Baltic countries, whereas for neoplasms and other diseases in Central Eastern European countries (among men only). No clear educational gradient was observed for neoplasms among women in any country. The relative differences followed the same country profile only for neoplasms – being higher among men in Central Eastern Europe.

From 1990 to 2000, an increase in relative educational differences was observed for all selected cause-of-death groups in all countries (Table 4). Absolute differences decreased for circulatory diseases in Poland, and for infectious diseases and external causes of death in Poland and Hungary (only among men), but increased in all other instances. In 2000, the absolute differences were larger for most cause-of-death groups in the Baltic countries (except for neoplasms and among men also for other diseases); relative differences were larger in the Baltic countries for infectious diseases, and among women also for other diseases and external causes of death.

Figure 1 shows that in the Baltic countries, external causes and circulatory diseases made the largest contribution to the overall mortality increase among the lowest educated group. Though neoplasms contributed to the mortality increase among the lowest educated group in all countries (except for men in Estonia and Poland), this increase was counterbalanced by declining mortality from circulatory diseases and external causes of death in Central Eastern European countries. Circulatory diseases and then neoplasms contributed the most to the overall mortality decline in higher educated groups in all countries, and in Central Eastern Europe also in the group with upper secondary education.

Table 5 summarizes the contribution of different cause-of-death groups to the increase of the rate difference between the lowest and highest educated groups in total mortality. In Estonia and Lithuania, the external causes and circulatory diseases each contributed 25-41% and infectious diseases contributed 4-8% to the increase of the rate difference in total mortality. The contribution of circulatory diseases was also high among men in Hungary. Neoplasms contributed 47-114% to the increase of the rate difference in total mortality in Poland and Hungary.

Discussion

We found that at the end of the communist period the educational differences in total mortality were rather similar in all four countries, though cause-of-death pattern showed considerable variation. During the post-communist transition period educational differences in total mortality increased in all countries, though the increase in both absolute and relative terms was much larger in Baltic countries. The relative differences in mortality by education increased in all countries, in both age groups and in all selected cause-of-death groups, the absolute differences decreased for some cause-of-death groups in Central Eastern Europe. In Central Eastern Europe mortality rates decreased at all educational levels for most cause-of-death groups, whereas in Baltic countries mortality rates increased for most selected cause-of-death groups among those at the lowest educational level and for some cause-of-death groups also among those with upper secondary or higher education.

In unlinked census based cross-sectional studies the results may be biased if there are differences between death certificates and census records as regards misreporting or non-response, or they cover different populations. These problems may lead to both under- or overestimation of mortality differences. The recent study in Lithuania found that in unlinked study educational differences in mortality were overestimated when compared to the linked study.[20] Misreporting of education on death certificates in Lithuania may be partly explained by different educational classifications that were used for death and census records around 2000. We couldn't detect similar discrepancies in educational classifications in other countries but also in Lithuania around 1990. As misreporting of education may be particularly large for older people[20] we restricted our analysis to the 35-64 age group. The inclusion of older age groups would probably have diminished the gap in absolute educational differences in mortality between Baltic countries and Central Eastern European countries around 2000, as the large increase in mortality that occurred in former Soviet republics but not in Central Easter European countries in the 1990s, affected disproportionally the middle age population. We may have overestimated the educational differences around 2000 in Lithuania to some extent, however we believe that the differences we found between Baltic countries and Central Eastern European countries reflect the real trends. Our results are also in line with earlier studies from Russia and Czech Republic.[11,12]

During the communist period the Baltic republics were more advanced in terms of living standards and economic development than rest of the Soviet republics and departed less from the countries in Central Eastern Europe. Levels of income were low, but the overall income distribution in the former communist countries was more egalitarian than in most market economies even after allowing for fringe benefits and various forms of implicit income received by *nomenklatura.*[21] Investment in education not only did not pay high returns but it also did not bring advantage in terms of easier access to jobs.[22] Surprisingly, at the end of the communist period the educational differences in mortality in Eastern Europe were at least as large as in west[8] suggesting that factors other than income inequalities determined educational differences in mortality in Eastern Europe. In the light of increasing poverty in Eastern Europe during the 1980s[18,23] it is however possible that poverty was one of the causal factors contributing to the educational differences in mortality in Eastern Europe already at the end of the communist period as indicated by the large relative educational differences in mortality from infectious diseases around 1990. Large educational differences in mortality from external causes, particularly in the Baltic countries indicate that high levels of alcohol consumption among those with lower education may have been related to the educational gap in mortality around 1990. In Poland the more restrictive alcohol policy over the 1980s reduced the overall alcohol related mortality[24] but not the differences between educational groups.

The collapse of the communist system and the transition reforms drastically reduced output and severely affected employment in Eastern Europe. In the early 1990s the Baltic countries experienced much larger declines in national income and in real wages than countries in Central Eastern Europe but have since recovered much ground.[25] By 2000, GDP levels had surpassed their respective 1989 levels in Poland and Hungary (27% and 4% respectively) but were still below 1989 level in Estonia and Lithuania (by 19% and 32%).[25] The transition was accompanied by the emergence of large-scale unemployment. Compared to the former Soviet republics, Central Eastern European countries afforded more protective labor market policies spending larger proportions of GDP on social transfers.[18,26] In Hungary and Poland, unemployment benefits strongly reduced poverty whereas in Estonia such effect was only minimal.[26] Income distribution is the next decisive factor influencing poverty beside the decline in overall income. During the transition income inequalities increased significantly in Estonia and Lithuania, whereas they remained modest in Hungary and Poland.[21] Though poverty increase was universal in all transition economies, the rise in Baltic countries was much larger than in Central Eastern Europe.[21]

During the transition, education has become an increasingly distinctive measure of wealth in all former communist countries, as average returns in wages to years of education have risen dramatically.[27,28] Education also increased ability to switch from one job to another, to avoid unemployment, and to exit from both unemployment and inactivity to employment.[22] Higher education significantly reduced the probability of being poor, more so in Central Eastern European countries than in the Baltics.[18]

Social disruption, poverty and increasing differences in wealth are likely to be the underlying structural factors to the increasing educational differences in mortality. In the Baltic countries, unlike in the Central Eastern European countries, they contribute to the rise of absolute mortality among those with a low(er) education. The relatively high contribution of infectious diseases to the overall mortality increase among the lowest educated in Baltic countries is evidence of poverty driven causal mechanisms. Income and poverty can be linked to the access to housing, health services, healthy diet, to the exclusion from social participation, or to the psychosocial stress. All these factors are known to affect health and/or mortality, though the causal pathways may vary.

Alcohol accounts for high proportion of premature mortality in Eastern Europe.[29] Alcohol was the major factor explaining high mortality from external causes during the post-communist transition.[30] External causes of death made the largest contribution to the increase of educational differences in mortality in the Baltic countries, indicating that alcohol may be an important causal factor, and particularly in younger ages. Poverty may have exaggerated the role of alcohol in widening educational gap in mortality by increasing the probability to drink non-beverage alcohols that are much cheaper but have very high ethanol content and high toxicity.[31] In Hungary, where alcohol contribution is also known to be very high, the mortality rates are very high for liver cirrhosis and certain cancers.[29] As liver cirrhosis accounted almost half of the deaths in the group of other diseases in Hungary, we may conclude that alcohol has contributed to the widening educational gap also in Hungary. Alcohol is likely to explain part of the increasing educational differences in the circulatory diseases mortality in Baltic countries and Hungary. It is possible also that social control of alcohol consumption in Poland in the 1990s has contributed to the lowering of circulatory mortality rates in all educational groups there.

Dietary changes have had a major impact on the decline of cardiovascular mortality in Poland in 1990s,[32] with all educational groups gaining from the progress to about the same extent. In Baltic countries and in Hungary, not only alcohol but also limited access to healthy food may have contributed to the increasing mortality among lower educated and to the widening educational gap.

Neoplasms have contributed to the widening educational gap in total mortality in all countries suggesting that some underlying factors originate long before the transition period. In Central Eastern Europe the contribution of neoplasms has been large compared to other causes of death, indicating that factors in past are equally or even more important in explaining increasing educational gap in mortality in the 1990s.

Conclusions

Educational differences in mortality increased in all four countries over the period of post-communist transition. Clear differentiation occurred between the Baltic countries and the countries in Central Eastern Europe as regards mortality trends or cause-specific mortality by educational groups. In Hungary and Poland all educational groups experienced health gains to varying degrees whereas in Estonia and Lithuania, socioeconomic transition has been much more detrimental for those with a lower educational level. Differences in the trends in inequalities in mortality between

Baltic and Central Eastern European countries can be related to the differences in socioeconomic development during the transition. All four countries would benefit from focusing on the social determinants of health, and in particular to make it a priority to address the growing mortality gap between educational groups.

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Table 1. Descriptive information about data.

Country	Study years	Number of deaths (% of missing cases)	Person years (% of missing cases)
Estonia	1987-1991	26360 (0.7)	2908465 (0.0)
	1998-2002	26449 (3.1)	2612645 (2.1)
Lithuania	1988-1990	33176 (0.5)	3904164 (0.0)
	2000-2002	33928 (1.3)	3935637 (0.5)
Poland	1990-1991	217157 (6.4)	27061356 (0.2)
	2001-2003	282798 (1.0)	42980313 (2.1)
Hungary	1988-1991	165688 (0.2)	16120552 (0.0)
	1999-2002	150092 (0.7)	15965480 (0.0)

Table 2. Age-standardized mortality rates per 100 000 and mortality rate ratios with 95% confidence intervals (CI) for total mortality by educational level from 1990 to 2000 in age group 35-64.

	Men							Women						
	Mortality rate			Rate ratio (95% CI)				Mortality rate			Rate ratio (95% CI)			
	1990	2000	Change 1990-2000	1990		2000		1990	2000	Change 1990-2000	1990		2000	
Estonia														
Lower secondary or less	1612	2245	634	2.03	(1.92-2.14)	3.24	(3.06-3.44)	571	872	301	1.57	(1.46-1.70)	2.98	(2.74-3.23)
Upper secondary	1221	1536	315	1.53	(1.45-1.62)	2.32	(2.20-2.46)	477	501	24	1.36	(1.26-1.48)	1.92	(1.78-2.08)
Higher	808	657	-151	1.00		1.00		352	264	-88	1.00		1.00	
Rate difference[a]	804	1588	785					219	609	389				
Lithuania														
Lower secondary or less	1494	2349	855	2.23	(2.11-2.36)	3.37	(3.20-3.54)	559	944	384	1.66	(1.54-1.80)	2.85	(2.65-3.07)
Upper secondary	1143	1291	147	1.72	(1.62-1.82)	2.04	(1.95-2.15)	415	413	-2	1.29	(1.19-1.40)	1.67	(1.56-1.79)
Higher	685	619	-66	1.00		1.00		332	250	-82	1.00		1.00	
Rate difference	809	1730	921					227	694	467				
Poland														
Lower secondary or less	1483	1294	-189	2.35	(2.30-2.41)	3.25	(3.18-3.32)	513	470	-43	1.80	(1.72-1.88)	2.32	(2.26-2.39)
Upper secondary	991	660	-331	1.54	(1.50-1.59)	1.61	(1.57-1.65)	449	314	-135	1.55	(1.48-1.62)	1.54	(1.50-1.59)
Higher	653	406	-247	1.00		1.00		298	207	-92	1.00		1.00	
Rate difference	830	888	58					214	264	49				
Hungary														
Lower secondary or less	1691	1687	-4	2.39	(2.33-2.45)	3.38	(3.29-3.47)	649	648	-1	1.66	(1.59-1.73)	2.35	(2.26-2.44)
Upper secondary	1114	906	-209	1.52	(1.48-1.57)	1.83	(1.77-1.89)	561	387	-174	1.35	(1.29-1.42)	1.42	(1.36-1.49)
Higher	718	501	-217	1.00		1.00		421	290	-131	1.00		1.00	
Rate difference	974	1187	213					228	358	130				

[a] Rate difference between the lowest and highest educated group

Table 3. Age-standardized mortality rates per 100 000 and mortality rate ratios with p-values for total mortality by educational level from 1990 to 2000
in two age groups.

	Age group 35-49									
	Men					Women				
	Mortality rate			Rate ratio		Mortality rate			Rate ratio	
	1990	2000	Change 1990-2000	1990	2000	1990	2000	Change 1990-2000	1990	2000
Estonia										
Lower secondary or less	965	1626	660	2.84 [a]	5.60 [a]	320	649	329	2.29 [a]	5.69 [a]
Upper secondary	585	859	275	1.72 [a]	3.05 [a]	211	266	55	1.56 [a]	2.44 [a]
Higher	337	278	-59	1.00	1.00	135	108	-26	1.00	1.00
Rate difference[d]	628	1347	719			185	541	356		
Lithuania										
Lower secondary or less	1018	1945	927	3.31 [a]	6.62 [a]	365	880	514	2.20 [a]	6.83 [a]
Upper secondary	653	696	43	2.16 [a]	2.40 [a]	224	219	-5	1.44 [a]	1.77 [a]
Higher	301	290	-11	1.00	1.00	156	125	-32	1.00	1.00
Rate difference	717	1655	937			209	755	546		
Poland										
Lower secondary or less	778	654	-123	3.25 [a]	4.25 [a]	255	239	-16	2.14 [a]	2.98 [a]
Upper secondary	456	268	-188	1.84 [a]	1.75 [a]	207	132	-75	1.68 [a]	1.65 [a]
Higher	248	153	-95	1.00	1.00	122	80	-42	1.00	1.00
Rate difference	530	502	-28			133	159	26		
Hungary										
Lower secondary or less	932	878	-54	3.45 [a]	4.16 [a]	361	369	8	2.26 [a]	3.16 [a]
Upper secondary	471	522	51	1.73 [a]	2.47 [a]	240	216	-24	1.49 [a]	1.87 [a]
Higher	270	209	-61	1.00	1.00	162	116	-45	1.00	1.00
Rate difference	662	668	7			200	253	54		

	Age group 50-64									
	Men					Women				
	Mortality rate			Rate ratio		Mortality rate			Rate ratio	
	1990	2000	Change 1990-2000	1990	2000	1990	2000	Change 1990-2000	1990	2000
Estonia										
Lower secondary or less	2428	3029	602	1.77 [a]	2.66	888	1155	266	1.42 [a]	2.48 [a]
Upper secondary	2024	2390	366	1.47 [a]	2.10	813	798	-14	1.30 [a]	1.74 [a]
Higher	1402	1134	-268	1.00	1.00	626	459	-167	1.00	1.00
Rate difference[d]	1026	1895	869			262	695	433		
Lithuania										
Lower secondary or less	2095	2861	766	1.81 [a]	2.69 [a]	804	1026	222	1.46 [a]	2.41 [a]
Upper secondary	1761	2040	278	1.52 [a]	1.95 [a]	656	657	2	1.19 [b]	1.61 [a]
Higher	1169	1034	-135	1.00	1.00	554	408	-146	1.00	1.00
Rate difference	926	1827	901			250	619	368		
Poland										
Lower secondary or less	2373	2101	-273	2.05 [a]	2.94 [a]	837	761	-76	1.61 [a]	2.10 [a]
Upper secondary	1666	1155	-511	1.44 [a]	1.59 [a]	754	543	-211	1.46 [a]	1.49 [a]
Higher	1163	724	-439	1.00	1.00	520	366	-154	1.00	1.00
Rate difference	1210	1376	166			317	395	78		
Hungary										
Lower secondary or less	2650	2708	59	2.05 [a]	3.17 [a]	1012	1000	-13	1.36 [a]	2.03 [a]
Upper secondary	1925	1390	-536	1.49 [a]	1.62 [a]	965	603	-362	1.27 [a]	1.23 [a]
Higher	1282	868	-414	1.00	1.00	748	509	-239	1.00	1.00
Rate difference	1368	1840	472			264	491	227		

[a] (p<0.001)
[b] (p<0.01)
[c] (p<0.05)
[d] Rate difference between the lowest and highest educated group

Table 4a. Age-standardized mortality rates per 100 000 and mortality rate ratios with p-values for selected causes of death from 1990 to 2000
in age group 35-64 among men.

	Circulatory diseases				Infectious diseases				Neoplasms				Other diseases				External causes			
	Mortality rate		Rate ratio		Mortality rate		Rate ratio		Mortality rate		Rate ratio		Mortality rate		Rate ratio		Mortality rate		Rate ratio	
	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000
Estonia																				
Lower secondary or less	653	773	1.80 [a]	3.00 [a]	27	60	4.99 [a]	11.80 [a]	387	373	1.85 [a]	2.56 [a]	194	393	2.13 [a]	3.44 [a]	350	647	2.76 [a]	3.95 [a]
Upper secondary	524	559	1.45 [a]	2.24 [a]	10	26	1.65	5.38 [a]	336	287	1.59 [a]	1.99 [a]	130	256	1.42 [a]	2.38 [a]	222	409	1.75 [a]	2.61 [a]
Higher	368	248	1.00	1.00	6	5	1.00	1.00	211	142	1.00	1.00	93	107	1.00	1.00	130	155	1.00	1.00
Rate difference[d]	285	525			21	55			176	231			101	286			220	491		
Lithuania																				
Lower secondary or less	516	687	1.60 [a]	2.61 [a]	41	113	11.66 [a]	15.47 [a]	351	400	1.90 [a]	2.35 [a]	210	342	3.43 [a]	4.79 [a]	376	806	3.68 [a]	4.63 [a]
Upper secondary	457	448	1.43 [a]	1.85 [a]	15	25	4.15 [a]	3.63 [a]	304	293	1.58 [a]	1.83 [a]	120	151	2.04 [a]	2.31 [a]	247	374	2.38 [a]	2.39 [a]
Higher	331	240	1.00	1.00	4	7	1.00	1.00	185	155	1.00	1.00	62	64	1.00	1.00	104	153	1.00	1.00
Rate difference	185	447			37	106			167	245			148	278			272	653		
Poland																				
Lower secondary or less	590	422	1.93 [a]	2.88 [a]	18	15	6.02 [a]	6.53 [a]	372	366	2.08 [a]	2.76 [a]	280	295	3.00 [a]	4.21 [a]	224	196	3.79 [a]	3.99 [a]
Upper secondary	440	234	1.42 [a]	1.57 [a]	6	6	2.02 [a]	2.44 [a]	259	209	1.45 [a]	1.55 [a]	176	135	1.85 [a]	1.86 [a]	109	77	1.83 [a]	1.57 [a]
Higher	314	148	1.00	1.00	3	2	1.00	1.00	179	134	1.00	1.00	97	71	1.00	1.00	61	49	1.00	1.00
Rate difference	276	274			15	12			193	232			183	223			163	147		
Hungary																				
Lower secondary or less	633	572	2.11 [a]	3.56 [a]	19	15	4.39 [a]	5.02 [a]	431	506	1.94 [a]	2.82 [a]	355	386	3.37 [a]	3.71 [a]	253	209	3.23 [a]	3.94 [a]
Upper secondary	468	291	1.51 [a]	1.83 [a]	8	6	1.69 [a]	2.01 [b]	332	300	1.46 [a]	1.69 [a]	191	195	1.75 [a]	1.89 [a]	116	114	1.49 [a]	2.17 [a]
Higher	303	162	1.00	1.00	4	3	1.00	1.00	224	180	1.00	1.00	107	103	1.00	1.00	79	52	1.00	1.00
Rate difference	329	411			15	12			207	325			248	282			174	157		

[a] (p<0.001)
[b] (p<0.01)
[c] (p<0.05)
[d] Rate difference between the lowest and highest educated group

Table 4b. Age-standardized mortality rates per 100 000 and mortality rate ratio for selected causes of death from 1990 to 2000 in age group 35-64 among women.

	Circulatory diseases				Infectious diseases				Neoplasms				Other diseases				External causes			
	Mortality rate		Rate ratio		Mortality rate		Rate ratio		Mortality rate		Rate ratio		Mortality rate		Rate ratio		Mortality rate		Rate ratio	
	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000
Estonia																				
Lower secondary or less	216	308	2.39 [a]	5.36 [a]	5	19	1.53	13.00 [a]	181	198	1.01	1.29 [a]	93	170	1.85 [a]	4.62 [a]	76	177	1.87 [a]	4.52 [a]
Upper secondary	155	151	1.74 [a]	2.86 [a]	4	5	1.31	5.17 [b]	196	174	1.15 [c]	1.23 [a]	67	88	1.42 [a]	2.80 [a]	56	83	1.43 [b]	2.41 [a]
Higher	90	53	1.00	1.00	3	1	1.00	1.00	172	143	1.00	1.00	47	32	1.00	1.00	39	35	1.00	1.00
Rate difference[d]	125	255			2	17			9	55			46	138			37	142		
Lithuania																				
Lower secondary or less	185	267	2.14 [a]	3.94 [a]	6	28	2.32	10.43 [a]	174	253	1.03	1.47 [a]	106	161	2.40 [a]	4.11 [a]	88	235	3.16 [a]	5.47 [a]
Upper secondary	127	114	1.48 [a]	2.05 [a]	4	6	1.65	2.99 [a]	174	160	1.03	1.21 [a]	63	58	1.53 [a]	2.03 [a]	47	76	1.84 [a]	2.45 [a]
Higher	90	56	1.00	1.00	3	2	1.00	1.00	169	132	1.00	1.00	41	29	1.00	1.00	28	31	1.00	1.00
Rate difference	95	212			3	26			5	121			64	132			59	204		
Poland																				
Lower secondary or less	194	135	2.47 [a]	3.47 [a]	4	4	2.64 [a]	2.78 [a]	180	203	1.25 [a]	1.71 [a]	99	94	2.31 [a]	3.47 [a]	36	34	2.05 [a]	2.21 [a]
Upper secondary	150	74	1.90 [a]	1.90 [a]	3	2	1.44	1.53 [c]	194	164	1.34 [a]	1.38 [a]	75	52	1.68 [a]	1.91 [a]	26	21	1.49 [a]	1.33 [a]
Higher	80	40	1.00	1.00	2	2	1.00	1.00	154	121	1.00	1.00	44	28	1.00	1.00	18	16	1.00	1.00
Rate difference	114	95			2	3			26	82			55	66			17	18		
Hungary																				
Lower secondary or less	238	206	2.47 [a]	4.15 [a]	4	4	1.64 [a]	3.52 [a]	203	240	1.03	1.52 [a]	142	150	2.81 [a]	3.09 [a]	62	48	1.42 [a]	2.54 [a]
Upper secondary	162	91	1.60 [a]	1.85 [a]	4	2	1.19 [a]	1.51	248	186	1.19 [a]	1.21 [a]	94	78	1.74 [a]	1.64 [a]	53	30	1.15 [c]	1.61 [a]
Higher	103	53	1.00	1.00	3	1	1.00	1.00	212	165	1.00	1.00	56	51	1.00	1.00	48	20	1.00	1.00
Rate difference	135	153			1	3			-9	75			86	99			14	29		

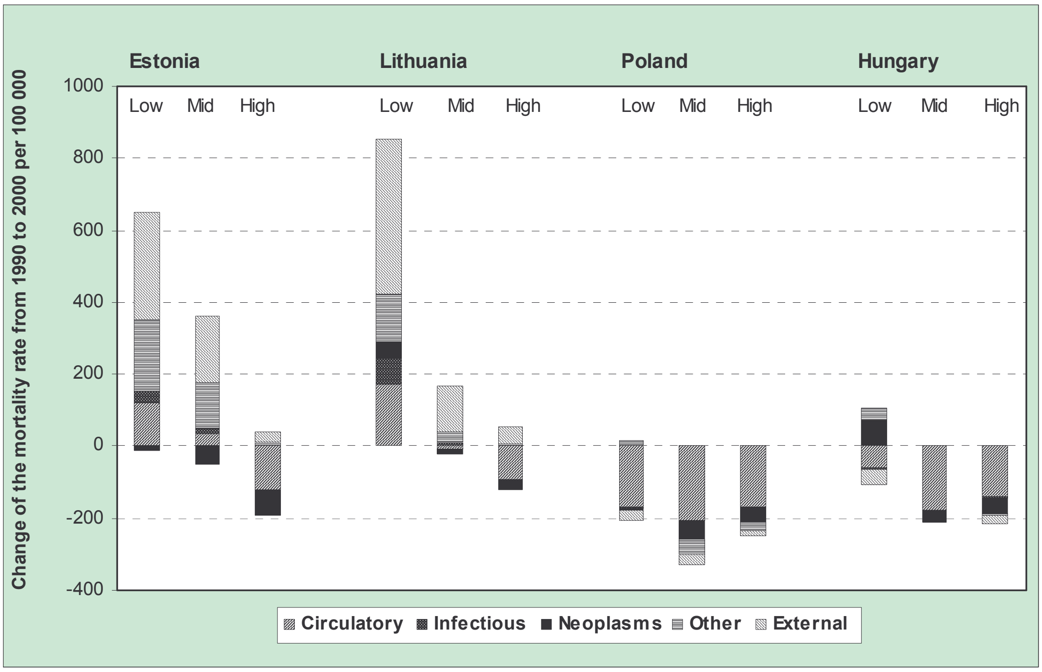
[a] (p<0.001)
[b] (p<0.01)
[c] (p<0.05)
[d] Rate difference between the lowest and highest educated group

Table 5. Contribution (%) of different cause-of-death groups to the change of mortality rate differences between the lowest and highest educated group from 1990 to 2000.

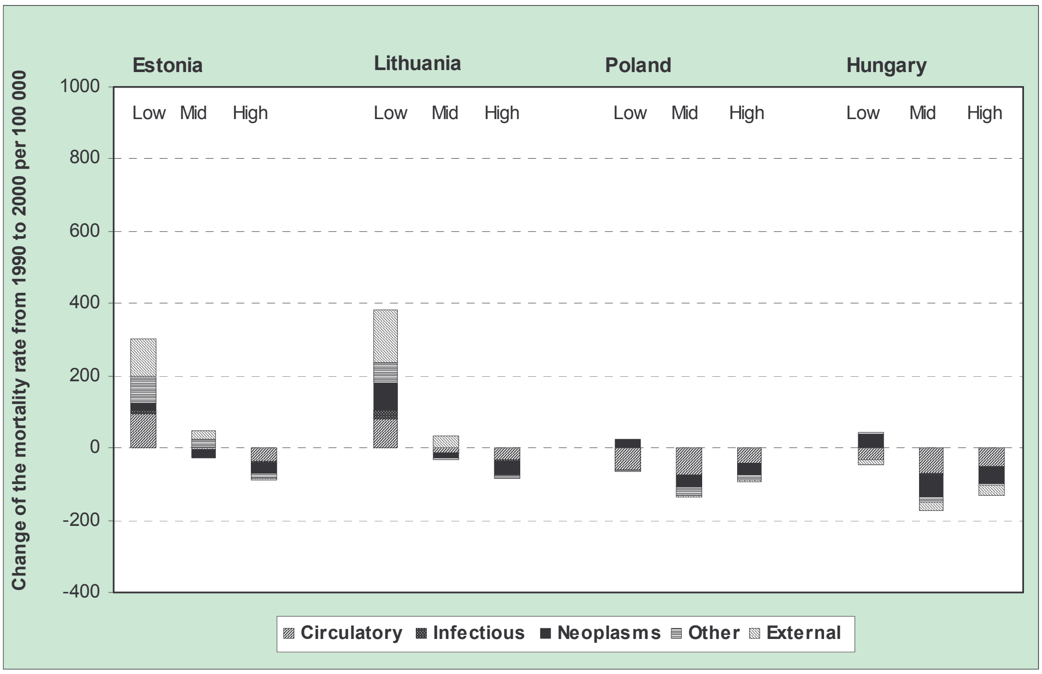
	Men				Women			
	Estonia	**Lithuania**	**Poland**	**Hungary**	**Estonia**	**Lithuania**	**Poland**	**Hungary**
Circulatory diseases	30.6	28.5	-3.6	38.2	33.4	24.9	-38.1	13.6
Infectious diseases	4.3	7.5	-4.4	-1.5	3.9	4.8	0.1	1.0
Neoplasms	7.0	8.5	66.5	55.4	11.9	24.8	114.3	64.1
Other diseases	23.5	14.1	69.3	15.9	23.6	14.6	22.3	10.2
External causes	34.5	41.4	-27.8	-8.0	27.1	30.9	1.4	11.1
Total mortality	100	100	100	100	100	100	100	100

Figure 1. Contribution of different causes of death to the total change of mortality by educational
groups from 1990 to 2000 in age group 35-64.

a) Men



b) Women



Chapter 4

Educational differences in cancer mortality among women and men: a gender pattern that differs across Europe

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Abstract

Background
To compare socioeconomic inequalities in total cancer mortality between women and men in different European populations, and to investigate which cancer sites explain the differences between gender and populations.

Methods
We used data from longitudinal mortality studies. Studies were performed among women and men aged 30-74 at baseline during the 1990s in 12 European populations (Madrid, Basque region, Barcelona, Slovenia, Turin, Switzerland, France, Belgium, Denmark, Norway, Sweden, Finland). Socioeconomic status was measured using the educational level declared at the census at the beginning of the follow-up period. We conducted Poisson regression analyses and computed relative indices of inequality (RII).

Results
We observed large variations within Europe for educational differences in total cancer mortality among men and women. Three types of situations were observed: Denmark, Norway and Sweden (significant RII around 1.3-1.4 among both men and women); France, Switzerland, Belgium and Finland (significant RII around 1.7-1.8 among men and around 1.2 among women); Spanish populations, Slovenia and Turin (significant RII from 1.29 to 1.88 among men; no differences among women except in the Basque region where the RII is significantly lower than 1). Lung, upper aerodigestive tract and breast cancers explained most of the variations found between gender and populations in the magnitude of inequalities in total cancer mortality.

Conclusion
Large variations in socioeconomic inequalities in cancer mortality are found between European gender and populations. Given time trends in cancer mortality, the gap in the magnitude of socioeconomic inequalities in cancer mortality between men and women will probably decrease in the future, as will differences between European populations.

Introduction

Studies consistently reported socioeconomic inequalities for total mortality but also for many causes of death such as cardiovascular diseases in many different populations [1-4]. For cancer mortality in particular, the situation differed by gender. Studies consistently observed higher total cancer mortality rates among men with lower socioeconomic position [5-11]. On the contrary among women, most studies were conducted in Southern Europe and did not find any variation by socioeconomic status [5, 6, 10, 12], even though slightly higher total cancer mortality rates were sometimes found among women with higher or lower socioeconomic position, depending on the country [7, 9]. This raises the questions to what extent socioeconomic inequalities in total cancer mortality among women indeed vary between countries, which cancer sites are mostly responsible for the facts that inequalities are smaller in some countries than in others, and that inequalities seem to be smaller among women than among men. An international comparison of educational disparities in cancer mortality would provide some clues to these questions. Previous studies on socioeconomic inequalities in upper aerodigestive tract, lung or breast cancers showed differences between European populations and between gender for lung cancer [13-15]. However, no study included all cancer sites and tried to investigate the role of different cancer sites in explaining differences between men and women. By highlighting which cancer sites contribute to differences between women and men, such an international comparison would be informative on cancer etiology. Such comparisons may indeed help to understand the contextual determinants of cancer inequalities such as alcohol consumption patterns, the smoking epidemic or past social and sanitary developments.

A new large longitudinal dataset including many European populations spread all over Western Europe was recently collected. The mortality follow-up covered about 10 years and was carried out in the 1990s. The aim of this study is to compare educational differences in total cancer mortality between women and men, and to investigate which cancer sites explain the differences between gender and populations.

Material and methods

Longitudinal data from 12 European populations was used (Madrid, the Basque region, Barcelona, Slovenia, Turin, Switzerland, France, Belgium, Denmark, Norway, Sweden and Finland). Most datasets covered the entire national population except France (a representative sample of 1% of the population), the entire regional population (Madrid, the Basque region), or the population from specific urban areas (Barcelona, Turin). Subjects were selected from census and followed up during the 1990s (Table 1). Subpopulations were excluded in three datasets: foreigners in Switzerland, subjects deceased outside Catalonia in Barcelona and foreigners and subjects born in overseas areas in France.

Analyses were performed among subjects aged 30-74 at the time of the census. The follow-up period was shorter for Belgium, Denmark, the Basque region and Madrid. In order to get results on comparable ages in terms of observed age at death, analyses were conducted on slightly older age groups at baseline for these populations (35-79 for Madrid and 30-79 for Belgium and the Basque region). The age range for the Danish data could not be changed, as no information on socioeconomic position was available for subjects aged over 75.

The linkage between census data and mortality registries was achieved for more than 96% of all deceased persons in almost all populations except Madrid (70%), the Basque region (93%) and Barcelona (94.5%). In these populations however, no variation in this percentage was found according to age, sex or socioeconomic position (in the Basque region unfortunately, this check could not be conducted for the socioeconomic position). In order to avoid an underestimation of absolute mortality rates in these three populations, observed absolute mortality was increased using correction factors (1/0.70, 1/0.93 and 1/0.945 respectively).

The socioeconomic status was measured with education declared at the census at the beginning of the follow-up period. This variable was categorized into three classes, which correspond to the ISCED (International Standard Classification of Education) classification: 0-2 (lower secondary education or less), 3-4 (upper secondary education), 5-6 (post-secondary education). The percentage of missing values for education was low: 6% for Belgium and less than 3% for the other populations. These subjects were excluded from the analysis.

The cause of death was obtained by linkage with death registries. Analyses were conducted for total cancer mortality (ICD 9: 140-249), and for the following cancer sites: lung (ICD 9: 162-3, 165), upper aerodigestive tract (UADT which group oral cavity, pharynx, esophagus and larynx) (ICD 9: 140-50, 161), colorectal (ICD 9: 153-4), stomach (ICD 9: 151), leukaemia and Hodgkin's disease (ICD 9: 201, 204-8), kidney and bladder (ICD 9: 188-9), liver (ICD 9: 155), pancreas (ICD 9: 157), breast (ICD 9: 174-5), cervix (ICD 9: 180), prostate (ICD 9: 185), other neoplasms (ICD 9: rest 140-249).

The magnitude of socioeconomic inequalities in mortality was estimated in both absolute and relative terms. To estimate relative inequalities, we computed relative indices of inequality (RII) using Poisson regression. The calculation of the RII is based on a ranked variable, which specifies for each educational group the mean proportion of the population with a higher level of education. For instance, the rank of the lowest educational group is calculated as the proportion of the population with middle or high education, plus half of the proportion of the population with a lowest educational level. The RII is then computed by regressing the mortality on this ranked variable. Thus, the RII expresses inequality within the whole socioeconomic continuum and can be interpreted as the ratio of mortality rates between the two extremes of the educational hierarchy. As it takes into account the size and relative position of each educational group, it is well adapted to compare populations with different educational distributions [16, 17]. Analyses were conducted separately for each population separately. In order to assess whether the estimates significantly differed between populations, we tested the interaction between country and education in a model that included all populations.

To estimate absolute socioeconomic inequalities we computed absolute mortality rate differences between the lowest and the highest educational level, both for all cancer mortality as for specific cancer types. Age-standardized mortality rates were computed, using the population of EU-15 plus Norway of 1995 as the standard population.

Results

Large differences were observed in the educational distribution between countries and among men and women (Table 1). The percentage of subjects with post-secondary education was lower among women in all populations except Sweden. This percentage was below 10% among women in Turin, France and Slovenia.

Graph 1 presents total cancer mortality rates by educational level. Mortality rates were dramatically lower among women. The mortality rate among women with the lowest education was lower than that found among men with the highest education in all populations except Denmark. Total cancer mortality rates were generally higher among men with lower educational levels. Among women however, the gradient was much narrower and was not observed in the Spanish regions, Slovenia and Finland. The lowest total cancer mortality rates were observed in the Spanish regions and in France for women, in the Nordic countries, especially in Sweden, for men (Table 2). Breast, lung and colorectal cancers accounted for 39-46% of all cancer cases among women except in Denmark (52%). Among men, prostate, lung and colorectal cancers accounted for 47-52% of all cancer cases, except in France (42%), the Basque region (44%) and Belgium (57%).

Table 2 presents RII for total cancer mortality by population and gender. We can distinguish three main patterns: in Denmark, Norway and Sweden, we observed socioeconomic inequalities favoring high-educated men and women with statistically significant RIIs around 1.3-1.4; in France, Switzerland, Belgium and Finland, RIIs were significantly higher than 1 among men and women, but they were larger among men (RII around 1.7-1.8) than among women (RII around 1.2); in Madrid, Barcelona, Slovenia and Turin, RIIs were significant among men (RII from 1.29 to 1.88) but not among women (borderline in Turin). The RII among women was even significantly lower than 1 in the Basque region.

RIIs among women by population and cancer site are presented in table 3. For some cancer sites, inequalities did not significantly differ between populations. No educational differences were found for leukaemia and Hodgkin’s disease. Small socioeconomic inequalities favouring high educated people were found for colorectal cancer, they were larger for liver cancer, and especially for cervical and stomach cancer. However, the analyses for cervix cancer were based on small number of deaths. For breast cancer, RIIs were significantly lower than 1 in all populations except in Turin, France and Switzerland.

A clear North-South gradient was found for lung cancer: we found an RII significantly lower than 1 in the three Spanish regions and Slovenia; and an RII significantly larger than 1 in Switzerland, Belgium, and the Nordic countries. No significant association between education and lung cancer mortality was observed in France and Turin. Statistically significantly higher UADT cancers mortality rates were found among lower educated women in Switzerland, France and the Nordic countries, even though mortality rates were low. Contrasting situations were found for pancreatic and kidney and bladder cancer. RIIs lower than 1 were found in the Spanish populations and in Slovenia whereas the highest RIIs were observed in the Nordic countries. For the category “other cancers”, the inequalities were remarkably similar: the RII ranged from 1.17 to 1.30 in 10 out of 12 countries.

RIIs among men by population and cancer site are presented in table 4. No statistically significant interaction between education and populations was observed for leukaemia and Hodgkin’s disease, prostate and pancreatic cancer. Mortality rates did not differ by educational level for leukaemia and Hodgkin’s disease and prostate, and we found slightly higher pancreatic cancer mortality rate among lower educated people.

Large variations between populations were found for lung, UADT and stomach cancers even though higher mortality rates among lower educated men were found in all populations. Larger RIIs were found in Northern countries and Switzerland for lung cancer; in Slovenia, Switzerland and France for UADT cancers; in the Southern populations for stomach cancer. A contrasting picture was found for liver cancer mortality with no educational differences in mortality in some populations (Belgium, Norway, Slovenia, Basque region) and higher mortality rates among lower educated people in others. Small socioeconomic inequalities favoring high educated men were found for cancer of colorectum, they were slightly higher for cancer of bladder and kidney (RIIs around 1.5).

Absolute mortality rate differences by cancer site are presented in table 5. It is noteworthy that few cancer sites (lung, UADT and breast) explain most of the European and gender discrepancies. Colorectal and prostate cancers are also frequent but do not explain much of the differences observed in absolute socioeconomic inequalities. The situation is particularly striking among women: populations with larger excess deaths among lower educated women due to lung cancer are also those where the educational differences in breast cancer mortality induce a low excess deaths among high educated women (Norway, Sweden and Denmark). These populations contrast to the populations where excess deaths among higher educated women are due to both breast and lung cancer (Spanish populations and Slovenia).

Discussion

Summary of the results

Educational differences in total cancer mortality were statistically significant and similar among women and men in Norway, Sweden and Denmark. When compared with these countries, inequalities in the other countries were larger among men. They were smaller among women, they were even non-existent in Madrid, Barcelona, Turin and Slovenia and reverse in the Basque region. Variations in socioeconomic inequalities for lung, UADT and breast cancers explained most of the differences found between European populations as well as between gender.

Evaluation of the data

The follow-up periods were shorter in Madrid, the Basque region, Belgium and Denmark. These differences in the follow-up periods were accounted for by changing the age range at baseline for these populations in order to have similar average age at death in all populations. However, subjects may be slightly older or younger in these populations compared with others. Slight under-estimation (in Madrid, the Basque region and Belgium) or over-estimation (in Denmark) of socioeconomic inequalities may then have occurred.

In France and Switzerland, foreigners were excluded and analyses were therefore conducted on more homogeneous populations. Migrants have lower cancer mortality rates for most cancer sites, except some sites specific of their native country (nasopharynx, gallbladder or liver (because of exposure to hepatitis B virus)) [18-20]. It is then unclear whether the exclusion of foreigners in France and Switzerland has led to under- or overestimation of socioeconomic inequalities.

With regards to the codification of causes of death, potential influences of national diagnosing practices should also be considered. All data came from populations with reliable cause-of-death registries. Our results would be biased only if diagnosing practices differed by socioeconomic position within populations. Even though there is no evidence to support this hypothesis, such a bias cannot be entirely excluded.

Large variations between populations were observed in the educational distribution. Part of these differences may be due to real differences. Nevertheless, despite the use of a common educational classification for all populations, we cannot rule out the possibility that there are also differences in the way in which national educational classifications are being squeezed into this common classification. Problems due to comparability between educational systems of different countries are inherent to all comparative studies. We evaluated the sensitivity of the results to alternative educational classifications. In one type of analyses, for example, we used a classification into 4 educational levels by distinguishing between men who completed lower secondary education from men with primary education only. We also considered another classification in 3 educational levels in order to get population distributions that were as similar as possible between populations. The results were quite robust to these alternative classifications. The RIIs only slightly changed and the hierarchy between populations did not change. We may then consider that, even though we unfortunately could not avoid some misclassification, this is unlikely to have biased the main results.

Use of education as an indicator of socioeconomic position has several advantages. Education is an individual measure of socioeconomic position and allows classification of all individuals, including those who do not work. Level of education is acquired early in life, which makes it unlikely that low education is the result of ill-health, but which also means that it may not accurately indicate the current socioeconomic position.

Socioeconomic inequalities by cancer site

As previously found in the literature, we observed socioeconomic inequalities favoring high-educated men in total cancer mortality [5-12]. We found a North-South gradient among women with no inequalities in the south and larger inequalities in the Nordic countries. Until now, the available literature among women was fragmentary and mainly for Southern Europe countries. In accordance with the literature, we observed higher cervix cancer mortality rates among women with lower education, and no association between education and mortality for leukaemia and Hodgkin's disease [5, 9-12, 21]. No clear association is documented in the literature for pancreatic, kidney and bladder cancer [5, 9, 11, 12, 21, 22]. We also found contrasted results for these cancers. However, from this international overview, there appears a fairly consistent pattern for kidney and bladder cancer, with slightly higher mortality rates among lower educated men. The literature often distinguished colon from rectal cancer and found contradictory results [5, 9, 11, 21]. Two American studies nevertheless observed the emergence of higher mortality from colorectal cancer among men with lower socioeconomic status at the end of the 1980s [23, 24]. In agreement with this, we consistently found a similar gradient in European populations in the 1990s, both among men and women.

Differences between women and men

We observed large disparities between populations in the difference between men and women in the magnitude of socioeconomic inequalities in total cancer mortality. For instance, this difference is much smaller in Sweden, Norway and Denmark. Compared to other countries, these countries have larger inequalities among women, and smaller inequalities among men. Looking at the situation by cancer sites will give some clues to understand these differences.

Patterns of educational differences in lung cancer mortality highly differ according to population and gender. This result, already found among older data [15], is confirmed in the present study which includes new populations (France, Slovenia, the Basque region, whole Switzerland). The heterogeneity found between populations reflects differences in the smoking epidemic between countries. The 'smoking epidemic' is an epidemiological concept used to describe the diffusion of the smoking habit [25]. During this epidemic, higher smoking rates are first observed among subjects with higher socioeconomic position but later among subjects with lower socioeconomic position. The smoking epidemic is less advanced in Spain, and also Slovenia. There, we observed higher tobacco consumption among women with high education (but already reverse patterns among men). On the contrary, this epidemic is already at its final stage in Nordic countries, Belgium and Switzerland, with higher tobacco consumption among women with low education. France and Northern Italy (Turin) show an intermediate situation [26, 27]. Thus the gradual diffusion of the smoking epidemic not only explains international variations in socioeconomic inequalities in lung cancer mortality, but also that in southern populations these inequalities are still much larger among men than among women.

Alcohol consumption is likely to be involved in liver and UADT cancers. We found very large socioeconomic inequalities favouring high-educated men for these cancers in France and the Spanish populations, but no inequality in the Nordic countries and Belgium. These results have been developed elsewhere [13]. Socioeconomic inequalities were also observed in most populations among women, but the low mortality rates make any conclusion difficult and evidence on socioeconomic inequalities in alcohol consumption among women is still fragmentary and no clear pattern emerges from the literature [28, 29]. Nevertheless, it is noteworthy that the gender pattern differed throughout Europe: differences between men and women were small in Northern Europe and large in Southern Europe, where we observe large inequalities among men and small (or even reverse) inequalities among women. This is consistent with the findings from studies on socioeconomic differences in alcohol consumption [Kunst A, personal communication]. However, given the very low mortality rates among women, UADT cancers almost do not contribute to socioeconomic inequalities in total cancer mortality among women in all populations.

Despite a general pattern of higher breast cancer mortality rates among higher educated women, we found variations between populations. It has been suggested that these differences may in part be due to differences in reproductive behaviour, and especially delayed first birth [14]. The magnitude of relative inequalities did not strongly differ between populations; the magnitude of absolute inequalities nevertheless substantially differed because of variations in national breast cancer mortality rates. As a result, breast cancer contributed to differences between populations, and thus to differences between gender, in socioeconomic inequalities in total cancer mortality. The large inequalities in total cancer mortality among women in Norway, Sweden and Denmark were mainly driven by the situation found for lung cancer. Nevertheless, the negative contribution of breast cancer is only moderate in these countries, and consequently the “moderating” effect of breast cancer on inequalities in total cancer mortality is not as strong in these countries as in Madrid or Slovenia.

Consistent with literature, we found higher stomach cancer mortality rates among lower educated men and women [5, 9-12, 21]. Helicobacter pylori infection is a main risk factor for this cancer and is also associated with socioeconomic position [30]. Infection by Helicobacter pylori infection is likely to be associated with factors linked to socioeconomic position during childhood even though the etiology is still unclear. Among cancers with large socioeconomic inequalities favoring high educated people, stomach cancer is the only one for which inequalities are not larger in the Nordic countries. As Helicobacter Pylori infection at young age is a risk factor for stomach cancer, differences between populations in socioeconomic inequalities in stomach cancer mortality may be due to differences in past social and sanitary developments, even though there is no data to support this suggestion. The relatively small inequalities in cancer mortality in the Nordic countries may perhaps be understood against the background of active housing policies as well as the more egalitarian social and economic policies since the first half of the 20th century.

Differences between countries in health care access probably also explain part of the differences we observed, especially for cancers with good survival. Nevertheless, the fact that we did not observe socioeconomic inequalities for leukaemia and Hodgkin’s disease or prostate cancer (cancers with good prognosis) in any populations suggested that these differences, if any, were probably not substantial. There are unfortunately no data available on this issue.

Future perspectives

The large geographical and gender variations in the magnitude of socioeconomic inequalities in cancer mortality suggest a large potential for change. Recent studies have suggested smaller educational differences in breast cancer mortality among younger women in many European populations [14, 31, 32]. Countries in Southern Europe will also certainly reach the last stage of the smoking epidemic, which may result in the emergence of socioeconomic inequalities favoring high-educated women in lung cancer mortality in these countries. At the same time socioeconomic inequalities in lung cancer mortality will probably not further increase among women and men in Northern Europe. Given these recent trends, variations between countries, and variations between men and women, in socioeconomic inequalities in cancer mortality are likely to become smaller in the future. Future trends will to a large extent be determined by trends in inequalities in lung, UADT and breast cancers. Policies that may affect these trends, including tobacco control, alcohol policies and breast cancer screening, should ensure to reach lower groups as well as higher socioeconomic groups.

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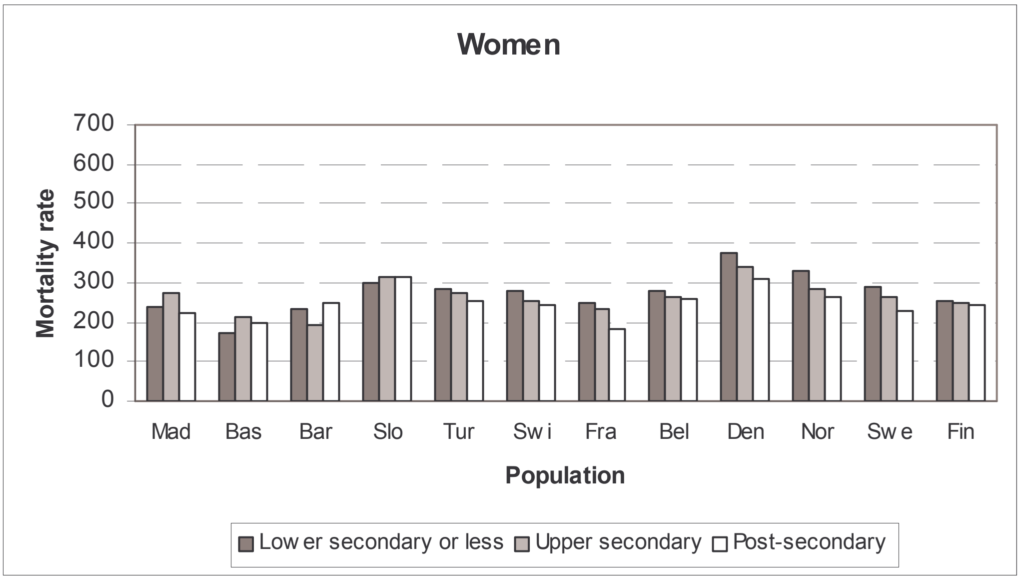
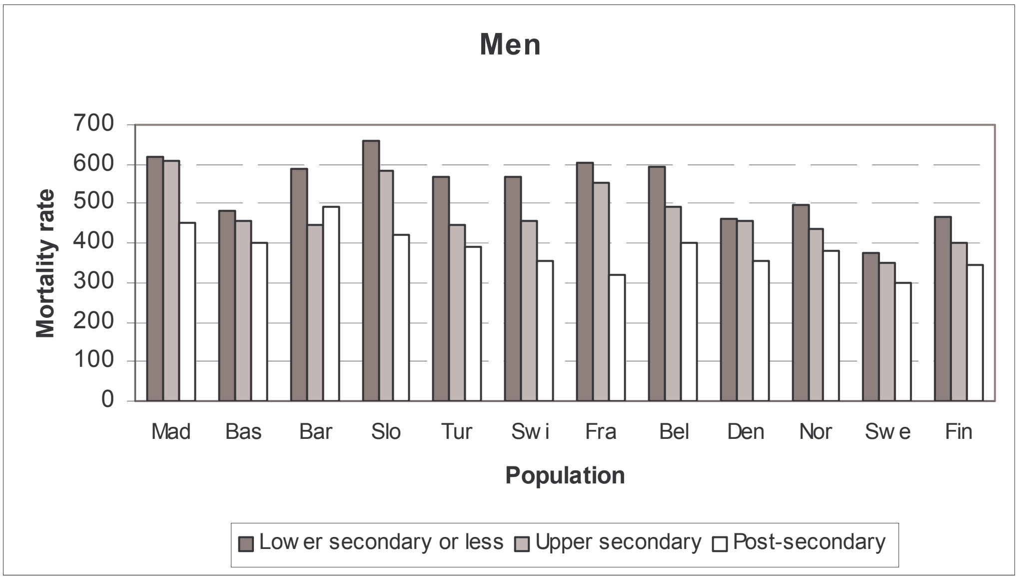
Table 1: Socio-demographic characteristics, by gender and population

Population	Follow-up	Women				Men			
				Education (%)[1]				Education (%)[1]	
		Person years	Cancer deaths	Middle/high	High	Person years	Cancer deaths	Middle/high	High
Madrid	May-1996/Dec-1997	2,030,998	3,331	24.2	11.7	1,756,059	6,133	35.9	18.5
Basque region	May-1996/Jun-2001	3,186,595	5,431	25.4	12.0	2,985,865	11,737	34.4	14.3
Barcelona	Jan-1992/Dec-2001	4,489,610	11,450	23.1	13.8	3,714,380	20,253	34.8	19.5
Slovenia	Apr-1991/Dec-2000	5,158,738	14,316	43.5	9.1	4,614,864	20,105	62.6	12.4
Turin	Nov-1991/Oct-2001	2,611,141	7,837	24.5	6.8	2,611,968	11,294	32.8	10.6
Switzerland	Dec-1990/Dec-2000	15,113,931	39,612	60.3	7.2	12,969,989	53,679	80.4	24.3
France	Mar-1990/Dec-1999	1,270,981	2,883	37.2	10.0	1,135,299	5,375	49.4	12.7
Belgium	Mar-1991/Dec-1995	13,688,568	37,354	32.7	13.9	12,700,788	58,760	38.7	16.8
Denmark	Jan-1996/Dec-2000	7,033,258	24,170	49.9	19.9	6,893,032	25,915	59.9	20.1
Norway	Nov-1990/Nov-2000	10,424,746	69,894	63.8	16.8	10,021,675	38,722	70.1	21.7
Sweden	Jan-1991/Dec-2000	22,116,058	61,446	59.1	19.0	21,421,623	70,339	59.7	16.4
Finland	Dec-1990/Dec-2000	13,478,149	32,880	48.6	19.7	12,396,052	39,734	51.2	21.5

[1] Middle/high: upper secondary education or more, High: post-secondary education

Graph 1: Total cancer mortality rates[1] (per 100000 person years) by education among women and men, by population





1: Age adjusted mortality rates using direct standardization

Table 2: Relative indices of inequality (RII) related to education and mortality rates[1] (MR) for total cancer mortality, by population and gender

	Women		Men	
	MR	RII (95% CI)	MR	RII (95% CI)
Madrid	242	0.89 (0.74-1.08)	593	1.52 (1.34-1.72)
Basque region	178	0.63 (0.54-0.75)	473	1.29 (1.17-1.43)
Barcelona	246	1.04 (0.94-1.16)	586	1.57 (1.47-1.68)
Slovenia	302	0.93 (0.87-1.00)	595	1.72 (1.63-1.82)
Turin	284	1.12 (0.98-1.27)	532	1.88 (1.71-2.06)
Switzerland	263	1.21 (1.16-1.26)	465	1.83 (1.77-1.89)
France	239	1.30 (1.08-1.57)	555	1.89 (1.69-2.13)
Belgium	276	1.17 (1.11-1.23)	555	1.80 (1.73-1.88)
Denmark	356	1.33 (1.26-1.40)	441	1.31 (1.25-1.37)
Norway	303	1.38 (1.32-1.44)	449	1.45 (1.39-1.50)
Sweden	271	1.31 (1.27-1.35)	356	1.32 (1.28-1.35)
Finland	257	1.20 (1.15-1.26)	437	1.72 (1.64-1.80)
Interaction[2]		<0.005		<0.005

1: Age adjusted mortality rates using direct standardization, per 100,000 person years
2: p-value for interaction test between education and population

Table 3: Mortality rates[1] (MR) and relative indices of inequality (RII) related to education by cancer site among women, by population.

	Lung		UADT[2]		Leukaemia and Hodgkin's disease		Breast		Cervix	
	MR	RII (95% CI)	MR	RII (95% CI)	MR	RII (95% CI)	MR	RII (95% CI)	MR	RII (95% CI)
Madrid	15	0.34 (0.17-0.65)	5	1.02 (0.27-3.79)	8	0.94 (0.34-2.62)	48	0.51 (0.35-0.74)	5	4.87 (0.92-25.90)
Basque region	13	0.29 (0.17-0.48)	4	0.76 (0.26-2.25)	5	0.73 (0.28-1.92)	36	0.61 (0.43-0.86)	3	4.31 (0.79-23.49)
Barcelona	16	0.49 (0.34-0.69)	5	0.79 (0.40-1.56)	8	1.20 (0.66-2.19)	51	0.79 (0.64-0.97)	5	1.43 (0.71-2.91)
Slovenia	29	0.49 (0.40-0.61)	5	1.56 (0.89-2.74)	8	0.73 (0.48-1.10)	57	0.69 (0.59-0.80)	9	2.10 (1.39-3.17)
Turin	32	0.74 (0.52-1.06)	6	1.16 (0.49-2.77)	10	0.95 (0.49-1.82)	61	0.93 (0.72-1.20)	3	7.77 (1.48-40.86)
Switzerland	29	1.35 (1.20-1.52)	7	1.28 (1.00-1.63)	8	1.05 (0.84-1.31)	59	0.96 (0.88-1.04)	5	1.78 (1.33-2.38)
France	18	0.84 (0.45-1.55)	7	4.41 (1.38-14.08)	8	0.87 (0.31-2.48)	54	1.19 (0.82-1.71)	4	3.05 (0.65-14.45)
Belgium	26	1.61 (1.35-1.93)	7	0.88 (0.64-1.20)	9	1.10 (0.82-1.47)	66	0.83 (0.75-0.91)	5	2.36 (1.58-3.51)
Denmark	80	2.31 (2.05-2.60)	11	1.60 (1.17-2.19)	8	1.09 (0.77-1.55)	67	0.83 (0.74-0.93)	9	2.26 (1.61-3.16)
Norway	43	2.77 (2.45-3.14)	6	1.94 (1.40-2.69)	7	0.89 (0.66-1.19)	51	0.78 (0.70-0.86)	9	3.28 (2.52-4.27)
Sweden	37	1.79 (1.63-1.96)	5	1.70 (1.33-2.17)	8	0.98 (0.81-1.18)	45	0.88 (0.82-0.95)	5	2.59 (2.02-3.32)
Finland	24	1.85 (1.56-2.21)	6	2.00 (1.41-2.82)	9	1.10 (0.84-1.44)	46	0.85 (0.76-0.94)	4	3.47 (2.20-5.46)
Interaction[3]		<0.005		<0.005		NS		NS		NS

	Stomach		Liver		Kidney and bladder		Pancreas		Colorectum		Other	
	MR	RII (95% CI)	MR	RII (95% CI)	MR	RII (95% CI)	MR	RII (95% CI)	MR	RII (95% CI)	MR	RII (95% CI)
Madrid	17	2.41 (0.97-5.97)	12	0.68 (0.27-1.68)	6	0.64 (0.18-2.26)	12	0.73 (0.31-1.74)	32	1.19 (0.67-2.10)	83	1.29 (0.91-1.83)
Basque region	11	1.80 (0.76-4.24)	7	1.29 (0.43-3.89)	6	0.54 (0.21-1.40)	10	0.38 (0.19-0.75)	20	0.77 (0.44-1.33)	62	0.63 (0.47-0.85)
Barcelona	11	2.02 (1.17-3.50)	12	1.63 (0.97-2.76)	6	1.26 (0.64-2.47)	11	0.67 (0.43-1.05)	32	1.36 (1.00-1.84)	74	1.30 (1.07-1.57)
Slovenia	24	1.51 (1.15-1.99)	7	1.55 (0.93-2.59)	9	0.64 (0.42-0.96)	16	0.86 (0.63-1.18)	38	1.28 (1.03-1.59)	100	1.04 (0.92-1.18)
Turin	13	3.16 (1.48-6.71)	10	2.77 (1.16-6.59)	8	2.52 (0.94-6.75)	15	1.25 (0.69-2.24)	34	0.97 (0.67-1.41)	93	1.17 (0.94-1.47)
Switzerland	9	2.34 (1.86-2.95)	5	1.49 (1.10-2.03)	11	1.89 (1.54-2.32)	16	1.27 (1.08-1.50)	26	1.02 (0.90-1.16)	89	1.23 (1.15-1.32)
France	8	4.95 (1.24-19.68)	6	1.59 (0.45-5.63)	8	0.96 (0.35-2.64)	12	1.86 (0.73-4.70)	27	1.24 (0.70-2.17)	86	1.26 (0.93-1.72)
Belgium	10	2.44 (1.74-3.41)	5	1.38 (0.90-2.11)	11	1.68 (1.24-2.28)	13	1.31 (1.01-1.70)	34	1.24 (1.05-1.45)	90	1.22 (1.11-1.34)
Denmark	7	1.51 (1.01-2.25)	5	1.72 (1.10-2.70)	14	1.80 (1.35-2.40)	17	0.94 (0.74-1.19)	40	1.18 (1.01-1.39)	100	1.23 (1.12-1.36)
Norway	12	1.77 (1.41-2.20)	2	1.32 (0.79-2.18)	12	2.09 (1.66-2.62)	18	1.39 (1.16-1.67)	42	1.25 (1.11-1.41)	100	1.26 (1.17-1.36)
Sweden	9	1.83 (1.53-2.20)	7	1.80 (1.45-2.24)	12	1.71 (1.46-2.01)	19	1.23 (1.09-1.39)	29	1.31 (1.18-1.45)	96	1.29 (1.22-1.37)
Finland	14	1.39 (1.12-1.73)	7	1.81 (1.31-2.50)	10	1.10 (0.85-1.41)	20	1.45 (1.20-1.75)	24	1.03 (0.88-1.21)	93	1.21 (1.12-1.32)
Interaction[3]		NS		NS		<0.005		<0.005		NS		<0.005

1: Age adjusted mortality rates using direct standardization, per 100,000 person years, 2: Upper aerodigestive tract, 3: p-value for interaction test between education and population

Table 4: Mortality rates[1] (MR) and relative indices of inequality (RII) related to education by cancer site among men, by population

	Lung		UADT[2]		Leukaemia and Hodgkin's disease		Prostate	
	MR	RII (95% CI)	MR	RII (95% CI)	MR	RII (95% CI)	MR	RII (95% CI)
Madrid	175	1.53 (1.22-1.92)	56	2.58 (1.71-3.89)	16	1.75 (0.84-3.65)	38	1.12 (0.67-1.87)
Basque region	125	1.31 (1.08-1.59)	59	2.04 (1.53-2.71)	11	0.90 (0.48-1.71)	29	0.94 (0.61-1.45)
Barcelona	169	1.80 (1.60-2.04)	52	3.12 (2.48-3.91)	15	1.04 (0.71-1.52)	34	1.01 (0.77-1.32)
Slovenia	181	2.08 (1.89-2.29)	62	5.56 (4.70-6.57)	14	1.22 (0.86-1.72)	44	1.18 (0.95-1.47)
Turin	179	2.53 (2.13-2.99)	33	3.61 (2.41-5.42)	14	1.07 (0.63-1.80)	31	1.01 (0.69-1.49)
Switzerland	127	2.91 (2.73-3.10)	37	4.05 (3.60-4.55)	14	1.19 (0.98-1.43)	56	1.13 (1.03-1.25)
France	147	1.64 (1.32-2.03)	78	4.30 (3.10-5.95)	13	1.36 (0.63-2.91)	37	1.04 (0.65-1.65)
Belgium	216	3.10 (2.89-3.32)	38	1.74 (1.51-2.00)	16	1.03 (0.83-1.28)	50	1.17 (1.01-1.34)
Denmark	128	1.76 (1.61-1.93)	36	1.77 (1.51-2.08)	13	1.02 (0.78-1.32)	43	0.94 (0.81-1.10)
Norway	107	2.45 (2.26-2.65)	21	2.27 (1.90-2.71)	11	0.82 (0.65-1.05)	67	0.94 (0.85-1.03)
Sweden	70	1.81 (1.69-1.93)	17	2.03 (1.77-2.33)	12	1.12 (0.96-1.32)	59	1.04 (0.97-1.12)
Finland	138	3.48 (3.18-3.81)	19	2.38 (1.94-2.94)	13	1.18 (0.93-1.51)	52	1.01 (0.88-1.16)
Interaction[3]		<0.005		<0.005		NS		NS

	Stomach		Liver		Kidney and bladder		Pancreas		Colorectum		Other	
	MR	RII (95% CI)	MR	RII (95% CI)	MR	RII (95% CI)	MR	RII (95% CI)	MR	RII (95% CI)	MR	RII (95% CI)
Madrid	40	2.41 (1.46-3.97)	38	2.76 (1.61-4.74)	41	1.23 (0.77-1.98)	21	0.85 (0.47-1.55)	63	1.08 (0.75-1.56)	105	1.29 (0.97-1.70)
Basque region	36	3.15 (2.03-4.90)	22	1.16 (0.72-1.87)	33	1.62 (1.07-2.45)	18	0.78 (0.49-1.25)	52	0.92 (0.69-1.24)	87	1.02 (0.82-1.28)
Barcelona	29	4.14 (2.95-5.79)	37	1.56 (1.20-2.02)	40	1.31 (1.02-1.67)	26	1.02 (0.75-1.39)	61	1.15 (0.95-1.40)	95	1.22 (1.05-1.43)
Slovenia	59	2.31 (1.93-2.76)	17	1.15 (0.84-1.57)	31	0.95 (0.75-1.20)	24	1.31 (1.00-1.70)	72	0.97 (0.83-1.14)	90	1.10 (0.96-1.26)
Turin	29	4.53 (2.82-7.28)	36	2.49 (1.69-3.68)	39	1.58 (1.11-2.25)	23	0.83 (0.55-1.23)	53	1.46 (1.09-1.95)	95	1.33 (1.08-1.64)
Switzerland	21	2.53 (2.16-2.95)	18	1.68 (1.42-1.98)	30	1.41 (1.24-1.60)	23	1.27 (1.10-1.47)	47	1.27 (1.14-1.40)	93	1.35 (1.26-1.45)
France	22	2.62 (1.39-4.94)	36	2.59 (1.63-4.12)	33	1.33 (0.83-2.14)	24	1.01 (0.60-1.70)	47	1.58 (1.06-2.36)	118	1.73 (1.36-2.20)
Belgium	25	3.19 (2.57-3.96)	12	1.03 (0.79-1.34)	35	1.37 (1.17-1.61)	22	0.97 (0.80-1.17)	52	1.18 (1.04-1.34)	90	1.25 (1.14-1.37)
Denmark	13	2.05 (1.55-2.69)	9	1.39 (1.01-1.93)	34	1.09 (0.92-1.30)	21	1.06 (0.86-1.30)	54	1.03 (0.90-1.18)	90	1.11 (1.00-1.22)
Norway	27	1.89 (1.61-2.21)	4	1.00 (0.68-1.46)	32	1.62 (1.40-1.88)	23	1.35 (1.14-1.60)	61	1.08 (0.97-1.19)	96	1.19 (1.10-1.29)
Sweden	19	1.83 (1.60-2.08)	11	1.68 (1.42-1.98)	26	1.28 (1.15-1.43)	23	1.16 (1.04-1.30)	39	1.11 (1.01-1.21)	81	1.14 (1.07-1.21)
Finland	29	2.36 (1.97-2.83)	13	1.35 (1.05-1.73)	27	1.50 (1.26-1.79)	27	1.16 (0.98-1.37)	36	0.94 (0.81-1.09)	82	1.25 (1.14-1.38)
Interaction[3]		<0.005		<0.005		0.01-0.005		NS		0.025-0.01		<0.005

1: Age adjusted mortality rates using direct standardization, per 100,000 person years, 2: Upper aerodigestive tract, 3: p-value for interaction test between education and population

Table 5: Mortality rate[1] difference between subjects with lower secondary education or less and subjects with post-secondary education for total cancer mortality and by cancer site, per gender and population

Population	Total cancer	Cancer site											
		Lung	UADT	Breast	Cervix	Prostate	Leukemia and Hodgkin's disease	Stomach	Liver	Bladder and kidney	Pancreas	Colorectum	Other
WOMEN													
Madrid	16	-5	1	-23	4	-	3	4	-1	0	-2	9	27
Basque region	-27	-13	-1	-7	2	-	-4	6	1	1	-1	-5	-6
Barcelona	-18	-8	0	-13	1	-	1	1	1	0	-4	3	0
Slovenia	-16	-18	2	-22	6	-	0	8	2	-1	-3	4	7
Turin	34	-7	0	5	3	-	2	6	6	7	-2	6	7
Switzerland	4	2	0	0	0	-	0	0	0	0	0	0	1
France	65	6	5	2	3	-	4	8	1	2	2	-5	39
Belgium	20	7	-1	-9	3	-	-1	4	1	4	2	3	7
Denmark	67	42	4	-9	6	-	0	2	2	6	1	3	10
Norway	68	31	3	-13	8	-	-1	3	0	6	4	7	18
Sweden	58	18	3	-6	4	-	0	4	3	4	3	5	20
Finland	22	7	3	-10	3	-	0	4	3	0	3	0	9
MEN													
Madrid	165	48	32	-	-	5	4	17	25	8	-2	5	22
Basque region	83	26	19	-	-	-2	-5	18	3	13	4	2	4
Barcelona	102	46	26	-	-	-1	-1	17	10	2	-3	0	6
Slovenia	240	107	74	-	-	5	2	36	2	2	1	7	4
Turin	176	84	14	-	-	-1	0	22	15	16	-2	10	17
Switzerland	214	104	38	-	-	5	2	15	7	9	4	8	22
France	281	83	78	-	-	4	-1	12	25	18	13	13	35
Belgium	188	126	11	-	-	7	1	14	0	8	0	9	12
Denmark	105	63	16	-	-	-1	-1	7	2	7	1	4	8
Norway	119	67	13	-	-	-3	-2	11	1	11	6	4	13
Sweden	77	32	8	-	-	1	1	9	5	6	3	4	8
Finland	123	85	10	-	-	-1	1	13	1	5	1	-2	11

1: Age adjusted mortality rates using direct standardization, per 100,000 person years

Chapter 5

Socio-economic inequalities in lung cancer mortality in Europe: an update

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Abstract

Objectives
This paper aims: (1) to describe socioeconomic inequalities in lung cancer mortality in 16 European populations; (2) to highlight results from European countries for which until now no or only limited information is available, in particular the new EU member states (3); to get further insight into socioeconomic inequalities in lung cancer mortality in different European populations by relating these to socioeconomic inequalities in overall mortality and smoking within the same or reference populations.

Methods
Educational inequalities in lung cancer and total mortality were assessed by direct standardization and calculation of two indices of inequality: the Relative Index of Inequality (RII) and the Slope Index of Inequality (SII). SII's were used to calculate the contribution of inequalities in lung cancer mortality to inequalities in total mortality. Within the age group 40-59 years indices of inequality for lung cancer mortality were compared with indices of inequalities in smoking.

Results
In most populations there are important inequalities in lung cancer mortality. Some regional patterns can be distinguished. In men inequalities are largest in the Eastern European and Baltic countries, in women inequalities are largest in Northern European countries. Among Southern European women lung cancer mortality rates are higher among the high educated. There are indications that inequalities among women in the Eastern and Baltic countries are increasing. Even though absolute inequalities in lung cancer mortality in Eastern European and Baltic countries are substantially larger than in most other countries, the contribution of lung cancer mortality inequalities to total mortality inequalities in these countries is rather low. At population level and for a specific age group (40- 59 years) there appears to be a correlation between inequalities in lung cancer mortality and inequalities in smoking. Inequalities in lung cancer mortality are in most populations larger then inequalities in smoking, but this is not the case in some Northern European female populations.

Conclusions
Future efforts to tackle socioeconomic inequalities in lung cancer mortality in Europe should focus especially on Eastern European and Baltic countries. In some Northern European populations there are still large socio-economic inequalities in smoking, especially among women, which may result in persisting socio-economic gradients in lung cancer mortality in the next decades.

Introduction

Recent figures from the International Agency for Research on Cancer indicate that lung cancer in Europe is still the most common death from cancer with an estimated 334.800 deaths (19,7% from total) in 2006 (1). Even though lung cancer mortality in men has been declining since the late 1980s, female lung cancer mortality is still increasing in most European countries (2). Trends may also show important variations from one country to another (3).

The relationship between lung cancer mortality and socioeconomic status has been investigated in several individual countries, both in Europe (4),(5),(6) and elsewhere (7),(8). At the European level some studies have assessed socioeconomic inequalities in overall mortality and cause-specific mortality in a range of European countries (9), (10). In one study a systematic analysis was conducted of variations between countries in the size and pattern of socioeconomic inequalities in lung cancer mortality, using data from 10 European populations, collected in the first half of the nineties (11). The study demonstrated consistently higher lung cancer mortality rates among the "lower" educated men and women in Northern and Western Europe and an inverse or less pronounced socioeconomic gradient in some Southern European populations.

In this contribution we present more European results on socioeconomic inequalities in lung cancer mortality, based on more recent and more extensive datasets, collected in 16 European populations. More specifically the objectives of the paper are: (1) to describe socioeconomic inequalities in lung cancer mortality in a wider range of European population groups; (2) to highlight results from European countries for which until now no or only limited information is available, in particular the new EU member states (3); to get further insight into socioeconomic inequalities in lung cancer mortality in different European populations by relating these to socioeconomic inequalities in overall mortality and smoking within the same or reference populations.

The latter is particularly important. Cigarette smoking is the major cause of lung cancer, and most lung cancers have historically occurred among current cigarette smokers or recent quitters. As population patterns in smoking prevalence will continue to be the most powerful predictor of the future occurrence of lung cancer (12), smoking data could give clues about the future evolution of socioeconomic inequalities in lung cancer mortality. Differences between smoking inequalities and lung cancer mortality inequalities should however be interpreted with caution, taking into account the time lag between exposure and established disease. This time lag varies and depends on smoking duration and intensity (13),(14), but in overall terms a 20- to 50-year delay is assumed between the uptake of regular smoking and the occurrence of lung cancer (15).
Previous research has shown that the contribution of lung cancer mortality to the difference between manual and non-manual classes in total mortality varies substantially from one country to another (16). The comparison of inequalities in lung cancer mortality

with inequalities in total mortality may help to explore this further and estimate the impact of lung cancer mortality on the overall socioeconomic inequalities in mortality.

Methods

Data

Data was collected in the framework of the EUROTHINE project. Data on lung cancer mortality, total mortality and socioeconomic status was available for 16 countries or regions, including 6 new EU member states. Table 1 describes the data sources and some characteristics of the data collection. Most data sources (12) were situated at the national level, but also regional and big urban populations (Basque Country, Barcelona, Madrid, Turin) were included. The majority of networks (11) provided longitudinal data. In the other cases unlinked cross sectional data were available (Czech Republic, Estonia, Hungary, Lithuania and Poland).

In some populations it was not possible to achieve a 100% linkage between the population and death registries. In one population, Madrid, this was particularly a problem: circa 30% of mortality records could not be linked. For this reason absolute estimates for Madrid were corrected by using weighted numbers of death with a weighting factor equaling 1/0.7=1.428571.

In order to compare results on mortality from longitudinal and cross sectional datasets we grouped the data by age group according to the average age of death. Such information was available and more or less comparable in both types of data. The analyses were restricted to age groups with an average age at death between 40 and 79 years.

The cause specific mortality that was considered was mortality due to cancer of trachea, bronchus, lung (ICD 10 codes C33-C34; C39). Socioeconomic status was assessed through educational level. The national categories of educational level were harmonized on the basis of the International Standard Classification of Education (ISCED) and regrouped in 4 categories (no or only primary education - ISCED 1; lower secondary – ISCED 2; upper secondary and post-secondary non-tertiary – ISCED 3+4; tertiary education - ISCED 5+6).

For eleven populations, including 4 new EU member states, survey data was available with information on smoking status. For Turin and Madrid no health interview data were available but we used national health interview surveys from Italy and Spain as comparator.

As indicator for smoking we used ‘being a current regular or occasional smoker’.

Analysis

In a first step we calculated for each population age standardized lung mortality rates by level of education. This was done by direct standardization using the European standard population as reference. For this analysis the two lowest education categories were taken together, as the distinction between these two groups is not the same for many countries and may be especially problematic in the unlinked cross-sectional studies because of the numerator/denominator bias. Standardized rates were calculated stratified by sex for the complete age group under study and for 4 subgroups: 40-49 years, 50-59 years, 60-69 years and 70-79 years.

In a second step we computed the Relative Index of Inequality (RII) for lung cancer mortality, which is a regression-based measure that looks at systematic association between mortality and relative socioeconomic position across all educational groups and can be interpreted as the ratio of mortality rates between the two extremes of the educational hierarchy (17). Age standardized and gender specific RII's were computed for all ages (40-79 years) together and for the 4 age groups separately. Overall age specific RII's were also calculated for total mortality.

Estimates of the magnitude of smoking inequalities are strongly determined by the overrepresentation of younger smokers in national surveys, whereas mortality estimates are almost entirely determined by patterns of mortality of older persons. This is a problem because of the strong age-dependency of the observed inequalities. In order to reduce this discrepancy, we calculated RII's for lung cancer mortality for a rather narrow age range (40 to 59 years). Taking into account the time of the mortality data collection and the survey year(s), RII's for smoking were calculated for approximately the same birth cohort in the corresponding health survey.

The RII's were calculated with the PROC GENMOD command of SAS v9.1 applying Poisson models in case of lung cancer mortality and binomial models in case of smoking.

Both for total and lung cancer mortality and current smoking we computed the slope index of inequality (SII), which measures respectively the absolute rate difference and the absolute prevalence difference between the lower and the higher end of the educational hierarchy. The SII for total and lung cancer mortality was estimated with the formula SII = 2*MR*(RII-1))/(RII+1), where MR is the age adjusted overall mortality rate. The SII for smoking was calculated with the same formula, replacing the MR by the age adjusted prevalence rate (PR).

Results

In the 16 populations that were studied the age standardized lung cancer mortality rates in the age group 40-79 years ranged from 65,8/100.000 person years in Sweden to

252,4/100.000 person years in Hungary among men, and from 11,9/100.000 person years in Madrid to 76,4/100.000 person years in Denmark among women.

Table 2 presents age standardized lung mortality rates by level of education for men and women in different age groups. Among men we observed a sharp increase in lung cancer mortality with a decreasing educational level. The highest socioeconomic gradients were found in the younger age groups. In the Southern European populations the socioeconomic gradient was smaller or even absent, e.g. in the age group between 40 and 49 years in the Basque Country.

Among women gradients in lung cancer mortality rates in function of educational attainment varied more between the regions. In the Northern European and Continental populations we observed in all age groups a similar pattern as among men: the lower the educational level, the higher the lung cancer mortality rate and this for all age groups. In the Southern European populations higher mortality rates were found among the highest educated. Quite interesting was the pattern among women in the Eastern European en Baltic countries: whereas we observed higher mortality rates among the low educated in the youngest age group, this relationship gradually inversed with increasing age. In the highest age group higher mortality rates were observed in the highest educated group. This phenomenon was most pronounced in Hungary, but also quite clear in Poland, Slovenia and Estonia.

The observed patterns are confirmed in Table 3 and Table 4 in which RII's and 95% confidence intervals are presented by country, sex and age group. In the Northern European, Continental, Eastern European and Baltic populations RII's among men were all significantly higher than 1 and decreased with increasing age. Large inequalities were observed among men aged 40-59 years in Eastern European and Baltic countries. Among the male population in Southern European populations inequalities were small or non-existent in all age groups.

Inequalities among women were usually smaller than among men in all age groups. In the Southern European populations most RII's were significantly lower than 1.

RII's for lung cancer mortality and total mortality in different European populations, are presented in Figure 1. Among men, RII's were significantly higher than 1 in all populations, indicating that both a higher lung cancer and overall mortality rate were associated with a lower socioeconomic status. Especially for lung cancer mortality we observed large variations in the size of the inequalities, ranging from a RII of 1,37 (95% CI 1,16-1,63) in the Basque Country to 8,87 (95% CI 8,38-9,40) in the Czech Republic. In most countries inequalities in lung cancer mortality were larger than inequalities in total mortality, although this was not the case in Sweden, Denmark and the Spanish populations.

Among women the picture was quite different: RII's were usually higher for total mortality than for lung cancer mortality. In the Southern European populations and Slovenia a lower socioeconomic status was associated with a higher total mortality, but with a lower lung cancer mortality.

For most populations we were able to compare inequalities in lung cancer mortality with inequalities in current smoking (Figure 2). This was done for a specific age group: people between 40 and 59 years. Among men RII's for lung cancer mortality were in most populations higher than RII's for smoking. Some regional patterns could however be distinguished. In the Southern European populations, especially the Spanish ones, inequalities in both lung cancer mortality and smoking were small or even nonexistent. In the Eastern and Baltic populations we observed much larger inequalities for lung cancer mortality than for smoking.

Among women in the age group 40 to 59 years the RII's for both lung cancer mortality and current smoking were significantly higher than 1 in the Northern European countries, Belgium, Hungary, the Czech Republic and Estonia. In the Spanish populations RII's were significantly lower than 1. Inequalities in smoking were however smaller than lung cancer mortality inequalities.

SIIs of lung cancer mortality and total mortality, together with the contribution of lung cancer mortality to the total mortality in the population 40-79 years are presented in Table 5.

Figure 3 compares SII's for lung cancer mortality with SII's for smoking (in the age group 40-59 years) in 13 European populations. Generally speaking the correlation between the two indices is quite good: the higher the SII for lung cancer mortality, the higher the SII for smoking. In Hungary we found large inequalities in lung cancer mortality, whereas inequalities in smoking are more or less within the range of the other countries.

Discussion

Summary of findings

Our study indicates that there are still important socioeconomic inequalities in lung cancer mortality in Europe. Among men inequalities in lung cancer mortality contribute substantially to inequalities in total mortality. Among women this is not the case, except in the Northern European countries and especially in Denmark. In most populations educational inequalities are larger for lung cancer mortality than for smoking in the age group 40-59 years.

Some regional patterns can be distinguished. Very important socioeconomic gradients, with much higher lung cancer mortality rates among the low educated, are observed in the male populations of some Eastern European countries, like the Czech Republic and Hungary. Among women the largest inequalities are observed in the Northern populations.

Among Southern European males educational gradients in lung cancer mortality are relatively small. Moreover, the inequalities hardly vary in function of age group. Among

Southern European females, lung cancer mortality inequalities and total mortality are opposite to each other: low educated women have smaller lung cancer mortality rates, but a higher total mortality as compared to the higher educated.

Methodological considerations

There is no doubt that the study results have to be interpreted with caution because of methodological limitations that could affect the comparability of the results.

One major problem is that we compare data from longitudinal studies with data from unlinked cross sectional studies. Results based on unlinked cross sectional data may be biased due to differences, e.g. a differential non-response, between the data obtained form the mortality registry (numerator) and the data available from the population census or other surveys (denominator) (18). Although this bias may affect RII's in both directions (19) the high RII's obtained in the Czech Republic and Hungary probably indicate that at least in these countries the Rate Ratios are somewhat overestimated.

The comparability of mortality data from different European populations is also for other reasons far from straightforward. It is plausible that the quality of data collection varies from country to country. In some countries it was not possible to achieve a 100% linkage between the population and death registries. We corrected this for Madrid, where 30% of deaths were excluded due to linkage failure, assuming that missing information on education was at random, which can of course not be guaranteed. In other populations this linkage failure involved less than 10% of death, which was estimated as acceptable. The same concerns with respect to comparability of data apply for the survey data on smoking. Differences in the questionnaires, survey methodology, response rates, missing values, etc. across European countries may affect the comparability of the results. Even thought the methodological problems are acknowledged, it is assumed that they do not affect the overall results to such an extent that the final conclusions are seriously compromised.

Comparison with other studies and interpretation of results

Generally speaking our findings are in line with the Mackenbach paper (11) that explored inequalities in lung cancer mortality by educational level in 10 European populations. This is not surprising. Our study population includes 8 populations that were also included in this study, although we have been working with more recent data. The typical Southern European pattern with higher lung cancer mortality rates among the low educated men and the high educated women, which is also reported in other studies (20), is confirmed by our data from the Basque Country, and is also observed in Slovenia, that shows that the north-south gradient is also prevalent among Eastern European countries.

If we would apply our findings on lung cancer mortality in the Eastern European and Baltic countries to the concept of the spread of the smoking epidemic, as described in several papers (21),(22),(23), we could stage lung cancer mortality among men in Eastern European and Baltic countries (relative high mortality rates, higher mortality in low educated groups) as more advanced than the Southern European populations but not yet having reached the situation of the Northern European countries (relative low mortality rates, higher mortality in low educated group). Also among women, patterns of lung cancer mortality inequality in the Eastern European and Baltic countries would be intermediate between what we observe in Northern Europe (substantially higher mortality rates in the high educated groups) and Southern Europe (inverse pattern). Differences in inequalities between age groups are poor estimators of an evolution over time as they are very much the result of a selection of survivors, hence inequalities may tend to decrease with increasing age group. It is however striking that among females in the Eastern European and Baltic countries educational inequalities in the youngest age group (40-49 years) are very similar to what we find in the Northern European countries, whereas inequalities in the oldest age group (70-79 years) are quite in line with the observations in Southern European countries. This supports our hypothesis that the lung cancer mortality inequalities in Eastern European and Baltic countries are shifting from a Southern European to a Northern European pattern, which would also mean that in the coming years increasing socioeconomic inequalities may be expected among women. The findings that in some Eastern European countries lung cancer mortality rates are decreasing in male populations and increase in women (24),(25) support this hypothesis.

Up to now, few other studies have up to now explored socioeconomic differences in lung cancer mortality rates in new EU member states. One study in Estonia reported an important increase in lung cancer mortality differences by education between 1989 and 2000, both in men and women (26). The magnitude of the inequalities that are reported in this study are in line with the findings in Figure 2.

The contribution of inequalities in lung cancer mortality to inequalities in total mortality is quite heterogeneous. This finding is also confirmed by a study conducted in 11 European countries, that concluded that inequalities in mortality from specific causes of death, and the contributions these causes make to inequalities in total mortality, vary between countries (16). From our results it is clear that in Eastern European and Baltic countries the contribution of lung cancer mortality inequalities to total mortality inequalities is rather low, especially among women, even though absolute inequalities in lung cancer mortality are substantially larger than in most other countries.

In Hungary there are both among men and women quite important inequalities in lung cancer mortality, whereas inequalities in smoking are within the range of the other populations. Even though the methodological limitations discussed earlier could explain some of this discrepancy it may be worthwhile to explore this phenomenon further. Among women in Northern European countries absolute inequalities in smoking are larger than in most other countries. This may indicate that the evolution of socioeconomic inequalities in lung cancer mortality in these countries may show in the future a less favorable evolution than in other countries.

There is no doubt that smoking is the main factor that explains the socio-economic differences that are observed in lung cancer mortality. Some studies report that about 98% of all male lung cancer deaths occur among those who have smoked. Estimates from

Finland indicate that about 86% of lung cancer deaths among men could be avoided if smoking were eliminated (6).

However, even though the educational differences in lung cancer mortality are likely to reflect mainly the higher proportion of heavy smokers among the less educated people, the contribution of other factors than smoking to explain socio-economic inequalities in lung cancer mortality cannot be completely ignored. There is evidence that there is a difference in lung cancer risk between social classes, in addition to the effect of smoking. Other environmental and occupational exposures (27), but also poor lung health, deprivation and poor socioeconomic conditions throughout life may interfere (5). Inequalities in access to treatment (28),(29) and differences in treatment may lead to differences in survival (30).

Among men in Hungary, the Czech Republic, Lithuania and Estonia, we observe much larger socioeconomic inequalities in lung cancer mortality than in smoking. This may be an indication of a favourable evolution towards a reduction of inequalities, but could also indicate that other factors than smoking, contribute to the observed inequalities in lung cancer mortality. Further research is needed to confirm this.

Conclusions

Our study confirms that regional patterns of socioeconomic inequalities in lung cancer mortality follow more or less the same pattern as inequalities in smoking. In Eastern European and Baltic countries absolute inequalities in lung cancer mortality are largest. Among women the inequalities are still smaller, but there are some indications of an increasing trend. Future efforts to tackle socioeconomic inequalities in lung cancer mortality in Europe should focus especially on Eastern European and Baltic countries, and although these efforts should primarily target smoking prevention, there is also need for further research to establish the role of other factors than smoking, such as other environmental and occupational factors, differences in access to treatment and survival. More efforts are also needed to reduce lung cancer mortality inequalities, especially among women, in the Northern European countries.

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Tables and figures

Table 1. Data sources in the populations under study

Population	Type of mortality data	Follow-up period	Person years at risk	% missing data education	Data sources used for comparison with socioeconomic inequalities on smoking	Year(s) of survey(s)	Sample size
North							
Finland	Longitudinal	1990-2000	27.550.171	0,0%	Finbalt Health Monitor	94/98/00/02/04	20371
Sweden	Longitudinal	1991-2000	48.340.986	9,8%	Swedish Survey of Living Conditions	00/01	11484
Norway	Longitudinal	1990-2000	22.262.277	2,3%	Norwegian Survey of Living Conditions	02	6820
Denmark	Longitudinal	1996-2000	15.354.602	0,0%	Danish Health and Morbidity Survey	00	16690
Continental							
Belgium	Longitudinal	1991-1995	27.635.206	6,0%	Health Interview Survey	97/01	18481
Switzerland	Longitudinal	1990-2000	30.728.441	0,6%	Not available	-	
South							
Turin	Longitudinal	1991-2001	5.287.281	0,0%	Health and health care utilization survey Italy	99/00	118245
Basque Country	Longitudinal	1996-2001	6.457.258	1,5%	Basque Health Interview Survey	97/02	12443
Barcelona	Longitudinal	1992-2001	8.915.780	0,7%	Health Interview Survey Barcelona	00	
Madrid	Longitudinal	1996-1997	4.664.793	3,3%	National Health Survey	01	20748
East							
Slovenia	Longitudinal	1991-2000	10.325.538	1,3%	Not available		
Hungary	CS unlinked	1999-2002			National Health Interview Survey	00/03	10532
Czech Rep.	CS unlinked	1999-2003	30.308.765	0,0%	Sample Survey of the Health Status of the Czech Pop.	02	2476
Poland	CS unlinked	2001-2003	65.844.117	2,0%	Not available	-	
Baltic							
Lithuania	CS unlinked	2000-2002	6.189.927	0,5%	Finbalt Health Monitor	94/98/00/02/04	11647
Estonia	CS unlinked	1998-2002	4.141.440	2,3%	Health Behavior among Estonian Adult Population	-	4376

Table 2. European age standardized lung mortality rates per 100.000 person years at risk, by age, sex and level of education

Region	Country	Educa-tion*	Sex and age group (in years)									
			Men					Women				
			40-49	50-59	60-69	70-79	**40-79**	40-49	50-59	60-69	70-79	**40-79**
North	Finland	Low	17,4	75,4	247,6	505,2	**145,8**	6,1	18,7	39,9	69,9	**25,3**
		Middle	12,3	58,4	157,8	387,0	**104,6**	3,7	10,4	30,3	61,5	**18,7**
		High	4,6	26,0	84,5	277,0	**62,2**	3,4	11,9	25,0	58,4	**17,6**
	Sweden	Low	9,7	43,4	133,1	226,6	**74,0**	13,5	39,2	67,7	89,9	**42,9**
		Middle	6,2	36,5	108,4	206,7	**62,7**	8,2	30,7	61,7	88,5	**36,9**
		High	3,7	20,6	69,2	151,6	**41,5**	5,0	16,6	36,0	64,7	**22,7**
	Norway	Low	23,3	89,4	231,2	359,6	**130,9**	22,4	57,4	97,3	99,4	**59,3**
		Middle	14,1	53,9	162,8	283,1	**92,2**	10,0	29,7	64,9	81,2	**37,0**
		High	5,3	31,8	106,3	217,7	**61,8**	5,7	13,0	46,2	63,2	**23,9**
	Denmark	Low	14,1	69,9	221,0	453,5	**130,8**	13,8	62,3	159,9	242,0	**89,1**
		Middle	10,3	50,2	189,6	471,6	**118,6**	9,6	41,7	115,3	207,9	**67,2**
		High	4,9	26,6	114,9	286,3	**70,2**	4,6	22,4	83,8	154,6	**45,9**
Continental	Belgium	Low	24,2	115,5	335,9	661,3	**199,3**	8,2	20,8	42,0	57,5	**25,6**
		Middle	14,6	69,8	216,5	464,1	**131,3**	5,4	16,1	31,8	66,9	**22,1**
		High	8,8	45,4	157,4	322,0	**91,2**	5,1	13,4	28,2	50,6	**18,4**
	Switzerland	Low	37,3	130,0	302,8	456,2	**176,0**	15,9	31,8	49,6	61,8	**33,9**
		Middle	20,2	78,5	196,4	355,4	**118,2**	8,9	23,7	45,8	65,9	**28,7**
		High	9,8	43,1	119,8	222,2	**70,4**	6,7	17,1	36,5	73,7	**24,7**
South	Turin	Low	28,7	120,1	317,3	569,8	**187,0**	4,9	20,8	46,3	93,9	**29,9**
		Middle	15,8	85,8	204,8	406,3	**127,1**	6,7	18,0	65,9	94,9	**34,0**
		High	16,1	57,2	146,5	385,0	**102,8**	5,8	24,5	44,7	130,7	**35,5**
	Basque C.	Low	13.4	64.4	138.6	338.5	**96.7**	5.5	8.6	11.1	24.7	**10.0**
		Middle	10.8	71.9	150.4	269.1	**92.3**	6.5	19.2	15.8	35.6	**16.1**
		High	13.9	60.1	102.6	257.8	**77.8**	14.2	28.4	42.5	24.7	**26.2**
	Madrid	Low	41,7	119,1	322,7	533,3	**187,9**	4,1	10,3	22,7	36,3	**14,1**
		Middle	34,4	123,1	251,1	627,1	**182,4**	6,3	27,4	41,3	74,4	**29,0**
		High	30,6	90,7	220,3	425,9	**139,4**	10,4	20,7	27,9	29,6	**19,9**
	Barcelona	Low	51.9	128.4	279.1	474.0	**177.5**	6.5	10.8	18.3	38.1	**14.3**
		Middle	42.9	95.3	208.5	344.7	**132.7**	8.6	24.8	32.5	41.1	**23.0**
		High	36.7	88.5	217.7	373.1	**133.9**	9.9	19.9	29.4	54.9	**22.8**
East	Slovenia	Low	45,6	161,9	382,6	487,8	**210,4**	10,0	20,5	41,5	57,7	**26,1**
		Middle	31,2	105,3	334,6	456,9	**173,2**	9,0	24,1	56,6	111,9	**36,8**
		High	12,9	53,1	178,0	295,4	**96,3**	7,4	20,7	88,9	116,3	**42,8**
	Hungary	Low	89,8	280,2	507,4	602,9	**304,4**	41,5	73,2	89,8	115,7	**71,2**
		Middle	49,9	144,8	260,7	362,1	**164,3**	24,5	49,3	95,0	160,1	**64,4**
		High	16,9	81,6	186,5	337,1	**113,7**	9,7	45,0	102,2	222,8	**67,2**
	Czech Rep.	Low	35,8	190,8	459,9	616,6	**248,9**	9,9	39,6	71,0	98,6	**43,5**
		Middle	15,9	76,4	199,0	308,9	**111,0**	6,1	27,2	65,9	128,0	**40,8**
		High	4,2	31,5	101,2	200,1	**58,0**	3,0	15,6	44,9	82,7	**25,9**
	Poland	Low	46,7	208,2	502,3	695,2	**277,0**	18,3	47,4	64,4	87,7	**46,1**
		Middle	17,7	94,1	256,6	416,3	**143,0**	9,3	40,2	69,2	119,3	**45,7**
		High	7,0	47,4	151,1	257,0	**81,9**	4,3	24,8	53,9	103,9	**33,8**
Baltic	Lithuania	Low	72,5	191,9	395,1	521,3	**235,9**	6,7	15,1	22,4	48,0	**17,9**
		Middle	26,4	117,0	257,3	378,2	**148,7**	4,8	7,9	20,5	51,5	**14,9**
		High	15,8	39,4	131,0	212,2	**72,5**	2,1	10,4	14,0	19,7	**9,5**
	Estonia	Low	55,4	192,8	452,7	631,6	**256,4**	18,1	22,2	31,9	74,1	**29,3**
		Middle	24,8	140,9	361,3	582,5	**203,5**	3,2	18,8	35,7	110,9	**28,4**
		High	7,2	46,7	141,3	319,9	**87,3**	2,5	9,7	22,3	50,6	**15,0**

Low: no, primary and lower secondary education (ISCED 1+2)
Middle: upper secondary and post-secondary non-tertiary education (ISCED 3+4)
High: Tertiary education (ISCED 5 +6)

Table 3. Relative indices of inequality (and 95% CI) for lung cancer mortality in men in 16 European populations, by age group

Population	Age group							
	40-49 yrs		50-59 yrs		60-69 yrs		70-79 yrs	
North								
Finland	4,75	(3,38- 6,69)	3,74	(3,05- 4,58)	4,54	(3,88-5,32)	2,48	(2,15-2,86)
Sweden	3,31	(2,31- 4,75)	2,25	(1,90- 2,65)	1,99	(1,78-2,24)	1,39	(1,27-1,53)
Norway	5,87	(3,99- 8,63)	3,97	(3,19- 4,93)	2,59	(2,26-2,97)	1,86	(1,66-2,09)
Denmark	3,49	(2,01- 6,05)	3,25	(2,55- 4,14)	1,97	(1,68-2,30)	1,34	(1,18-1,52)
Continental								
Belgium	4,09	(3,02- 5,54)	3,90	(3,31- 4,58)	2,89	(2,61-3,19)	2,30	(2,10-2,52)
Switzerland	5,34	(3,94- 7,24)	4,07	(3,46- 4,78)	3,16	(2,85-3,52)	2,24	(2,04-2,46)
South								
Turin	2,60	(1,38- 4,89)	2,06	(1,55- 2,75)	2,20	(1,81-2,68)	1,71	(1,40-2,08)
Basque Country	1,33	(0,63- 2,80)	1,05	(0,73- 1,50)	1,26	(0,90-1,75)	1,61	(1,24-2,08)
Madrid	1,30	(0,70- 2,40)	1,42	(0,93- 2,16)	1,68	(1,22-2,32)	1,12	(0,80-1,57)
Barcelona	1,72	(1,22- 2,43)	1,98	(1,56- 2,53)	1,62	(1,37-1,92)	1,70	(1,43-2,02)
East								
Slovenia	3,36	(2,41- 4,68)	3,29	(2,68- 4,04)	1,80	(1,57-2,05)	1,57	(1,32-1,88)
Hungary	7,18	(6,07- 8,49)	8,37	(7,46- 9,39)	5,12	(4,52-5,80)	2,96	(2,60-3,37)
Czech Rep.	15,00	(11,35-19,81)	15,13	(13,37-17,13)	8,84	(8,04-9,71)	6,73	(6,13-7,40)
Poland	7,30	(6,33- 8,43)	4,65	(4,30- 5,02)	2,88	(2,71-3,05)	2,27	(2,13-2,42)
Baltic								
Lithuania	7,67	(4,18-14,06)	4,37	(3,26- 5,87)	2,68	(2,19-3,28)	1,79	(1,41-2,27)
Estonia	8,99	(4,38-18,46)	3,35	(2,40- 4,67)	2,42	(1,95-3,00)	1,41	(1,11-1,79)

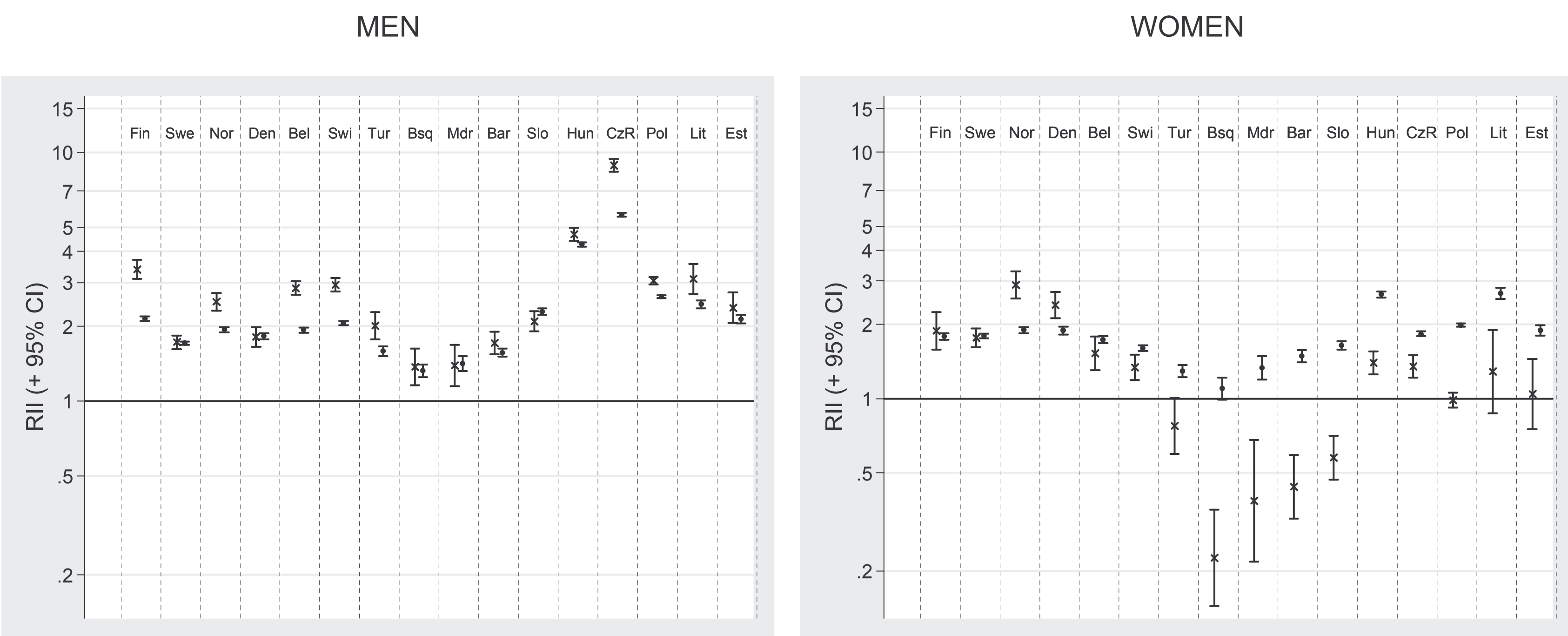
Table 4. Relative indices of inequality (and 95% CI) for lung cancer mortality in women in 16 European populations, by age group

Population	Age group							
	40-49 yrs		50-59 yrs		60-69 yrs		70-79 yrs	
North								
Finland	2,51	(1,45- 4,33)	2,57	(1,74-3,78)	2,02	(1,48-2,76)	1,34	(1,01-1,76)
Sweden	3,71	(2,67- 5,15)	2,77	(2,31-3,32)	1,65	(1,42-1,92)	1,18	(1,04-1,35)
Norway	6,62	(4,32- 10,14)	5,77	(4,33-7,68)	2,60	(2,11-3,20)	1,62	(1,33-1,97)
Denmark	4,56	(2,52- 8,27)	3,69	(2,82-4,83)	2,38	(1,95-2,91)	1,64	(1,36-1,97)
Continental								
Belgium	1,82	(1,12- 2,96)	1,81	(1,28-2,55)	1,80	(1,39-2,33)	1,12	(0,87-1,45)
Switzerland	3,28	(2,25- 4,79)	2,00	(1,55-2,58)	1,26	(1,03-1,53)	0,89	(0,73-1,07)
South								
Turin	0,60	(0,18- 2,00)	1,13	(0,60-2,13)	0,71	(0,46-1,09)	0,75	(0,51-1,11)
Basque Country	0,24	(0,09- 0,66)	0,11	(0,05-0,26)	0,22	(0,08-0,60)	0,40	(0,18-0,87)
Madrid	0,33	(0,07- 1,58)	0,34	(0,10-1,08)	0,34	(0,13-0,91)	0,47	(0,16-1,35)
Barcelona	0,41	(0,18- 0,91)	0,29	(0,15-0,55)	0,45	(0,26-0,77)	0,59	(0,36-0,97)
East								
Slovenia	1,42	(0,76- 2,65)	1,00	(0,63-1,58)	0,56	(0,41-0,77)	0,39	(0,27-0,54)
Hungary	4,59	(3,59- 5,86)	2,43	(2,01-2,94)	0,87	(0,72-1,06)	0,43	(0,35-0,53)
Czech Rep.	3,28	(2,14- 5,03)	2,22	(1,81-2,72)	1,16	(0,97-1,38)	0,97	(0,83-1,14)
Poland	5,07	(4,06- 6,32)	1,56	(1,36-1,78)	0,76	(0,67-0,86)	0,46	(0,41-0,53)
Baltic								
Lithuania	3,59	(0,70- 18,37)	1,61	(0,60-4,34)	1,03	(0,55-1,95)	0,90	(0,53-1,53)
Estonia	26,26	(4,18-165,04)	2,34	(0,97-5,63)	1,09	(0,60-2,00)	0,57	(0,37-0,88)

Table 5. Absolute inequalities in lung cancer mortality and total mortality (SII's in deaths per 100.000 person years) and contribution of inequalities in lung cancer mortality to inequalities in total mortality in men and women, age group 40 –79 years

	MEN			WOMEN		
	SII lung cancer mortality (per 100.000 PY)	SII total mortality (per 100.000 PY)	Contribution inequalities lung ca mort. to total mort. inequalities	SII lung cancer mortality (per 100.000 PY)	SII total mortality (per 100.000 PY)	Contribution inequalities lung ca mort. to total mort. inequalities
North						
Finland	137	1164	11.8%	14	421	3.3%
Sweden	35	562	6.2%	20	351	5.8%
Norway	88	846	10.3%	43	447	9.6%
Denmark	67	698	9.6%	63	477	13.2%
Continental						
Belgium	169	748	22.6%	10	313	3.2%
Switzerland	120	835	14.3%	9	281	3.1%
South						
Turin	114	593	19.2%	-8	173	-4.5%
Basque Country	30	225	13.5%	-15	29	-52.6%
Madrid	42	346	12.1%	-11	118	-9.0%
Barcelona	90	573	15.7%	-13	214	-6.1%
East						
Slovenia	126	1361	9.3%	-16	393	-4.0%
Hungary	327	3111	10.5%	22	1057	2.1%
Czech Rep.	308	2624	11.8%	12	559	2.2%
Poland	223	1816	12.3%	-1	599	-0.1%
Baltic						
Lithuania	183	2059	8.9%	4	890	0.4%
Estonia	165	2001	8.2%	1	693	0.1%

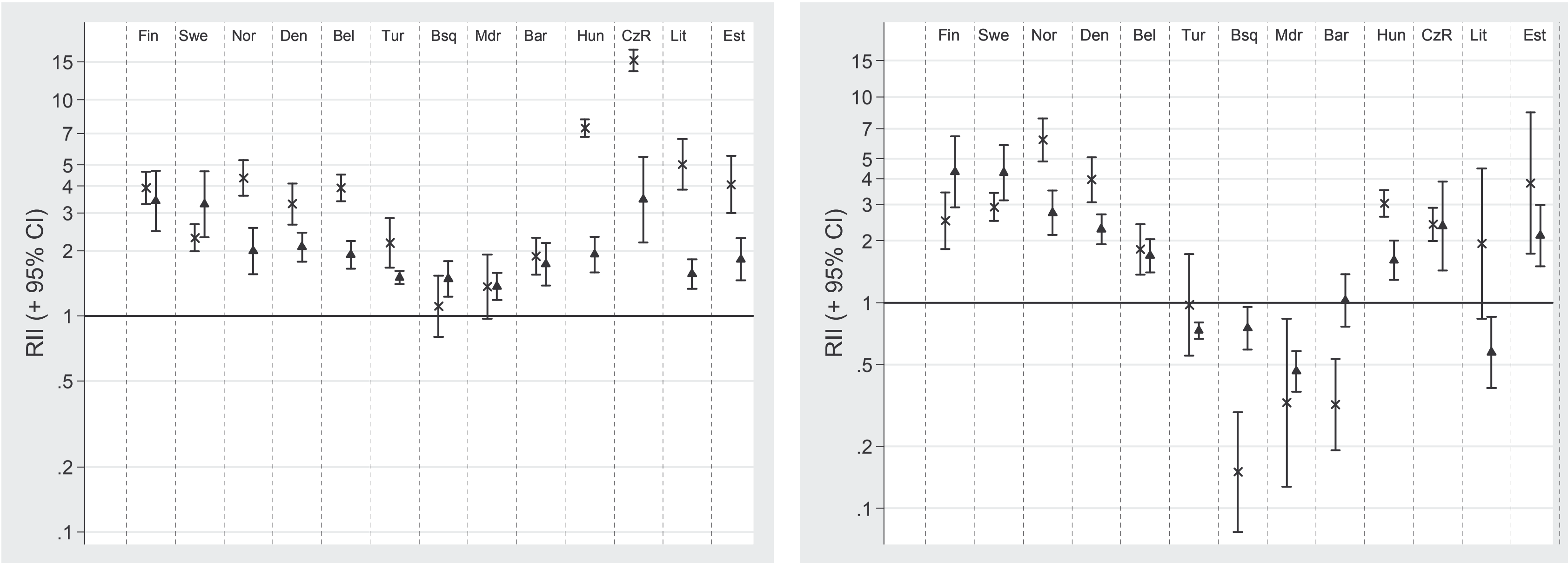
Figure 1. Relative indices of inequality (and 95%CI) for lung cancer mortality and overall mortality (16 European populations), age group 40-79 years



x RII for lung cancer mortality # RII for overall mortality

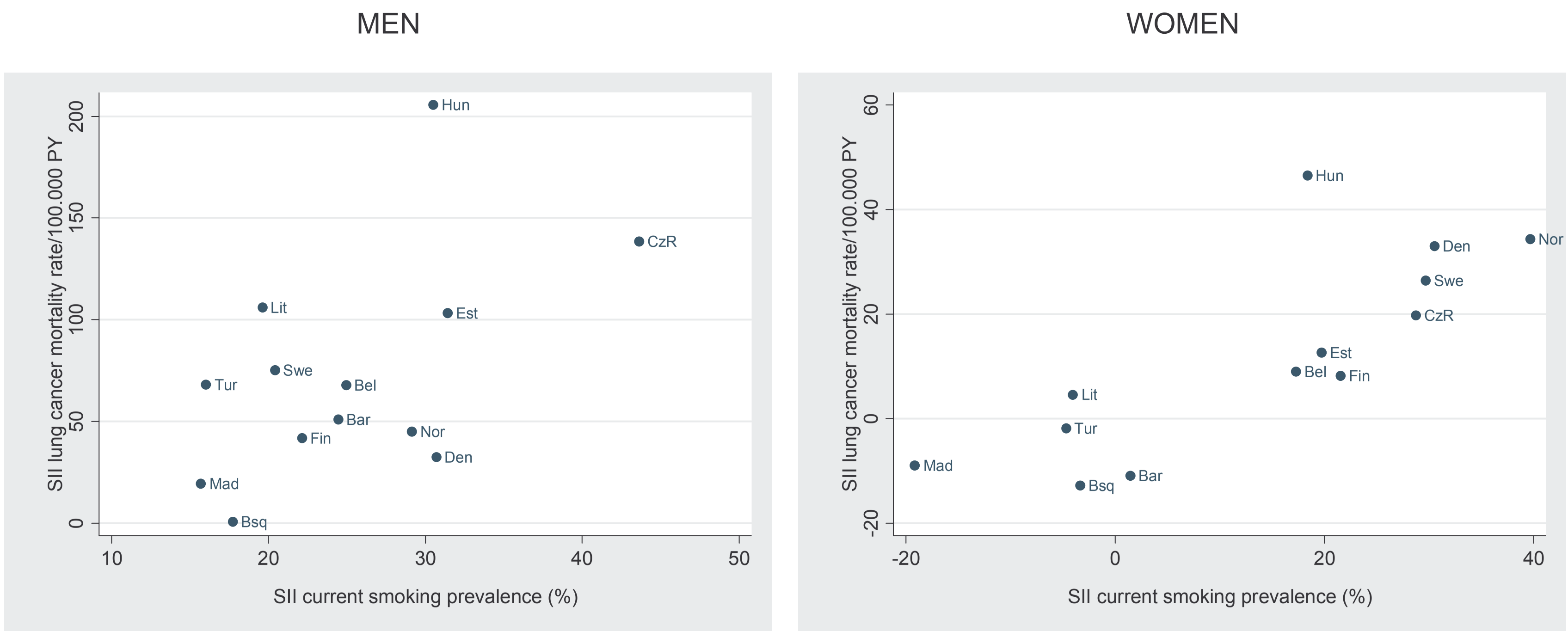
Figure 2 Relative indices of inequality (and 95%CI) for lung cancer mortality and current smoking in 13 European populations, age group 40-59 years

MEN WOMEN



x RII for lung cancer mortality % RII for current smoking

Figure 3 Comparison SII lung cancer mortality and SII current smoking in 13 European populations, age group 40-59 years



Chapter 6

Inequalities in alcohol-related mortality by educational level in 16 European populations

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Abstract

Objective
To evaluate the difference in inequalities in alcohol-related mortality (alcohol-related diseases and alcohol-related injuries) by educational level between 16 populations covering the North, Continental, South, East and Baltic region of Europe.

Methods
Data on mortality (ages 30-79) were obtained from 12 European Member States, 2 regions (Basque Country and Madrid) and 2 city-wide mortality registers (Barcelona and Turin). Data from 11 populations were from a longitudinal design. For the Czech Republic, Estonia, Hungary, Lithuania and Poland only unlinked cross-sectional data were available.
Alcohol-related mortality was defined following the National Institute on alcohol abuse (US) definitions. The socioeconomic position was defined by the highest educational attainment following the ISCED classification.
Data were analysed stratified by gender for each of the 3 alcohol-related mortality causes. Age-standardised mortality rates were computed using the European standard population. Using Poisson regression, the Relative Index of Inequality (RII) and Slope Index of Inequality (SII) were estimated as a summary of the relative and absolute magnitude of the socioeconomic inequalities in alcohol-related mortality.

Results
Large socioeconomic inequalities were observed. Differences were more pronounced in males. The RIIs ranged between 2 and 5 with 2 outliers: Hungary (6.0) and Czech Republic (8.6), whereas in females the RIIs range were between 1.3 and 4.4. The highest RIIs were observed in the East and Baltic Region and also among males also in Switzerland. The pattern of the RIIs in alcohol-related disease and alcohol-related injuries was similar but the inequalities in alcohol-related injuries were smaller in most countries.
The contribution of the socioeconomic differences in alcohol-related mortality in man to the overall mortality inequality was substantial. Only in 4 of the 16 populations was it lower than 10% and in 6 of the 16 populations it was at least 15%. Large contributions were observed in populations with both large and with small SIIs. In women, large % contributions (> 10%) were observed in Slovenia, Hungary and the Baltic region but also in the Basque Country.

Conclusion
The educational inequalities in alcohol-related mortality were the highest in the East and Baltic region. The observation that the contribution of alcohol to the overall mortality inequality was also substantial in populations with small alcohol-related differences in mortality may challenge the claimed beneficial impact of alcohol on mortality.

Introduction

Many studies have described the relationship between alcohol use and mortality to be J- or U-shaped. This potential beneficial effect makes alcohol consumption very challenging from a public health perspective as any policy towards this legal substance needs to find the right balance between benefits and harm. There is no doubt that excessive use causes significant harm to the physical, psychological and social health of individuals, families and communities(1).

This paper focuses on alcohol-related mortality. A recent meta-analysis of 34 cohort studies concluded that the net beneficial window for overall mortality is about 1-2 drinks per day in women and 2-4 drinks per day in men(2). The association between alcohol use and mortality is however complex as these thresholds may be affected by age, the presence of comorbidity(3), the type of alcohol(4) and the pattern of consumption, especially binge drinking(5). It has been further suggested that the beneficial effects are due to a systematic error in prospective studies as the abstainer category is contaminated with occasional or former drinkers(6).

Alcohol-related mortality includes deaths from a great number of underlying causes. These deaths can be divided into 2 large groups (table 2). Mortality from alcohol-related disease (natural causes) includes deaths from diseases related to alcohol which only manifest themselves after a long history of excessive alcohol consumption. These conditions are however also sensitive to one episode of excessive abusive drinking. Mortality from alcohol-related injuries or adverse effects (external causes) is most often related to situational and current problematic use, although long-term heavy drinking cannot be excluded. While the proportion of alcohol involvement in some causes may be high, alcohol abuse does not always result in deaths and therefore mortality rates do not necessary reflect the current prevalence of problematic drinking. Only part of the specific causes of death related to alcohol, such as alcoholic cirrhosis, can be wholly attributed to alcohol. For many other diseases and health outcomes alcohol is only one of the potential causes. Therefore an alcohol attributable fraction (AAF) has to be used. Because there are no pan-European estimates, this paper uses a comprehensive list with estimates of AAF provided by the National Institute of Health (US)(7). Using AAFs from one source has limitations. The AAFs are after all a function of the prevalence of alcohol use, the type of alcohol used and the drinking pattern, all of which are different over Europe given the variation in drinking cultures(8). The use of one particular list of AAFs may affect the absolute level of alcohol-related mortality of one particular population. However this paper studies the variation in alcohol-related mortality by socioeconomic position within and between populations.

Negative socioeconomic gradients in alcohol-related mortality have been describe within some European populations(9-11). The information remains limited and a European overview on difference in socioeconomic inequality in alcohol-related mortality is needed. Given the large variations in drinking culture within Europe and because surveys do not seem to catch the variation in alcohol consumption by socioeconomic status(11), it is of interest to evaluate the distribution of the inequality in alcohol-related mortality between populations and its contribution to the overall socioeconomic differences in mortality.

The objective of the study is to evaluate the difference in inequality of alcohol-related mortality by educational level between 16 European populations covering the North, Continental, South, East and Baltic regions. The study includes populations with different overall levels of alcohol-related mortality, different alcohol consumption patterns, different socially acceptable levels of alcohol consumption and different alcohol-related public policies.

Methods

Data

Data on mortality were obtained from 16 European populations (table 1): 12 European Member States, 2 regions (Basque Country and Madrid) and 2 city-wide mortality registers (Barcelona and Turin). Data from 11 populations were collected following a longitudinal design with a population definition mainly during the 1990s (census enumeration) and a variable follow-up period between 2 to 9 years. For the other populations (Czech Republic, Estonia, Hungary, Lithuania and Poland) only unlinked cross-sectional data were available. For the cross-sectional data, the number of deaths by causes is provided by the death registries and the number of person-years is given by the census.
A close to 100% linkage between the census data and mortality was achieved in all populations except Madrid (70%), Basque Country (93%) and Barcelona (94.5%). The linkage problems were not related to the age, sex or socio-economic position (except for the latter in the Basque Country). To correct for an underestimation of the mortality rates, a weigh equal to one over the linkage rate, was used.
All studies cover the total population, except for Switzerland where no data on foreigners are included. In order to compare the results on mortality from longitudinal and cross-sectional data for similar ages, the age variable used is the average age at death within 5 year age groups. This information is available for both types of mortality data. Because the quality of the causes of death decreases in the older ages, only the data up to the age of 79 years are included in the analysis. The database for each population included data on the number of deaths by selected causes and the number of person-years at risk by gender, 5-year age groups and level of education.

The definition of alcohol-related mortality used is given in Table 2(7). The data were not available at the level of single ICD9-codes (4 digits), but grouped within sets of predefined causes. The number of alcohol-related deaths was estimated using proportional mortality ratios in combination with the Alcohol-Attributable Fraction (AAF). Analyses were conducted for total alcohol-related deaths and for 2 major groups: deaths by alcohol-related diseases (natural causes) and by alcohol-related injuries or adverse effects (external causes). With the exception of Switzerland, where the cause of death coding was ICD8 until 1994 and ICD10 thereafter and Barcelona with the ICD-9 coding up to 1999, ICD9-coding has been used in all other populations.

The socioeconomic position of the individuals was defined by the highest educational attainment. For Denmark and Finland information on only 3 levels of education was available, whereas the other populations used 4 categories. Using guidelines of the International Standard Classification of Education(12), national categories were reclassified into 3 classes: No or only primary education or lower secondary (ISCED 0-2), upper secondary and post-secondary non-tertiary education (ISCED 3-4) and tertiary education (ISCED 5-6). Subjects with missing values for education (less than 3 % in all countries but Belgium and Sweden (6%)) were excluded from the analysis (Table 1).

Analysis

Data were analysed by country and stratified by gender and 3 age categories (30-79 years, 30-64 years, 65-79 years) for each of the 3 alcohol-related mortality causes (alcohol-related diseases, alcohol-related injuries or adverse effects and the combination of both) and for the overall mortality. Age-standardised mortality rates were computed for the overall population and for each of the educational classes, using the EU-standard population. Rate ratios, rate differences and their 95% confidence interval (95%CI) were calculated comparing lower education classes with the highest (13).
Using Poisson regression analysis with the Proc GENMOD procedure of SAS v9.1, the Relative Index of Inequality (RII) and 95% CI was estimated as a summary of the relative magnitude of the socio-economic inequalities in alcohol-related mortality, using a ranked variable rescaling the socio-economic position (using the full information available) on a scale between 0 and 1. The rescaled socio-economic position takes into account the size and relative position of each educational class and is therefore appropriate to compare populations with different educational definitions and distributions(14). The exponent of the regression coefficient gives the relative index of inequality (RII), corresponding to the model based rate ratio of the mortality rates between the two extremes of the educational hierarchy(15;16). The RII was adjusted for age by adding the age categories to the model.

The regression model allows for the estimation of the slope index of inequality (SII). The SII is the absolute difference in the predicted mortality rates between the two extremes of the educational hierarchy and is estimated as: SII = (2*MR*(RII-1))/(RII+1), where MR is the age-standardised overall mortality rate.

Finally, the correlation between the RIIs of overall mortality and the RIIs of alcohol-related mortality was estimated.

Results

Table 3 presents the mortality rates of all causes and alcohol-related mortality deaths (overall and divided by natural and external causes) between ages 30-79 years. The alcohol-related rates were higher (2.5 to 4.7 times) among men. This gender difference was larger than the gender difference for the overall mortality. Among males, the alcohol-related mortality was between 180 and 290/100000 in Slovenia, Hungary and the 2 Baltic States, Lithuania and Estonia. In these countries the alcohol-related deaths accounted for more than 10% of all mortality compared to 5-9% in the other populations. Countries with a rate of [100 – 180/100000[were Finland, Poland and the Czech Republic. In Sweden, Belgium and the populations in the South mortality rates were below 80/100000. The 4 populations with the highest alcohol-related mortality among men had also the highest rates (between 56 and 79/100000) and proportional mortality (about 8%) among females. In both males and females, the relative difference between the highest and lowest rate was about 5, which is larger than the difference in overall mortality (about 3). With few exceptions (Belgium, Lithuania (males)), mortality due to alcohol-related diseases accounted for at least 75% of all alcohol-related deaths.

Table 4a, b presents the age-standardised alcohol-related mortality rates by education for men and women in different age groups. The absolute differences by educational attainment were the largest in the East and Baltic region (ranging respectively, in the ages 30-79 years, between 100 to more than 300/100000 and between 42 to 100/100000 among females) and the smallest in the South. A similar ranking of the educational differences within the populations was observed in both males and females, in both age groups and for both the alcohol-related diseases as injuries. For alcohol-related injuries among females, rates were higher in the high educated group in Turin (ages 30-64 years) and in Switzerland (ages 65-79 years).

For the alcohol-related mortality in the ages 30-79 years, the largest RIIs (≥ 3) among men were observed in the East and Baltic region and in Switzerland compared to RIIs between 2 and 3 in the other populations (Table 3). In Hungary and the Czech Republic the RIIs even had values larger than 6. In general the RIIs of the alcohol-related mortality were larger than the RIIs of all cause mortality. A similar distribution of the RIIs size was observed for the alcohol-related diseases and alcohol-related injuries with the exception of the relatively smaller RIIs of the latter in Turin. All RIIs, except the alcohol-related injuries in Turin, were statistical significant.
The highest RIIs (≥ 2.5) for the overall alcohol-related mortality among women was observed in the East (except the Czech Republic: RII=2.2) and Baltic region. In the other populations, the RIIs were about 2 (North) and between 1.3 and 1.8 in the populations considered in the Continental and the South region. The RIIs tended to be larger than the inequality observed for the overall mortality (except Belgium, Switzerland). The RIIs for alcohol-related diseases and alcohol-related injuries gave a similar geographical pattern with the highest RIIs in the East and Baltic region. However the RII for alcohol-related injuries among women in Slovenia is 1.6 compared to a much larger inequality for the alcohol-related diseases (RII = 4.2). The RII of the alcohol-related injuries were lower than 1.6 in the North, Continental and South regions of Europe. In Turin and Madrid the RIIs were smaller than 1. The RIIs for alcohol-related injuries observed in the populations of the Continental and South region as well as Norway were not statistically significant.
Although much smaller in the older people, the patterns of the RIIs of the 2 subgroups of alcohol-related health outcomes were similar among men in the under 65 and 65-plus populations (Fig 1a). In the 30-64 years old population the RIIs for alcohol-related diseases were about 6 in Eastern Europe with the outlying value of 11.8 in the Czech Republic. There was a high RII, due to the differences in alcohol-related diseases in Turin. The RIIs for alcohol-related diseases in the older population remained larger than 5.5 in Hungary and the Czech Republic. Contrary to

what was observed in the younger age group the RIIs of alcohol-related diseases in the two member states of the Baltic Region were small.
The RIIs of the alcohol-related diseases among females were also much smaller in the 65+ populations (between 1.5 and 2.2 (except Hungary: RII=3)) with narrow between country variation (Fig 1b). In the younger age group, the pattern of alcohol-related diseases mimicked the pattern among younger men with RIIs above 2 in Turin and Barcelona, above 2.5 the North, above 3 in the East (6.3 in Slovenia) and above 6.4 in the Baltic region. The RIIs of alcohol-related injuries were high (above 3) in Hungary, Poland and the Baltic region. In most other populations the RIIs are smaller than 2 (except Czech Republic 2.2), and even smaller than 1 (Turin: 0.4, Madrid: 0.7).
Overall, higher observed RIIs for the overall mortality tended to go with high RIIs for alcohol-related mortality, alcohol-related diseases and alcohol-related injuries. Correlation coefficients were between 0.77 and 0.95 except in women in the age group 65-plus with a correlation coefficient of 0.64 and 0.32 for the alcohol-related diseases and for the alcohol-related injuries respectively.

The absolute educational differences in the alcohol-related mortality rate among males expressed as the slope index of inequality (SII) ranged between 142/100000 (Poland) and 414/100000 (Hungary) in the East and Baltic region (Table 5). The SII was about 50/100000 to 86/100000 in the other populations (except Finland: 124/100000). The contribution of the alcohol-related absolute inequality to the overall mortality educational differences was substantial and was larger than 15% in Basque Country, Barcelona, Slovenia, Hungary and the Baltic region. The SIIs for the alcohol-related injuries were lower, especially in the population in the South region, where they were between 2/100000 to 7/100000.
The SIIs for the overall alcohol-related mortality among women were smaller compared to the SIIs among men but large SIIs were observed in the same populations (between 62/100000 to 90/100000). The contribution of the alcohol-related SIIs to the overall educational differences in mortality was in these countries between 11% and 18%. The percent contribution to the overall SII was negative in Basque Country because of the inverse socioeconomic inequality in the overall mortality whereas the negative values observed in other populations (Turin, Madrid) were due to the inverse inequality in alcohol-related injuries.

Discussion

This study is the first to report on socioeconomic differences in alcohol-related mortality covering the whole of Europe and especially including the East and Baltic region. Between the populations, there is substantial difference in alcohol-related mortality which is relatively larger than the spread in overall mortality. In countries with the highest alcohol-related mortality rates the proportional mortality rates go up to more than 10% in men and is about 8% in women. In both males and females, the populations with the highest rates (overall and alcohol-related) are in the East and Baltic region. However Finland (males and females) and Denmark (females) are relatively high in the ranking of alcohol-related mortality. Alcohol-related diseases account in general for at least three quarters of all alcohol-related mortality

The socioeconomic inequalities in alcohol-related mortality are large and in general larger than the inequalities in overall mortality. The differences were more pronounced in males. In males the range of the relative inequalities is between 2 and 5 with 2 outliers (Hungary (6.0) and Czech Republic (8.6), whereas in females the RII range is between 1.3 and 4.4. The highest RIIs are observed in the East and Baltic Region and among males also in Switzerland. The pattern of the RIIs in mortality by alcohol-related disease and alcohol-related injuries is similar but the inequalities in alcohol-related injuries are in most countries somewhat smaller. The RII for alcohol-related injuries among males in Switzerland is among the smallest and in females there is an opposite (not significant) association between education level and alcohol-related injuries in Turin and Madrid.

By age, the distribution of the RIIs follows a similar geographical pattern but with larger inequalities below the age of 65 years. Out of this general pattern among men, is the high RII, due to the differences in alcohol-related diseases in Turin under the age of 65,and the low RIIs of alcohol-related diseases in the two populations of the Baltic Region in the oldest age group. Among older females, the range of the RIIs observed in the 16 populations is narrow. Two populations in the South (Madrid and Barcelona) have relatively large RIIs for the alcohol-related injuries.

Among men, there is an enormous range (about 250/100000) in the difference in size of the SIIs in alcohol-related mortality between populations in the East and Baltic region. This range is, of course, even larger when all populations are compared. The contribution of the socioeconomic differences in alcohol-related mortality to the overall mortality inequality is substantial. Only in 4 of the 16 populations it is lower than 10% and in 6 of the 16 populations it is at least 15%, much more than what could be expected from the proportional mortality. Large contributions are observed in populations with both large and with small SIIs. In women, large SII (> 60/100000) and large % contributions (> 10%) are observed in Slovenia, Hungary and the Baltic region but also in Basque Country.

There is evidence for a positive correlation between the size of the RIIs in overall mortality and the RIIs of alcohol-related mortality.

Limitations

The authors recognise that the comparability of the different population data may be challenged. Some of the limitations are discussed below. First, there were only 3 educational categories in Denmark and Finland compared to 4 in the other populations. This could lead to some overestimation of the RIIs and SIIs. Second, next to the fact that the period of follow-up is variable (between 2 to 9 years), some of the population data are cross-sectional. Therefore the age variable used is the age at death and not the age at start of follow-up. Further within the cross-sectional data, the socioeconomic distribution of the population and of the deaths comes from 2 different sources, probably inducing a numerator-denominator bias. This bias may lead to either an over- or underestimation of the measures of inequality and the bias may be more explicit in older ages(17). It could be one of the reasons for the very high RIIs in East and Baltic Region, especially the outlier values observed in the Czech Republic among men. Similarly, it could explain the low RIIs among older males in the Baltic region. However Slovenia, one of the countries in the East region provided data from a census-linked mortality follow-up. We observed relatively low inequalities in overall mortality in Slovenia compared to the other populations in the East and Baltic region. However this was not the case for the alcohol-related mortality, indicating that the observed inequalities in alcohol-related mortality can not be totally attributed to a numerator-denominator bias. The next limitation is related to the identification and counting of the alcohol-related deaths. The use of the AAFs from one non-European population(7) instead of population specific AAFs (only available for some of the populations in the study but with non-identical definitions) may have caused an over/underestimation of the overall alcohol-related mortality but should not have affected the RII within a population. As the population alcohol-related mortality rate is used in the estimation of the SIIs, these estimates may be over or underestimated. A far more serious problem challenging the comparability of the alcohol-related mortality data between the different populations is the difference in certification and the differences in coding practices. Also the coding in Switzerland was done for the first period of follow-up period using the ICD8 followed by the ICD10, whereas in the other populations the ICD9 was used. Differences in certification may be influenced by many factors including the frequency of occurrence of the health problem, the level of acceptance of alcohol use in society which is different between the European populations. Next there is sufficient evidence of difference in coding practice between the populations within Europe, which may have affected the identification of alcohol-related deaths, especially as many alcohol-related deaths are defined at the 4^{th} digit of the ICD9 codes.

Alcohol-related mortality consists of a combination of different natural and external causes of death, part of which alcohol use is only one of the causes. The level of alcohol consumption in a population does not fully correspond to the level of overall alcohol-related mortality. The proportion of heavy drinking (more than 6 drinks a day) and especially the culture of binge drinking, the consumption of bad quality home-made spirits(18) and non-beverage alcohol(19) may be important to explain not only the alcohol-related mortality rate but also the inequality in alcohol-related mortality(20). This drinking pattern not only explains the high mortality rate due to alcohol-related disease and alcohol-related injuries in the East and Baltic region(21) but contributes to the high inequalities in these 2 regions and in some of the countries in the North such as Finland compared to the smaller inequalities in the South. Finland seems to take a particular position closer the East and Baltic region. It not only has relatively large RII and SII but also the contribution of the alcohol-related inequalities to the inequality in all causes of death is high in both genders.
It is possible that the lower educational group is more prone to heavy drinking and/or binge drinking and more frequently consumes home-made spirits of bad quality(18) or non-beverage alcohol(19), which would make them more susceptible to develop alcohol-related morbidity and consequently mortality(11). Another potential reason is that they attract other negative factors such as social isolation, negative life events, job loss, marital problems which are associated with problematic alcohol use(22). The fact that the percent contribution of alcohol to the overall inequality is substantial in both men and women and that it is larger (or as large) than could be expected from the proportional mortality indicates that next to the alcohol there may be an effect modification of additional risk factors more prevalent among in the lower socioeconomic groups. This may also explain why populations with low RII and low SII in alcohol-related mortality (e.g. in the South region) still may have an important proportion of the overall mortality inequality attributed to the alcohol inequalities.

Policy implications

Countries differ with respect to the magnitude of alcohol related mortality and the magnitude of the educational inequalities in alcohol-related mortality. In particular, these inequalities are in general relatively larger than the inequalities in overall mortality. The highest inequalities may not only be related to the amount of alcohol consumed but also to the way it is consumed, such as binge drinking. The focus of prevention should take this into account. Furthermore it may be important for public policy to consider, when making up the balance between positive and negative health outcomes related to alcohol that even in populations with relatively small relative and absolute inequalities in alcohol-related mortality, the proportion of the overall mortality difference by education that is attributable to alcohol can be very high.

Conclusion

There is a substantial variation in alcohol-related mortality in Europe. The educational inequalities in alcohol-related mortality are the highest in the East and Baltic region. The observation that the contribution of alcohol to the overall mortality inequality is also substantial in populations with small alcohol-related mortality differences challenges the claimed beneficial impact of alcohol on mortality.

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Table 1: Data sources: Population ages 30-79 years

Population	Type* of mortality data	Follow-up period	Person-years at risk	Number of deaths	Number of alcohol-related deaths	After exclusion of subjects without information on education: Person-years at risk	Number of deaths	Number§ of alcohol-related deaths	Number of deaths by alcohol-related diseases	Number of deaths by alcohol-related injuries or adverse effects
Males										
North										
Finland	Long	1990-2000	12396052	163292	15970	12396052	163292	15970	12324	3647
Sweden	Long	1991-2000	21421623	242768	14378	21152942	236064	13943	11094	2849
Norway	Long	1990-2000	10021675	130710	7328	9760879	127642	7032	5681	1351
Denmark	Long	1996-2000	6908468	83752	6941	6908468	83752	6941	5940	1001
Continental										
Belgium	Long	1991-1995	12243949	140880	9883	11540180	130371	8993	6226	2768
Switzerland	Long	1990-2000	12969989	154124	11145	12888332	153897	11118	8611	2507
South										
Turin	Long	1991-2001	2261968	30003	1559	2261968	30003	1559	1344	216
Basque C.	Long	1996-2001	2886317	24270	2048	2853912	23130	1941	1729	212
Madrid	Long	1996-1997	2080496	22943	1379	2011020	21459	1295	1227	69
Barcelona	Long	1992-2001	3714380	54450	3430	3690860	51135	3204	2964	240
East										
Slovenia	Long	1991-2000	4614864	62198	7975	4550888	61296	7858	6517	1341
Hungary	CS	1999-2002	10966876	220938	32140	10966876	219717	31975	28098	3876
Czech Rep	CS	1999-2003	13902315	203624	14867	13902315	203624	14867	12332	2534
Poland	CS	2001-2003	29901072	448511	32623	29254203	444749	32282	26803	5479
Baltic										
Lithuania	CS	2000-2002	2653992	49470	5463	2640696	48948	5360	3815	1544
Estonia	CS	1998-2002	1737920	37653	4488	1696830	36798	4302	3402	900
Females										
North										
Finland	Long	1990-2000	13478149	106940	5714	13478149	106940	5714	4422	1292
Sweden	Long	1991-2000	22116058	161383	6033	21889274	156974	5883	4634	1249
Norway	Long	1990-2000	10424746	87094	3216	10195888	85380	3138	2460	677
Denmark	Long	1996-2000	7087689	72729	3408	7087689	72729	3408	2647	762
Continental										
Belgium	Long	1991-1995	12874677	82630	4281	12143969	76073	3919	2636	1283
Switzerland	Long	1990-2000	15113931	101511	4783	15022255	101378	4771	3547	1224
South										
Turin	Long	1991-2001	2611141	20618	819	2611141	20618	819	670	148
Basque C.	Long	1996-2001	3016712	10330	501	2983500	9837	475	412	63
Madrid	Long	1996-1997	2363783	12480	509	2289784	11777	485	458	27
Barcelona	Long	1992-2001	4489610	32883	1445	4460950	30453	1347	1198	149
East										
Slovenia	Long	1991-2000	5158738	40898	3054	5096563	40261	3012	2496	516
Hungary	CS	1999-2002	12867900	152371	11656	12867900	151780	11612	9890	1722
Czech Rep	CS	1999-2003	15220330	144395	6734	15220330	144395	6734	5643	1091
Poland	CS	2001-2003	33459816	282943	11350	32824611	281344	11276	9673	1603
Baltic										
Lithuania	CS	2000-2002	3293748	31486	2039	3278652	31252	2016	1621	395
Estonia	CS	1998-2002	2224980	25384	1811	2176565	25120	1762	1525	237

*: Type: Long=longitudinal, CS=cross-sectional
§:Number may not be the sum of the mortality by alcohol-related disease and by alcohol-related injuries or adverse effects due to rounding

Table 2. Cause of Alcohol-related mortality: definition*

	ICD9	AAF§	AGE	Available ICD9 combination in data set	% of the ICD9 combination selected
Alcohol-related diseases					
Alcohol psychosis	291	1	≥ 0	303, 305.0	1
Alcohol dependence syndrome	303	1	≥ 0		1
Nondependent abuse of alcohol	305.0	1	≥ 0		1
Alcoholic cardiomyopathy	425.5	1	≥ 0	425.5	1
Alcoholic fatty liver	571.0	1	≥ 0	571.0-571.3 577.0-577.1	0.76
Acute alcoholic hepatitis	571.1	1	≥ 0		
Alcoholic cirrhosis of liver	571.2	1	≥ 0		
Alcoholic liver damage, unspecified	571.3	1	≥ 0		
Acute pancreatitis	577.0	0.42	≥ 35		0.22
Chronic pancreatitis	577.1	0.60	≥ 35		0.02
Accidental poisoning by alcohol, not elsewhere specified	E860	1	≥ 0	E860	1
Pulmonary and other respiratory tb	011-012	0.25	≥ 35	010-018, 137	0.80
Malignant neoplasm of lip, oral cavity, pharinx	140-149	0.50 m$ 0.40 f	≥ 35	140-150	0.50 m 0.48 f
Malignant neoplasm of esophagus	150	0.75	≥ 35		0.50 m 0.53 f
Malignant neoplasm of stomach	151	0.20	≥ 35	151	1
Malignant neoplasm of liver and intrahepatic bile ducts	155	0.15	≥ 35	155	1
Malignant neoplasm of larynx	161	0.50 m 0.40 f	≥ 35	161	1
Diabetes	250	0.05	≥ 35	250	1
Essential hypertension	401	0.08	≥ 35	401-405	0.55
Cerebrovascual disease	430-438	0.07	≥ 35	430-438	1
Pneumonie, influenza	480-487	0.05	≥ 35	480-487	1
Disease of the esophagus, stomach duodenum	530-537	0.1	≥ 35	531-534, 540-543, 550-553, 560	1
Cirrhosis of the liver without mention alcohol	571.5	0.5	≥ 35	Remaining (570-577)	0.70
Biliary chirrhosis	571.6	0.5	≥ 35		
Alcohol-related injuries or adverse effects					
Motor vehicle accident	E810-825	0.42	≥ 0	E800-E829	0.99
Pedal cycle and other road acc	E826-829	0.20	≥ 0		0.01
Watersport ac	E830-838	0.20	≥ 0	E830-E848	0.25
Air and space transport acc	E840-845	0.16	≥ 0		0.66
Accidental falls	E880-888	0.35	≥ 15	E880-E888	1
Suicide	E950-959	0.28	≥ 15	E950-E959	1
Homicide	E960-969	0.46	≥ 15	E960-E969	1
Other: E901 911 917-920 922	E901 911 917-920 922	0.25	≥ 15	Remaining E800-E999	0.15
Poisoning	E980			E980-E989	0.20
No data available on					
Alcoholic polyneuropathy	357.5	1	≥ 0		
Alcoholic gastritis	535.3	1	≥ 0		
Excess blood alcohol level	790.3	1	≥ 0		

*: Definition: State trends in alcohol problems 1979-1992. US Alcohol Epidemiologic data reference manual, vol 5. National Institute on Alcohol abuse and alcoholism, Rockville MD,1996
§: AAF: Alcohol-Attributable Fraction; $: m, f: male, female

Table 3. Age-standardised (to the Standard European population) mortality rates per 100000 person years at risk (MR) and Relative indices of inequality (RII) with 95% confidence interval (CI) for all causes mortality and alcohol-related mortality by gender in 16 European populations, ages 30-79 years.

			All causes			Alcohol-related			Alcohol-related diseases			Alcohol-related injuries or adverse effects		
	Population		MR	RII	95% CI	MR	RII	95% CI	MR	RII	95% CI	MR	RII	95% CI
Males	North	Finland	1398.11	2.15	(2.11-2.20)	131.84	2.79	(2.61-2.99)	102.25	2.88	(2.67-3.11)	29.59	2.53	(2.20-2.90)
		Sweden	934.72	1.70	(1.68-1.73)	62.08	2.40	(2.25-2.56)	49.00	2.58	(2.40-2.78)	13.08	1.83	(1.59-2.11)
		Norway	1152.60	1.96	(1.92-2.01)	70.20	2.75	(2.51-3.03)	57.00	2.85	(2.56-3.16)	13.19	2.42	(1.96-2.98)
		Denmark	1040.37	1.88	(1.83-1.93)	95.51	2.06	(1.87-2.26)	82.67	1.99	(1.80-2.20)	12.84	2.55	(1.98-3.29)
	Continental	Belgium	1028.60	1.94	(1.90-1.99)	77.95	1.96	(1.80-2.13)	53.54	1.97	(1.78-2.18)	24.41	1.97	(1.71-2.29)
		Switzerland	1058.18	2.10	(2.06-2.14)	81.72	3.25	(3.01-3.50)	62.94	3.65	(3.36-3.98)	18.78	2.14	(1.84-2.50)
	South	Turin	1138.91	1.60	(1.54-1.67)	60.72	2.65	(2.17-3.24)	51.80	3.04	(2.44-3.78)	8.92	1.26	(0.76-2.08)
		Basque C.	1217.83	1.37	(1.28-1.45)	81.55	2.18	(1.75-2.72)	74.23	2.13	(1.68-2.69)	7.33	2.73	(1.49-5.02)
		Madrid	1138.81	1.56	(1.48-1.65)	69.01	2.36	(1.87-2.98)	65.54	2.35	(1.85-2.99)	3.47	2.91	(1.09-7.78)
		Barcelona	713.43	1.58	(1.53-1.64)	63.82	2.68	(2.31-3.11)	56.29	2.72	(2.33-3.18)	7.54	2.35	(1.40-3.96)
	East	Slovenia	1514.66	2.34	(2.27-2.41)	184.84	4.91	(4.51-5.35)	154.17	5.08	(4.62-5.59)	30.67	4.21	(3.43-5.17)
		Hungary	1938.43	3.96	(3.89-4.03)	289.99	5.99	(5.71-6.29)	255.01	5.98	(5.68-6.30)	34.97	6.09	(5.31-7.00)
		Czech Rep	1442.09	5.65	(5.55-5.75)	105.72	8.58	(8.02-9.18)	87.75	9.04	(8.39-9.74)	17.97	6.63	(5.64-7.79)
		Poland	1565.10	2.71	(2.68-2.74)	111.81	4.53	(4.34-4.73)	93.25	4.32	(4.12-4.53)	18.56	5.72	(5.14-6.38)
	Baltic	Lithuania	1937.85	2.59	(2.49-2.68)	215.14	4.57	(4.06-5.16)	154.58	4.47	(3.88-5.14)	60.56	4.76	(3.79-5.98)
		Estonia	2177.77	2.27	(2.18-2.35)	260.53	3.39	(3.00-3.83)	206.24	3.41	(2.98-3.91)	54.29	3.28	(2.50-4.31)
Females	North	Finland	648.20	1.73	(1.68-1.78)	38.67	2.33	(2.06-2.63)	29.75	2.74	(2.38-3.17)	8.91	1.43	(1.13-1.82)
		Sweden	535.74	1.78	(1.74-1.82)	22.55	2.08	(1.87-2.31)	17.26	2.41	(2.14-2.72)	5.28	1.25	(1.00-1.56)
		Norway	628.17	1.90	(1.85-1.96)	25.41	2.05	(1.77-2.38)	19.96	2.38	(2.01-2.82)	5.45	1.24	(0.91-1.69)
		Denmark	673.17	1.91	(1.84-1.99)	37.47	1.93	(1.65-2.26)	31.21	2.00	(1.69-2.38)	6.26	1.63	(1.13-2.36)
	Continental	Belgium	509.24	1.72	(1.67-1.78)	29.55	1.46	(1.28-1.67)	19.45	1.63	(1.38-1.92)	10.10	1.22	(0.98-1.53)
		Switzerland	531.36	1.59	(1.55-1.64)	27.80	1.52	(1.35-1.70)	20.50	1.71	(1.49-1.95)	7.30	1.08	(0.86-1.35)
	South	Turin	594.21	1.26	(1.19-1.33)	24.02	1.55	(1.16-2.09)	19.41	1.85	(1.33-2.58)	4.61	0.77	(0.40-1.47)
		Basque C.	510.22	0.93	(0.84-1.04)	23.11	1.34	(0.80-2.25)	20.11	1.41	(0.79-2.49)	3.00	1.17	(0.33-4.10)
		Madrid	463.73	1.34	(1.23-1.47)	19.20	1.54	(0.99-2.40)	18.05	1.61	(1.01-2.55)	1.14	0.93	(0.18-4.90)
		Barcelona	268.74	1.42	(1.34-1.50)	13.62	1.82	(1.39-2.40)	11.61	1.94	(1.45-2.61)	2.01	1.30	(0.62-2.71)
	East	Slovenia	702.26	1.65	(1.58-1.72)	55.51	3.53	(3.04-4.10)	45.95	4.20	(3.56-4.96)	9.57	1.65	(1.17-2.32)
		Hungary	900.90	2.55	(2.48-2.62)	79.39	3.63	(3.31-3.98)	68.54	3.75	(3.39-4.14)	10.85	2.97	(2.32-3.79)
		Czech Rep	726.59	1.89	(1.85-1.93)	36.07	2.22	(2.01-2.45)	30.29	2.31	(2.07-2.58)	5.78	1.81	(1.42-2.31)
		Poland	692.30	2.03	(2.00-2.06)	29.13	2.73	(2.52-2.96)	24.86	2.76	(2.53-3.02)	4.27	2.56	(2.08-3.14)
	Baltic	Lithuania	759.86	2.69	(2.56-2.84)	57.38	4.40	(3.56-5.45)	45.57	4.32	(3.41-5.47)	11.81	4.64	(2.86-7.54)
		Estonia	872.10	1.97	(1.88-2.07)	75.07	3.72	(3.04-4.56)	64.30	3.71	(2.99-4.62)	10.77	3.73	(2.13-6.55)

Table 4a. Age standardised* all causes mortality and alcohol-related mortality rates per 100000 person years at risk by educational level and age among males in 16 European populations, ages 30-79 years.

			All causes	Alcohol-related			Alcohol-related diseases			Alcohol-related injuries or adverse effects		
Region	Population	Educational level	30-79	**30-79**	30-64	65-79	**30-79**	30-64	65-79	**30-79**	30-64	65-79
North	Finland	Low	1576.7	**160.1**	149.3	206.9	**124.5**	115.0	166.0	**35.6**	34.4	40.9
		Middle	1290.1	**129.4**	120.4	168.4	**99.7**	91.2	136.9	**29.6**	29.2	31.5
		High	926.8	**74.7**	59.8	139.4	**57.0**	45.2	108.3	**17.7**	14.6	31.0
	Sweden	Low	1059.7	**76.9**	63.2	136.3	**61.6**	49.0	116.2	**15.3**	14.2	20.1
		Middle	862.0	**57.2**	45.6	107.5	**44.6**	33.7	91.9	**12.6**	11.9	15.6
		High	643.4	**32.9**	21.3	82.9	**24.1**	13.8	68.7	**8.7**	7.5	14.2
	Norway	Low	1395.7	**94.8**	77.2	171.2	**77.4**	62.1	143.3	**17.5**	15.1	27.8
		Middle	1076.7	**65.5**	48.0	141.4	**53.2**	37.8	119.9	**12.4**	10.3	21.5
		High	802.0	**40.2**	24.7	107.4	**31.4**	17.9	90.2	**8.7**	6.8	17.2
	Denmark	Low	1212.0	**115.7**	98.7	189.4	**99.1**	83.3	167.8	**16.6**	15.5	21.6
		Middle	1004.0	**94.8**	74.7	181.9	**83.4**	64.8	164.0	**11.4**	9.9	18.0
		High	712.5	**59.0**	41.2	136.1	**50.2**	34.3	119.2	**8.8**	6.9	16.9
Continental	Belgium	Low	1106.4	**84.1**	69.1	148.9	**57.2**	43.3	117.5	**26.9**	25.8	31.4
		Middle	865.8	**67.6**	55.3	120.7	**46.3**	34.5	97.6	**21.2**	20.8	23.1
		High	688.8	**52.3**	37.7	115.5	**35.8**	22.6	92.9	**16.5**	15.1	22.6
	Switzerland	Low	1423.0	**129.8**	106.0	232.7	**102.8**	81.4	195.8	**26.9**	24.7	36.8
		Middle	1025.2	**77.9**	59.6	157.3	**59.9**	43.7	130.2	**18.0**	15.9	27.0
		High	764.2	**49.4**	34.6	113.5	**34.6**	22.0	89.3	**14.7**	12.6	24.3
South	Turin	Low	1224.1	**69.2**	43.4	181.0	**59.6**	36.5	159.9	**9.5**	6.9	21.1
		Middle	968.6	**43.8**	23.5	131.8	**35.1**	18.1	108.8	**8.7**	5.4	23.0
		High	827.1	**34.1**	14.6	118.6	**27.7**	10.2	103.5	**6.5**	4.4	15.2
	Basque C.	Low	1250.8	**88.3**	66.3	183.8	**81.0**	59.5	173.9	**7.4**	6.8	9.9
		Middle	910.3	**53.6**	37.7	122.4	**48.5**	32.9	116.1	**5.1**	4.8	6.3
		High	975.3	**52.9**	32.2	143.0	**48.4**	28.4	135.0	**4.5**	3.8	8.0
	Madrid	Low	1200.6	**75.0**	50.6	199.7	**70.8**	46.8	193.8	**4.1**	3.8	5.9
		Middle	1064.2	**65.9**	40.4	196.4	**63.4**	38.2	192.2	**2.5**	2.2	4.2
		High	845.9	**38.6**	21.1	128.3	**36.5**	19.1	125.3	**2.2**	2.0	3.1
	Barcelona	Low	730.0	**67.5**	46.7	157.7	**59.1**	38.8	147.2	**8.4**	7.9	10.5
		Middle	679.5	**51.1**	34.2	124.2	**45.0**	28.6	116.5	**6.1**	5.7	7.8
		High	555.5	**39.2**	21.5	116.0	**34.7**	16.6	113.2	**4.5**	4.9	2.8
East	Slovenia	Low	1871.4	**270.5**	227.3	457.7	**226.3**	187.0	396.7	**44.2**	40.3	61.0
		Middle	1357.4	**147.5**	113.1	296.3	**122.5**	91.7	255.8	**25.0**	21.4	40.4
		High	905.1	**59.7**	36.6	159.7	**47.3**	26.0	139.7	**12.4**	10.7	20.0
	Hungary	Low	2317.8	**365.1**	331.0	539.6	**321.8**	292.9	469.8	**43.3**	38.1	69.7
		Middle	1301.7	**178.0**	162.0	259.7	**155.0**	140.8	227.7	**23.0**	21.2	31.9
		High	896.8	**95.4**	76.2	193.5	**84.4**	68.0	168.2	**11.0**	8.2	25.3
	Czech Rep.	Low	1779.3	**136.3**	109.9	271.7	**113.7**	90.2	233.6	**22.7**	19.7	38.1
		Middle	947.9	**61.7**	45.8	143.0	**50.6**	36.4	123.1	**11.1**	9.4	19.8
		High	621.5	**36.0**	25.1	91.5	**27.5**	18.1	75.9	**8.4**	7.1	15.6
	Poland	Low	1922.1	**146.9**	126.4	251.4	**121.9**	102.0	223.7	**25.0**	24.5	27.7
		Middle	1072.5	**66.9**	51.3	146.5	**56.8**	41.8	133.6	**10.1**	9.5	12.9
		High	731.0	**37.6**	25.1	101.4	**31.1**	19.5	90.6	**6.4**	5.6	10.7
Baltic	Lithuania	Low	2749.4	**390.3**	402.7	327.0	**278.5**	281.0	265.4	**111.9**	121.7	61.7
		Middle	1764.6	**188.2**	178.9	235.8	**132.3**	120.5	192.8	**55.9**	58.5	43.0
		High	986.7	**76.2**	63.7	140.0	**55.1**	42.6	119.0	**21.1**	21.1	21.1
	Estonia	Low	2816.9	**377.7**	381.7	357.4	**298.9**	297.8	304.4	**78.8**	83.9	53.0
		Middle	2148.4	**248.4**	236.3	310.3	**195.3**	180.2	272.8	**53.1**	56.1	37.5
		High	1137.7	**100.5**	87.0	169.5	**77.7**	63.2	151.7	**22.8**	23.7	17.8

*: reference: Standard European Population

Table 4b. Age standardised* all causes mortality and alcohol-related mortality rates per 100000 person years at risk by educational level and age among females in 16 European populations, ages 30-79 years.

			All causes	Alcohol-related			Alcohol-related diseases			Alcohol-related injuries or adverse effects		
Region	Country	Educational level	30-79	**30-79**	30-64	65-79	**30-79**	30-64	65-79	**30-79**	30-64	65-79
North	Finland	Low	716.8	**47.7**	39.8	82.1	**37.4**	30.6	66.9	**10.3**	9.2	15.2
		Middle	565.0	**33.9**	26.0	68.1	**25.0**	18.6	52.9	**8.8**	7.4	15.2
		High	486.0	**27.2**	19.2	61.6	**19.5**	13.1	47.3	**7.7**	6.2	14.2
	Sweden	Low	608.8	**27.9**	21.5	55.4	**21.8**	15.8	47.9	**6.1**	5.8	7.5
		Middle	485.5	**21.0**	15.1	46.8	**15.7**	10.4	38.6	**5.3**	4.7	8.2
		High	371.9	**14.0**	8.9	36.0	**9.5**	5.1	28.8	**4.5**	3.9	7.3
	Norway	Low	738.7	**32.1**	23.6	69.0	**26.0**	19.2	55.9	**6.1**	4.5	13.2
		Middle	552.3	**23.2**	15.3	57.5	**18.0**	11.7	45.6	**5.2**	3.7	11.9
		High	440.1	**16.5**	9.3	47.7	**11.7**	5.4	38.9	**4.8**	3.9	8.8
	Denmark	Low	762.6	**43.8**	35.6	79.4	**36.6**	29.9	65.7	**7.2**	5.7	13.7
		Middle	590.5	**35.1**	26.2	74.0	**30.1**	22.4	63.3	**5.1**	3.8	10.7
		High	490.3	**26.6**	18.9	59.9	**20.5**	14.6	46.2	**6.1**	4.4	13.7
Continental	Belgium	Low	529.2	**30.4**	23.3	61.1	**19.9**	13.9	45.7	**10.5**	9.4	15.4
		Middle	418.8	**26.1**	20.3	51.2	**17.4**	13.0	36.6	**8.7**	7.4	14.6
		High	390.5	**24.7**	18.8	50.0	**14.7**	10.0	34.9	**10.0**	8.8	15.2
	Switzerland	Low	598.4	**31.8**	24.0	65.9	**24.3**	17.9	51.7	**7.6**	6.0	14.3
		Middle	472.4	**25.5**	18.9	54.3	**18.4**	13.2	40.7	**7.2**	5.7	13.6
		High	427.9	**22.6**	15.9	51.7	**15.1**	10.1	36.5	**7.5**	5.8	15.2
South	Turin	Low	610.3	**25.2**	13.3	76.7	**20.8**	10.9	63.6	**4.5**	2.5	13.1
		Middle	529.5	**17.7**	8.2	58.6	**13.8**	5.5	49.7	**3.9**	2.8	8.8
		High	480.8	**18.7**	11.4	50.5	**13.1**	6.9	39.9	**5.6**	4.4	10.5
	Basque C.	Low	490.9	**22.8**	12.3	68.2	**20.0**	10.2	62.3	**2.8**	2.1	5.8
		Middle	362.5	**14.8**	7.8	45.2	**12.2**	5.5	41.2	**2.6**	2.2	4.0
		High	439.2	**17.7**	10.1	50.6	**15.4**	8.0	47.6	**2.2**	2.1	3.0
	Madrid	Low	469.6	**19.6**	9.9	69.2	**18.5**	9.1	66.5	**1.1**	0.7	2.7
		Middle	410.9	**15.2**	7.5	54.4	**14.4**	7.1	51.8	**0.8**	0.4	2.6
		High	363.2	**14.6**	10.1	37.7	**13.5**	9.0	36.7	**1.1**	1.1	1.0
	Barcelona	Low	260.2	**13.5**	8.5	34.9	**11.5**	7.0	31.2	**2.0**	1.5	3.7
		Middle	267.2	**10.5**	9.0	16.9	**8.7**	7.4	14.5	**1.8**	1.6	2.3
		High	247.5	**10.5**	6.6	27.5	**9.5**	6.0	24.3	**1.1**	0.6	3.1
East	Slovenia	Low	758.4	**68.1**	51.7	139.2	**57.7**	44.0	117.0	**10.4**	7.7	22.2
		Middle	603.9	**37.4**	26.0	86.9	**29.8**	20.2	71.5	**7.6**	5.8	15.4
		High	487.3	**26.0**	14.5	75.8	**17.1**	7.0	60.5	**9.0**	7.5	15.2
	Hungary	Low	1011.1	**96.2**	82.6	166.1	**83.5**	73.5	134.7	**12.7**	9.0	31.4
		Middle	633.5	**54.4**	45.9	97.5	**46.8**	40.5	79.3	**7.6**	5.5	18.2
		High	619.8	**38.6**	27.3	96.4	**32.6**	24.4	74.3	**6.1**	2.9	22.0
	Czech Rep.	Low	797.3	**41.4**	27.3	113.5	**35.0**	23.0	96.1	**6.5**	4.3	17.5
		Middle	580.8	**26.7**	15.1	86.2	**21.9**	12.2	71.3	**4.8**	2.9	14.9
		High	363.3	**17.0**	10.3	51.0	**13.8**	8.3	42.0	**3.2**	2.0	9.0
	Poland	Low	803.5	**36.3**	24.8	95.1	**30.9**	20.4	84.7	**5.3**	4.4	10.4
		Middle	542.9	**21.5**	13.9	60.1	**18.3**	11.4	53.4	**3.2**	2.6	6.7
		High	401.8	**13.9**	7.5	46.5	**10.9**	5.6	38.2	**2.9**	1.9	8.3
Baltic	Lithuania	Low	1184.2	**128.8**	130.3	121.0	**98.7**	97.7	103.5	**30.1**	32.6	17.5
		Middle	618.0	**48.5**	43.7	73.3	**37.7**	32.8	62.6	**10.9**	10.9	10.7
		High	411.5	**23.1**	17.3	52.8	**17.8**	13.0	41.9	**5.4**	4.3	10.9
	Estonia	Low	1216.8	**137.9**	137.8	138.1	**117.4**	116.2	123.3	**20.5**	21.6	14.7
		Middle	851.2	**71.3**	62.9	114.5	**60.9**	52.8	102.6	**10.4**	10.1	11.9
		High	525.7	**28.4**	20.9	66.4	**23.8**	16.8	59.5	**4.6**	4.1	6.9

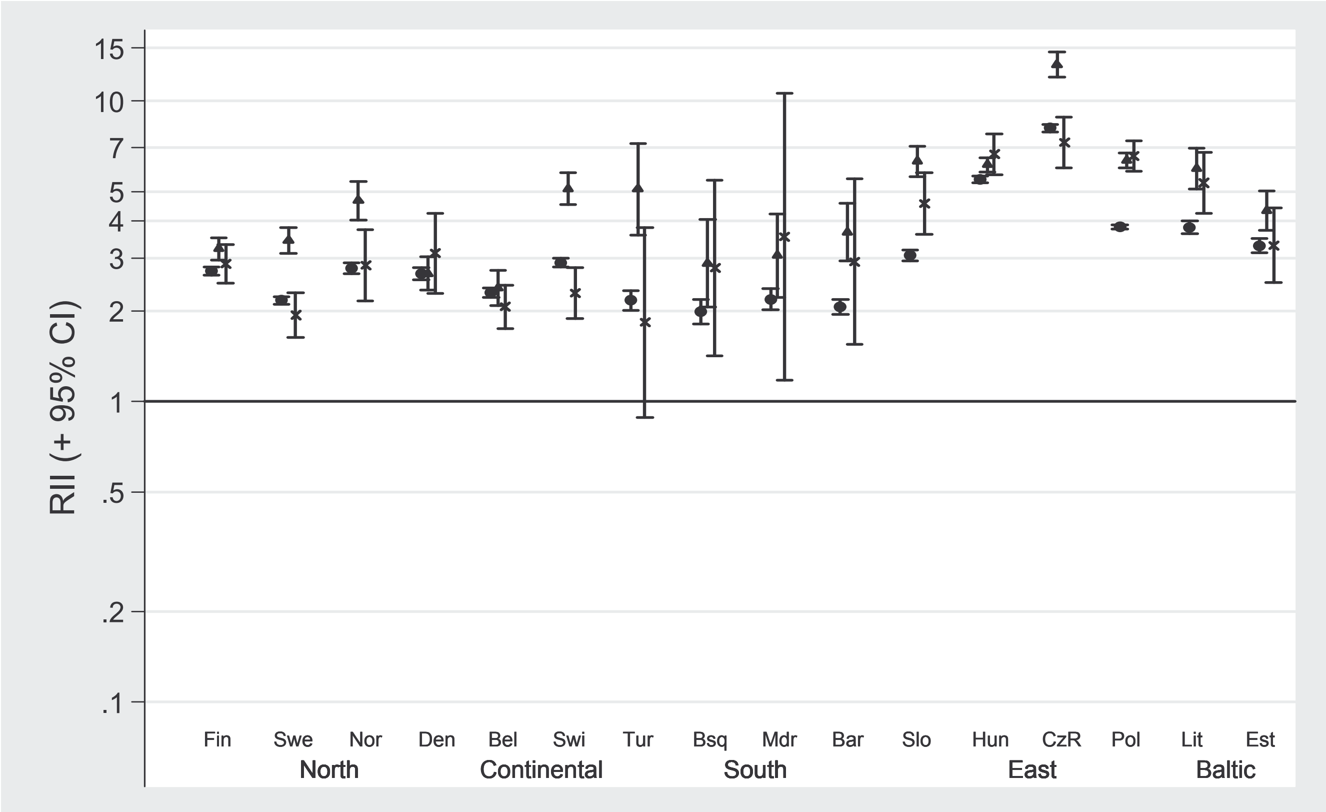
*: reference: Standard European Population

Table 5. The Slope indices of inequality (SII) per 100000 for alcohol-related mortality and % contribution to the absolute educational difference in all causes mortality rates by gender in 16 European populations, ages 30-79 years

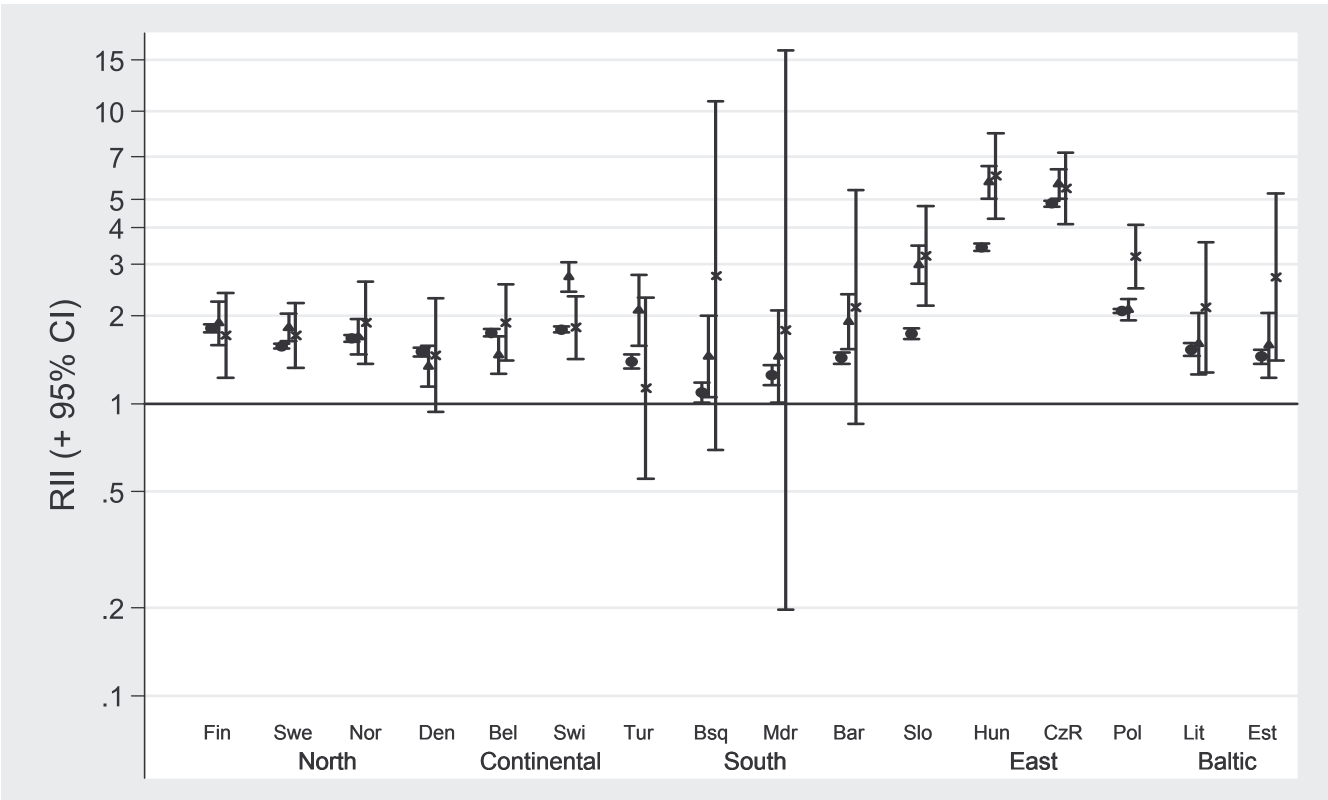
		All causes	Alcohol-related		Alcohol-related diseases		Alcohol-related injuries or adverse effects	
Population		SII	SII	%	SII	%	SII	%
Males								
North	Finland	1020.84	124.53	12.20	99.09	9.71	25.65	2.51
	Sweden	484.67	51.12	10.55	43.25	8.92	7.67	1.58
	Norway	747.63	65.52	8.76	54.78	7.33	10.95	1.46
	Denmark	635.78	66.17	10.41	54.74	8.61	11.21	1.76
Continental	Belgium	657.74	50.56	7.69	34.97	5.32	15.94	2.42
	Switzerland	750.97	86.53	11.52	71.74	9.55	13.64	1.82
South	Turin	525.65	54.9	10.44	52.31	9.95	2.05	0.39
	Basque C.	380.25	60.52	15.92	53.6	14.10	6.8	1.79
	Madrid	498.23	55.87	11.21	52.82	10.60	3.39	0.68
	Barcelona	320.77	58.27	18.17	52.05	16.23	6.08	1.90
East	Slovenia	1215.36	244.58	20.12	206.91	17.02	37.79	3.11
	Hungary	2313.61	414.03	17.90	363.88	15.73	50.21	2.17
	Czech Rep	2016.76	167.3	8.30	140.54	6.97	26.52	1.31
	Poland	1442.76	142.74	9.89	116.39	8.07	26.07	1.81
Baltic	Lithuania	1716.54	275.78	16.07	196.12	11.43	79.06	4.61
	Estonia	1691.60	283.68	16.77	225.41	13.33	57.84	3.42
Females								
North	Finland	346.66	30.89	8.91	27.68	7.98	3.15	0.91
	Sweden	300.63	15.81	5.26	14.27	4.75	1.17	0.39
	Norway	389.90	17.50	4.49	16.3	4.18	1.17	0.30
	Denmark	421.02	23.79	5.65	20.81	4.94	3	0.71
Continental	Belgium	269.60	11.05	4.10	9.32	3.46	2	0.74
	Switzerland	242.09	11.47	4.74	10.74	4.44	0.56	0.23
South	Turin	136.72	10.36	7.58	11.58	8.47	-1.2	-0.88
	Basque C.	-37.01	6.72	-18.16	6.84	-18.48	0.47	-1.27
	Madrid	134.76	8.16	6.06	8.44	6.26	-0.08	-0.06
	Barcelona	93.28	7.92	8.49	7.42	7.95	0.52	0.56
East	Slovenia	344.50	62.00	18.00	56.55	16.42	4.69	1.36
	Hungary	786.70	90.19	11.46	79.36	10.09	10.77	1.37
	Czech Rep	447.52	27.33	6.11	23.98	5.36	3.33	0.74
	Poland	470.67	27.02	5.74	23.27	4.94	3.74	0.79
Baltic	Lithuania	696.02	72.26	10.38	56.88	8.17	15.24	2.19
	Estonia	569.65	86.52	15.19	73.99	12.99	12.43	2.18

Figure 1a. Relative indices of inequality (and 95% CI) for all cause mortality and alcohol-related mortality among males in 16 European populations, ages 30-64 and 65-79 years

Ages 30-64 years

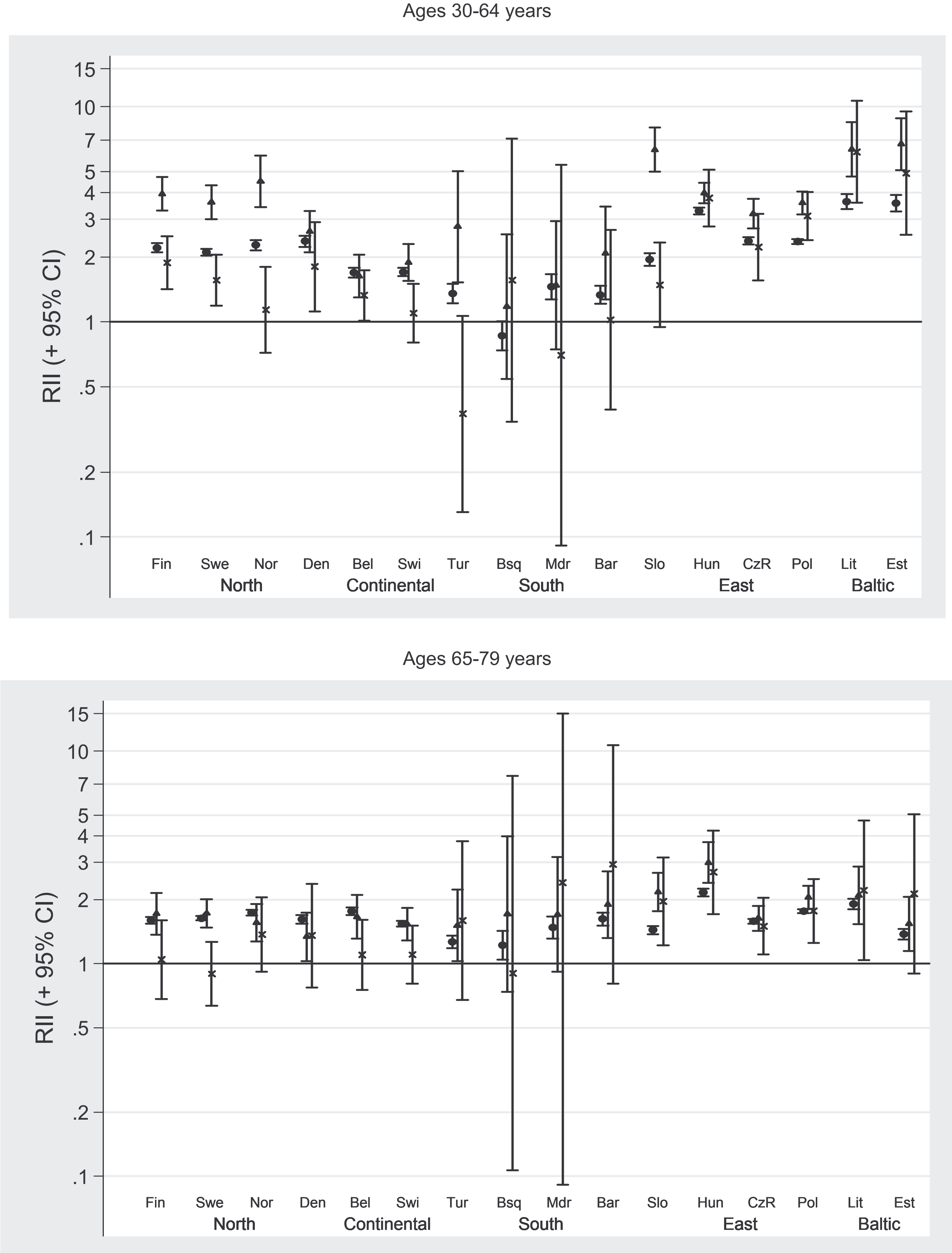


Ages 65-79 years



●: All causes mortality ▲ : Alcohol-related disease ×: Alcohol-related injuries or adverse effects

Figure 1b. Relative indices of inequality (and 95% CI) for all cause mortality and alcohol-related mortality among females in 16 European populations, ages 30-64 and 65-79 years



•: All causes mortality ▲ : Alcohol-related disease ×: Alcohol-related injuries or adverse effects

Chapter 7

Socio-economic inequalities in alcohol related cancer mortality among men: to what extent do they differ between Western European populations?

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Abstract

We aim to study socioeconomic inequalities in alcohol related cancers mortality (upper aero-digestive tract (UADT) (oral cavity, pharynx, larynx, oesophagus) and liver) in men and to investigate whether the contribution of these cancers to socioeconomic inequalities in cancer mortality differs within Western Europe. We used longitudinal mortality datasets including causes of death. Data were collected during the 1990s among men aged 30-74 years in 13 European populations (Madrid, the Basque region, Barcelona, Turin, Switzerland (German and Latin part), France, Belgium (Walloon and Flemish part, Brussels), Norway, Sweden, Finland). Socioeconomic status was measured using the educational level declared at the census at the beginning of the follow-up period. We conducted Poisson regression analyses and used both relative (Relative index of inequality (RII)) and absolute (mortality rates difference) measures of inequality. For UADT cancers, the RII's were above 3.5 in France, Switzerland (both parts) and Turin whereas for liver cancer they were the highest (around 2.5) in Madrid, France and Turin. The contribution of alcohol related cancer to socioeconomic inequalities in cancer mortality was 29-36% in France and the Spanish populations, 17-23% in Switzerland and Turin, and 5-15% in Belgium and the Nordic countries. We did not observe any correlation between mortality rates differences for lung and UADT cancers, confirming that the pattern found for UADT cancers is not only due to smoking. This study suggests that alcohol use substantially influences socioeconomic inequalities in male cancer mortality in France, Spain and Switzerland but not in the Nordic countries and nor in Belgium.

Introduction

Alcohol drinking is an important determinant for many causes of death, including cancer [1, 2]. In many populations, a strong association is observed between socioeconomic position and alcohol related mortality with higher mortality among subjects with a low socioeconomic position [3-5]. With regards to mortality from specific cancers related to alcohol use (liver, larynx, oral cavity, pharynx, oesophagus), however, variations in the level of socioeconomic inequalities among men are found between European populations. Large inequalities are found in Spain and Italy and, especially, in France [6-10]. On the contrary, some studies have suggested small socioeconomic inequalities in the Nordic countries and Switzerland [10-12].

Nevertheless, the literature is rather scarce and a European overview of differences in socioeconomic inequalities in alcohol related cancers is currently lacking. It would be of interest to document the true extent of the problem within Europe. Contrary to smoking [13], the role of alcohol in socioeconomic inequalities in cancer mortality has not yet been evaluated but may also be important. In addition, a comparison between European populations would show whether different patterns in socioeconomic inequalities in alcohol-related cancers are found within Europe and whether these patterns could be related to different drinking cultures. Differences in national levels of alcohol related cancers mortality rates are found between Western European countries, with substantially higher rates in Spain and Italy, and especially in France [14]. In addition, different drinking cultures are observed in Western Europe between countries but also within some countries. Daily wine consumption especially during meal is more common in countries like Spain, Portugal, Italy or France or in the Latin part of Switzerland whereas binge drinking and beer consumption is more widespread in the UK, the Nordic countries and the German part of Switzerland [15-17].

The aim of this study was to investigate differences in socioeconomic inequalities in alcohol-related cancers mortality between Western European populations. Our dataset included longitudinal studies from 13 populations from South to North of Western Europe with information on causes of death. We included populations with contrasted situations with regards to overall levels of alcohol related cancers mortality rates and drinking cultures.

We will first investigate socioeconomic inequalities among men in alcohol related cancers mortality, and thereby distinguish liver and upper aerodigestive tract (UADT) cancers. We will then focus on the contribution of alcohol related cancers to socioeconomic inequalities in mortality from all cancers types together. As UADT cancers are also smoking related, we will finally study lung cancer as an indicator of the smoking situation in each population and evaluate to which degree the international patterns of inequalities in UADT cancers are correlated with those for lung cancer.

Material and methods

Longitudinal data from 13 European populations were used, including Madrid, the Basque region (Spanish part), Barcelona, Turin, Switzerland (Latin and German part), France, Belgium (Brussels, Walloon and Flemish part), Sweden, Norway and Finland. Most datasets covered the entire national population, except for France (a representative sample of 1% of the population), Madrid and Basque region (regions), Barcelona and Turin (urban areas). In Belgium and Switzerland, we distinguished regions with differences in alcohol consumption and drinking patterns that could induce differences in socioeconomic inequalities in alcohol related cancers. Men were selected at the time of the population census and followed up during the 1990s (Table 1).

Analyses included men aged 30-74 at the census. The follow-up period was shorter for Belgium, Madrid and the Basque region. In order to have results on comparable ages in terms of observed ages at death, analyses for these three populations were conducted on slightly older age groups at baseline (35-79 for Madrid and 30-79 for Belgium and the Basque region).

The linkage between census data and mortality registries was achieved for more than 96% of all deceased persons in all populations except for Madrid (70%), the Basque region (93%) and Barcelona (94.5%). In these latter populations, however, no variation in this percentage was found according to age, sex or socioeconomic position (except in the Basque region for the latter factor). In order to avoid an underestimation of absolute mortality rates in these three populations, observed absolute mortality were increased by correction factors (1/0.70, 1/0.93 and 1/0.945 respectively).

The socioeconomic position (SEP) was measured with education declared at the time of the population census. This variable was categorized into three classes that corresponded to the ISCED (International Standard Classification of Education) classification: 0-2 (lower secondary education or less), 3-4 (upper secondary education), 5-6 (post-secondary education). The percentage of missing values for education was of 17% in Brussels, 5% in the Walloon and Flemish parts of Belgium and less than 3% for all other populations. These subjects were excluded from the analysis.

The cause of death was obtained by linkage with death registries. Analyses were conducted for all cancer mortality (ICD 9: 140-249), for lung cancer (ICD 9: 162-3, 165), and for alcohol related cancers: UADT (that groups oral cavity, pharynx, esophagus and larynx (ICD 9: 140-50, 161)) and liver (ICD 9: 155). UADT and liver cancer were selected for analyses because they are strongly associated with alcohol consumption [1, 18] and because they presented a substantial population attributable fraction (PAF) for alcohol (20-40% for UADT and 32% for liver [1, 19]). Lung cancer was selected as an indicator for the cumulative exposure of the population to smoking. This approach is considered to be acceptable, although lung cancer mortality is only an approximate indicator [20].

The magnitude of socioeconomic inequalities in mortality was estimated in both absolute and relative terms. To estimate relative inequalities, we computed relative indices of inequality (RII) using Poisson regression. The calculation of the RII is based on a ranked variable, which specifies for each educational group the mean proportion of the population with a higher level of education. For instance, the rank of the lowest educational group is calculated as the proportion of the population with middle or high education, plus half of the proportion of the population with a lowest educational level. The RII is then computed by regressing the mortality on this ranked variable. Thus, the RII expresses inequality within the whole socioeconomic continuum. It can be interpreted as the ratio of mortality rates between the two extremes of the educational hierarchy. As it takes into account the size and relative position of each educational group, it is well adapted to compare populations with different educational distributions [21, 22].

To estimate absolute socioeconomic inequalities we computed absolute rate differences between the lowest and the highest educational level, both for all cancer mortality and for the specific cancer types. Age-standardized mortality rates were computed, using the population of EU-15 plus Norway of 1995 as the standard population. The contribution of these different cancer types to socioeconomic inequalities in all cancer mortality was also calculated by expressing the rate difference for this cancer type as a percentage of the rate difference for all cancer mortality.

Results

The educational distributions highly differed between the populations (Table 1). The percentage of subjects with lower secondary education or less was the highest in the three Spanish populations and Turin (around 65%) and the lowest in Norway (less than 30%) and Switzerland (around 20%).

For UADT and liver cancers, we observed a regular inverse gradient in cancer mortality, with higher cancer rates for lower educational levels (Graph 1). Differences were found between populations and the situation is remarkable in France with the highest mortality rate among men with lower secondary education or less and among the lowest mortality rate among men with post-secondary education.

For UADT cancers, the largest RII’s (above 3.5) were observed in France, Switzerland (German and Latin part), and Turin (Table 2). The RII was lower than 2 but still significant in Belgium. For liver cancer, the largest RII’s (above 2.5) were found in Madrid, France and Turin. In contrast, the RII was around 1 and non-significant in the Basque region, Belgium and Norway. For lung cancer, the largest RII’s (around 3 or above) were observed in Finland, Belgium and the German part of Switzerland. They were lower than 2 but still significant in the Spanish populations and France.

Absolute mortality rate differences by cancer site are presented in Graph 2. The most striking result is the large range of mortality rates differences found for UADT cancers: from 7 in Sweden to 78 per 100000 person years in France. It was between

20 and 40/100000 in the Spanish populations and Switzerland (German part) and 46 in Switzerland (Latin part). The contribution of these cancer sites to socioeconomic inequalities is presented in Table 3. The contribution of UADT cancers was the highest in France, Barcelona and the Basque region, (around 25%), followed by the Latin part of Switzerland and Madrid (20%). The contribution of liver cancer was much lower. However, we observed differences between populations with the largest contribution in Madrid (15%) and also a substantial contribution in France, Barcelona and Turin (9%) whereas it was lower than 6% in all other populations. All in all, the contribution of alcohol related cancer to socioeconomic inequalities in cancer mortality was 29-36% in France and the Spanish populations, 17-23% in the Swiss regions, and Turin, and 5-15% in Belgium and the Nordic countries.

We do not observe a correlation between absolute inequalities for lung and UADT cancers (graph 3). Populations with the largest inequalities in lung cancer are not those with the largest inequalities in UADT cancers. Belgium shows large rate difference for lung cancer but small difference for UADT cancers. The rate difference for UADT cancers is similar in Madrid and the German part of Switzerland, whereas the rate difference for lung cancer is two times lower in Madrid. France shows particularly high difference for UADT cancers but only a medium rate difference for lung cancer. Also in terms of relative inequalities (RII's), there is no correlation between mortality rates differences for lung and UADT cancers (see Table 2).

Discussion

This study focused on differences between Western European populations with regards to socioeconomic inequalities in alcohol related cancer mortality. Large differences were found. Inequalities were largest in Spain, Switzerland and France and smallest in the Nordic countries and Belgium. In France, socioeconomic inequalities were remarkably large for UADT cancers. The contribution of alcohol-related cancers to socioeconomic inequalities in cancer mortality was high in France, Madrid and Barcelona (35%) compared to small (less than 5-15%) in Belgium and the Nordic countries. The lack of correlation between the inequalities found for lung and UADT cancers suggested that, even though smoking is a major risk factor for UADT cancers, large inequalities in UADT cancers were also due to other factors, probably alcohol drinking.

Evaluation of data

There are differences in the follow-up periods. Given the shorter follow-up period in Madrid, the Basque region and Belgium, we changed the age range at baseline for these populations such that studies were similar in terms of average at death. However, subjects may be slightly older or younger in these populations compared with others. This could have resulted in a slight under-estimation of relative socioeconomic inequalities and over-estimation of absolute inequalities for these populations. Nevertheless, these effects, if any, are likely to be small.

Some differences were found in the populations covered. In France and Switzerland, foreigners were excluded and analyses were thus conducted for more homogeneous populations. Perhaps the exclusion of foreigners has lead to underestimation of inequalities in alcohol-related cancers mortality in these countries. A large part of migrants, at least in France, come from Muslims countries and often do not drink alcohol for religious reasons [23]. In France, they generally have low levels of UADT cancers mortality. For liver cancer, on the other hand, mortality rates among migrants are higher than in the native population but the etiology is different (due to Hepatitis B or C infection) [24-26].

Differences could occur between populations in the coding of causes of death. Even though data came from countries with reliable cause-of-death registries, national diagnosing practices may differ between countries. International comparisons revealed that more deaths were classified as cancer deaths in France than in other countries, probably leading to an over-estimation of the French cancer mortality rates [27, 28]. This bias could be a serious issue for absolute measures of inequalities, especially if it occurs more for some cancer sites (for instance UADT in France). With regards to relative measures of inequalities, our results would be biased only if diagnosing practices differ by socioeconomic position of the deceased, and if this applies especially to some cancer sites. There is no evidence to support this hypothesis.

In addition, there is a specific problem related to liver cancer mortality rates because of frequent misclassification of metastases as primary cancers. An American study suggested that between 27 and 31% of liver cancer deaths were due to metastases or secondary cancers instead of primary cancers [29]. The results relating to liver cancer should therefore be considered cautiously. Unfortunately, no study investigated the potential association between socioeconomic position and misclassification as well as possible variations between countries. If the rate of misclassification does not differ by socioeconomic position, this problem would impact on absolute inequalities but not on relative inequalities.

Socioeconomic status was measured using information on educational level. We used a common classification for all populations that should avoid problems with the comparability between educational systems of different countries. However, large differences were observed between populations in the educational distributions. Part of these differences may be due to real differences in educational levels. But we cannot rule out the possibility that there are differences in the way in which educational systems are being squeezed into this common classification. However these differences probably have a weak influence on the results found here. We evaluated the sensitivity of the results to alternative educational classifications. In one type of analyses, for example, we used a classification into 4 educational levels by distinguishing between men who completed lower secondary education from men with primary education only. We also considered another classification in 3 educational levels in order to get population distributions that were as similar as possible between populations. The results obtained with these alternative classifications were quite similar to those presented here.

Several European countries were not included in this analysis. We did not include any country from Eastern Europe because of lack of longitudinal mortality studies.

We also did not include the UK since British data were not accessible for small causes of death because of confidentiality rules. In the UK, a low contribution of non-lung cancers to socioeconomic inequalities in all cancer mortality was found in the 1980s [30] whereas this contribution was comparable to that of lung cancer in another study conducted in the 1990s [31].

Possible explanations of the results

Socioeconomic inequalities in the distribution of risk factors may largely explain the results. Smoking is a major risk factor for both lung and UADT cancers; the PAF for smoking for UADT cancers is indeed around 70%,. Therefore, smoking may potentially explain a large part of the observed inequalities in UADT mortality. Nevertheless, smoking alone cannot fully explain the international patterns in inequalities. The differences in inequalities in UADT cancer between countries with comparable inequalities in lung cancer mortality, especially between northern and southern countries, point to the effect of other factors. Given the high PAF found for alcohol (between 20 and 40%) [1, 19] for UADT cancers, alcohol consumption is certainly one of those factors.

Consequently, variations in drinking patterns between European populations may partly explain our results. It is unlikely that the type of alcohol accounts for the differences observed as the type of alcohol consumed does not seem to have an effect on risk of UADT cancers [32, 33]. Differences in socioeconomic inequalities in the total amount of alcohol consumed may be the critical factor. In general, excessive alcohol consumption is found to be higher in men with low socioeconomic position, although results differ according to the country. No inequalities in high alcohol consumption are observed in Belgium [34] and inequalities are consistently reported for France [35, 36]. A European study suggested that France was the country with the largest inequalities, but only for excessive consumption (more than 6 drinks per day) [34]. Some studies do not report inequalities in Northern Italy [37] or Barcelona [38], whereas a European study observed inequalities in Spain, but only for excessive consumption [34]. In Sweden, higher alcohol consumption was found among non-manual workers in the 1970s, but an equalization of the social differences in heavy drinking and a tendency to reversal were observed in later years [39]. In Norway, higher alcohol consumption was observed in the upper education and income groups [40]. Thus, even though the literature is not totally consistent, it is globally in accordance with our findings.

With regards to absolute inequalities, the absolute level of consumption has also to be taken into account. It is higher in France, Spain, Switzerland, Italy followed by Belgium and lower in Finland and especially low in Sweden and Norway [41]. France thus presents a combination of both high level of alcohol consumption and relatively large inequalities in this consumption, followed by Spain. This may explain the largest absolute inequalities found in these populations.

We distinguished in Belgium and Switzerland different regions that could have relevant differences in drinking cultures. Whereas alcohol related cancer mortality rates gave a consistent “cultural” pattern with higher rates in the Walloon part of Belgium and especially in the Latin part of Switzerland, we observed in these regions only a slightly higher contribution of alcohol related cancers to inequalities in total cancer mortality. Few studies have been conducted on drinking pattern by linguistic region. They found no clear variations in Belgium [42] but higher daily and wine consumption in the Latin part of Switzerland compared to the German part [17]. Our results for Belgium and Switzerland are thus globally consistent with these studies and with our results found in the bordering countries. However, we could have expected more pronounced differences between linguistic regions. It seems that between regions within the same country, the pattern of socioeconomic inequalities in cancer mortality only slightly differed around a global national pattern. These results suggest that national factors, such as common national histories, socioeconomic policies and health care systems, predominate over regional factors in determining socio-economic inequalities in cancer mortality.

The situation in France is remarkable because the large socioeconomic inequalities in alcohol related cancers, and especially in UADT cancers. The situation may not be homogeneous within France. Larger inequalities in all-cause mortality are found in French regions with a higher alcohol consumption, in particular in the North [43, 44]. This result suggests that there could be large regional disparities in France in inequalities in alcohol-related mortality in general, and in alcohol-related cancer mortality in particular. The small size of our French dataset and resulting the lack of statistical power however hampered an regional analyses for France.

An important and consistent result in our study is that we do not observe large socioeconomic inequalities in alcohol-related cancer mortality in Northern Europe (Belgium and the Nordic countries). Some studies found a strong impact of alcohol drinking on health inequalities in the Nordic countries, but mainly through violent deaths [4, 5]. Interestingly, it is also in those countries that binge drinking is more widespread, whereas Spain and France are characterized by higher levels of daily alcohol consumption. These results suggest that binge drinking is mainly associated with inequalities in violent deaths whereas high levels of daily consumption influences inequalities in mortality in part through specific cancers.

Other risk factors than alcohol drinking and smoking may also partly explain our results. Liver cancer is related to infection from Hepatitis B or C, but mainly in countries with high liver cancer incidence, which is not the case of Western Europe [45]. Diet [46] and occupational exposures [47, 48] could also contribute to inequalities in mortality from UADT cancers, but their impact is likely to be weaker than that of alcohol.

Socioeconomic inequalities in cancer survival may partly explain socioeconomic differences in cancer mortality. Survival inequalities may be more important for cancers with a relatively good prognosis compared to cancer with very low survival rates [49-51]. Thus, socioeconomic inequalities in cancer survival might be more important for UADT cancers, as these have a better prognosis than liver or lung [52-55]. Unfortunately, no comparative study is available on differences between European populations in socioeconomic inequalities in cancer survival.

Conclusion

Inequalities in alcohol use have an impact on health inequalities in Europe. This has been shown by studies that found an impact of heavy drinking on socioeconomic inequalities in Northern Europe through poisoning, accidents and suicides. Our study showed that high alcohol consumption also impacts on health inequalities through cancer, but more so in Southern Europe (such as in Spain, France and Switzerland) than in Northern Europe. Thus, while heavy drinking is an important contributor to socioeconomic inequalities in mortality, there are large differences between populations in the relevant consumption patterns and associated causes of death.

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Table 1: Descriptive information on the data sources

Population	Follow-up period		Number of person years at risk	Educational level (%)		
	Date of census	End of follow-up		Lower secondary or less	Upper secondary	Post-secondary
Madrid	May 1996	Dec 1997	1,756,059	64.1	17.4	18.5
Basque region	May 1996	June 2001	2,985,865	65.6	20.1	14.3
Barcelona	Jan 1992	Dec 2001	3,714,380	65.2	15.3	19.5
Turin	Nov 1991	Oct 2001	2,611,968	67.2	22.2	10.6
France	Mar 1990	Dec 1999	1,135,299	50.6	36.7	12.7
Switzerland (Latin)	Dec 1990	Dec 2000	3,180,536	24.6	51.6	23.8
Switzerland (German)	Dec 1990	Dec 2000	9,789,453	17.9	57.6	24.5
Belgium (Walloon)	Mar 1991	Dec 1995	4,053,514	63.0	21.4	15.6
Belgium (Brussels)	Mar 1991	Dec 1995	1,141,038	52.5	21.9	25.6
Belgium (Flemish)	Mar 1991	Dec 1995	7,506,231	61.5	22.2	16.3
Norway	Nov 1990	Nov 2000	10,021,675	29.9	48.4	21.7
Sweden	Jan 1991	Dec 2000	21,421,623	40.3	43.3	16.4
Finland	Dec 1990	Dec 2000	12,396,052	48.8	29.7	21.5

Table 2: Mortality rates (MR) and relative indices of inequality (RII) with their 95% confidence intervals (CI) for all cancers and by cancer type, per population

	UADT cancers[1]			Liver cancer			Lung cancer			All cancers		
Population	N[2]	MR[3]	RII (95% CI)	N[2]	MR[3]	RII (95% CI)	N[2]	MR[3]	RII (95% CI)	N[2]	MR[3]	RII (95% CI)
Madrid	604	56	2.58 (1.71-3.89)	392	38	2.76 (1.61-4.74)	1,821	175	1.53 (1.22-1.92)	6,133	591	1.52 (1.34-1.72)
Basque region	1,519	59	2.04 (1.53-2.71)	543	22	1.16 (0.72-1.87)	3,133	125	1.31 (1.08-1.59)	11,737	473	1.29 (1.17-1.43)
Barcelona	1,974	52	3.12 (2.48-3.91)	1,357	37	1.56 (1.20-2.02)	6,254	169	1.80 (1.60-2.04)	20,253	553	1.57 (1.47-1.68)
Turin	735	33	3.61 (2.41-5.42)	742	36	2.49 (1.69-3.68)	3,895	179	2.53 (2.13-2.99)	11,294	532	1.88 (1.71-2.06)
France	816	78	4.30 (3.10-5.95)	361	36	2.59 (1.63-4.12)	1,462	147	1.64 (1.32-2.03)	5,375	555	1.89 (1.69-2.13)
Switzerland (Latin)	1,572	51	3.55 (2.92-4.31)	807	27	1.62 (1.24-2.10)	4,197	141	2.68 (2.38-3.01)	14,862	504	1.85 (1.73-1.96)
Switzerland (German)	2,893	32	3.99 (3.45-4.62)	1,281	15	1.49 (1.21-1.85)	10,681	123	2.96 (2.75-3.19)	38,817	452	1.80 (1.73-1.87)
Belgium (Walloon)	1,584	43	1.81 (1.44-2.29)	524	15	1.11 (0.74-1.66)	8,036	232	2.91 (2.58-3.28)	19,982	583	1.81 (1.69-1.95)
Belgium (Brussels)	429	47	1.48 (1.01-2.18)	132	15	1.65 (0.81-3.38)	1,590	175	2.97 (2.38-3.69)	4,788	529	1.82 (1.61-2.050
Belgium (Flemish)	2,262	34	1.87 (1.53-2.28)	557	9	0.98 (0.66-1.45)	13,446	214	3.14 (2.85-3.46)	33,990	544	1.79 (1.69-1.89)
Norway	1,861	21	2.27 (1.90-2.71)	384	4	1.00 (0.68-1.46)	9,211	107	2.45 (2.26-2.65)	38,722	449	1.45 (1.39-1.50)
Sweden	3,331	17	2.03 (1.77-2.33)	2,211	11	1.68 (1.42-1.98)	13,804	70	1.81 (1.69-1.93)	70,339	356	1.32 (1.28-1.35)
Finland	1,868	19	2.38 (1.94-2.94)	1,217	13	1.35 (1.05-1.73)	12,489	138	3.48 (3.18-3.81)	39,734	437	1.72 (1.64-1.80)

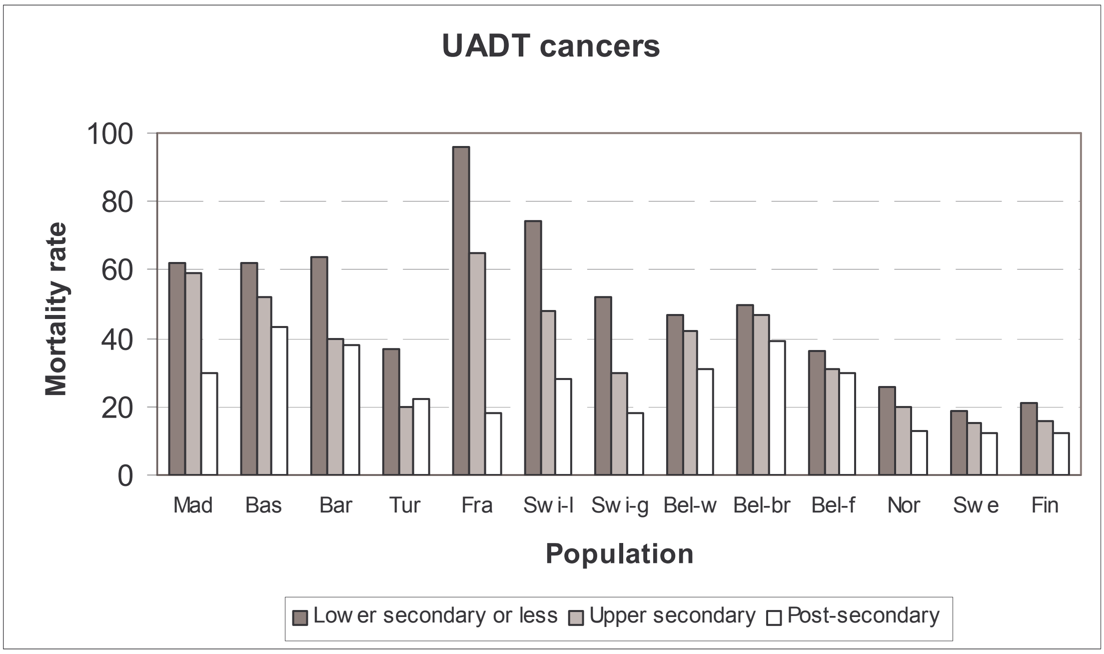
1: UADT: upper aerodigestive tract (oral cavity, pharynx, larynx, esophagus)
2: Number of cancer deaths 3: Age-standardized mortality rate using direct standardization, per 100,000 person years

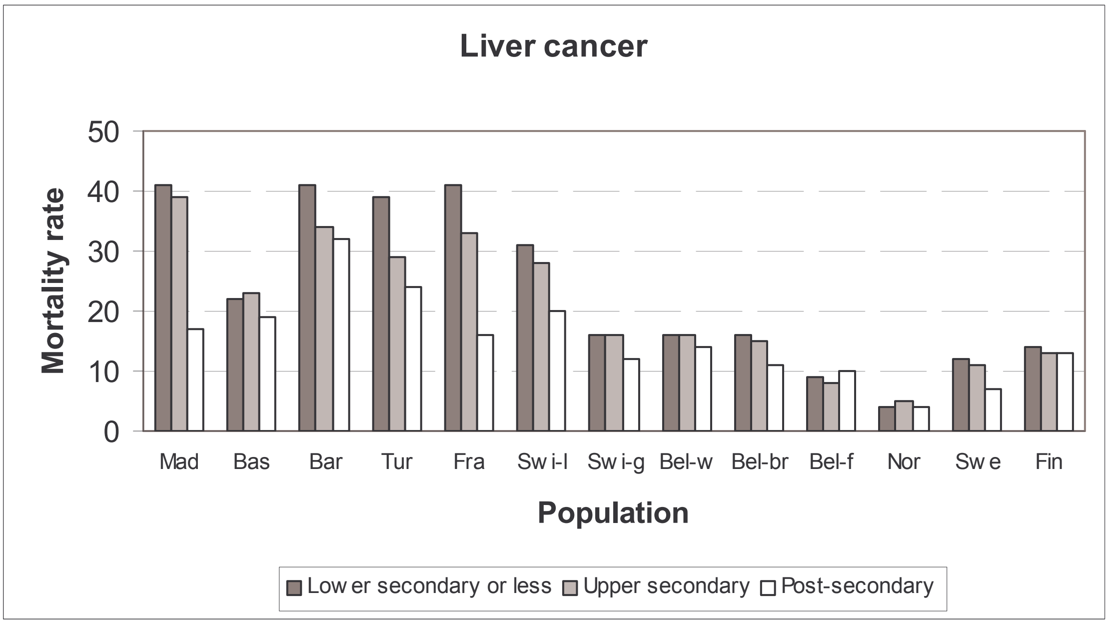
Table 3: Contribution (%) of different cancer sites to absolute socioeconomic inequalities in cancer mortality, per population

Population	UADT cancer[1]	Liver cancer	Lung cancer	Other cancers
Madrid	19	15	29	37
Basque region	25	4	31	40
Barcelona	26	9	45	20
Turin	8	9	48	35
France	27	9	29	35
Switzerland (Latin)	21	2	45	32
Switzerland (German)	16	3	50	31
Belgium (Walloon)	8	1	65	26
Belgium (Brussels)	6	3	57	34
Belgium (Flemish)	5	0	69	26
Norway	10	0	56	34
Sweden	10	5	42	43
Finland	7	1	70	22

1: UADT: upper aerodigestive tract (oral cavity, pharynx, larynx, esophagus)
Note: These percentages quantify the proportion of rate difference in cancer site mortality divided by the rate difference in all cancers mortality.

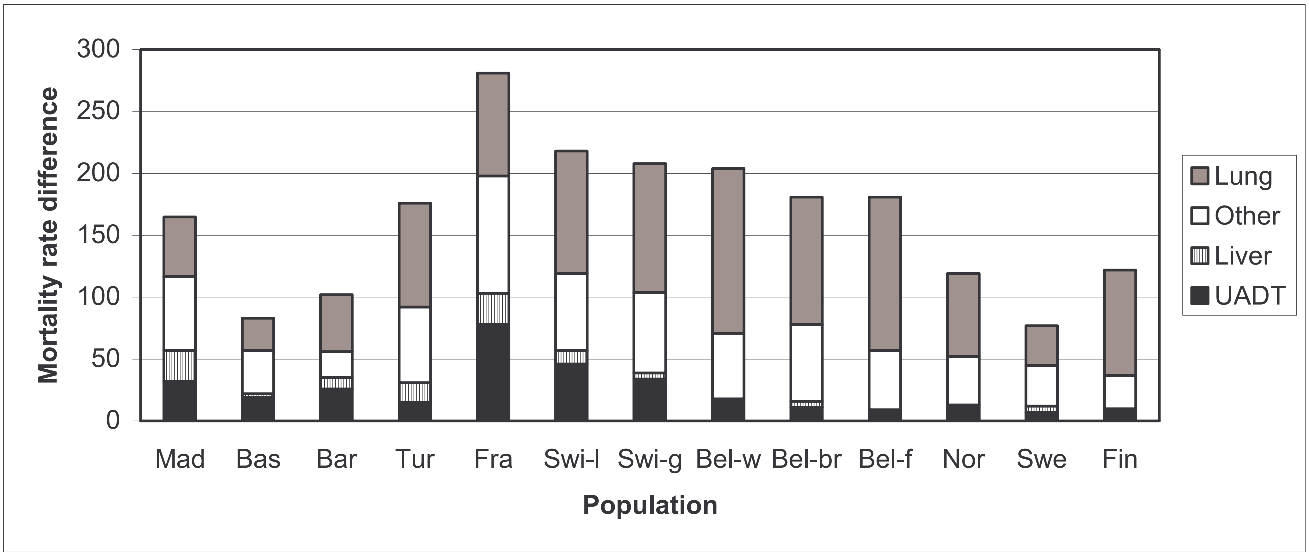
Graph 1: Alcohol related cancers mortality rates[1] (per 100,000 person years) by education, per population





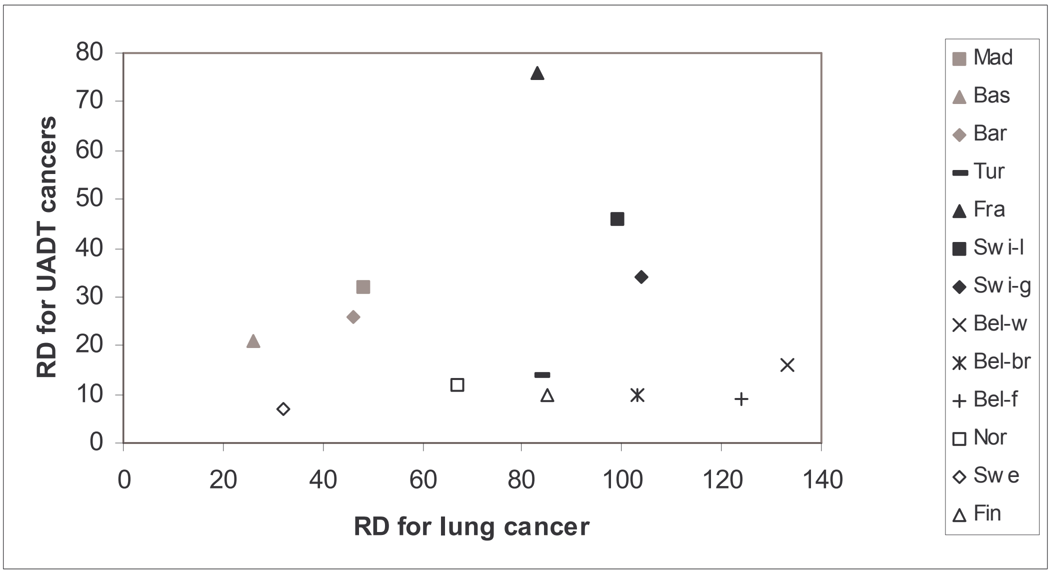
1: Age-standardized mortality rate using direct standardization, per 100,000 person years
Note: UADT cancers group cancers of oral cavity, pharynx, larynx and esophagus.
Swi-l and Swi-g correspond to the Latin part and the German part of Switzerland. Bel-w, Bel-br and Bel-f correspond to the Walloon part of Belgium, Brussels and the Flemish part of Belgium.

Graph 2: Absolute mortality rate[1] difference[2] (per 100,000 person years) in all cancers mortality according to specific cancers, per population



1: Age-standardized mortality rate using direct standardization, per 100,000 person years
2: between the two extreme educational levels (men with lower secondary education or less and men with post-secondary education)
Note: UADT= upper aero digestive tract (oral cavity, pharynx, larynx, esophagus)
Swi-l and Swi-g correspond to the Latin part and the German part of Switzerland. Bel-w, Bel-br and Bel-f correspond to the Walloon part of Belgium, Brussels and the Flemish part of Belgium.

Graph 3: Mortality rate[1] difference (RD) (per 100,000 person years) for upper aero digestive tract (UADT[2]) cancers and lung cancer, per population



1: Age-standardized mortality rate using direct standardization, per 100,000 person years
2: UADT cancers group oral cavity, pharynx, larynx, and esophagus cancers.
Note: Swi-l and Swi-g correspond to the Latin part and the German part of Switzerland. Bel-w, Bel-br and Bel-f correspond to the Walloon part of Belgium, Brussels and the Flemish part of Belgium.

Chapter 8

Educational inequalities in avoidable mortality in Europe

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Abstract

Objectives
Inequalities in avoidable mortality can pinpoint to shortcomings in the healthcare system in different countries. We compared the magnitude of educational inequalities in avoidable mortality in different European countries and determined the contribution of avoidable causes of death to the total mortality in Europe.

Methods
Mortality data for men and women aged 30-64 years were obtained from national longitudinal and cross-sectional mortality studies. Level of education classified in 4 educational groups according to ISCED was used as socioeconomic indicator. To estimate the magnitude of inequalities between lower and higher educated groups in each country we calculated age-standardized mortality rates and relative index of inequality for selected avoidable causes of death separately and combined. We also calculated difference in life expectancy between lower and higher educated groups for some groups of causes of death.

Results
Educational inequalities in avoidable mortality were present in all countries of Europe and in most types of avoidable causes of death with exception of avoidable malignant conditions. Especially large educational inequalities were found for all infectious diseases and acute conditions in all countries of Europe. Inequalities were larger in CEE and Baltic countries, followed by Northern and Western European countries and smaller in the Southern European regions. This geographic pattern was present in almost all types of avoidable conditions. Avoidable mortality inequalities contributed between 1/6 and 1/3 to the difference in life expectancy between high and low educated groups. Infectious diseases and cardio-respiratory conditions were main contributors to this difference in life expectancy.

Conclusions
Inequalities in avoidable mortality are present in all countries of Europe. Reduction of inequalities in cardio-respiratory and infectious diseases will largely contribute to the reduction of the total mortality in Europe. Reducing inequalities in avoidable mortality in CEE and Baltic countries through improving access and quality of healthcare for people of lower socio-economic class should be a priority for policies to reduce health inequalities in Europe.

Introduction

Medical care delivered to the population should be of such quality that the outcome would be the same regardless of the social background. Yet there are worldwide indications that health status, mortality and utilization of medical services differ for different socio-economic groups with those less educated and economically less affluent parts of society being in more disadvantaged position[1-5]. Large variations in health status between different social groups led to the hypothesis that these differences may be due, in part, to differences in access and quality of health services.

Avoidable mortality is a concept introduced in 1970th by Rutstein and Charlton to measure the performance of the healthcare system[6-8]. It represents mortality from conditions amenable to medical interventions i.e. deaths that should have been averted given a timely application of the current medical knowledge and technology. Since its introduction the term ‘avoidable mortality’ has evolved. Many researchers distinguish between avoidable causes of death related to medical care and related to health policy[9-11]. Levels and trends of avoidable mortality were widely documented[11-19]. Most researchers showed that levels of avoidable mortality were substantially decreasing over the past 50 years[16, 20-22]. Some studies also point out to higher levels in avoidable mortality among people disadvantaged because of ethnicity or socio-economic characteristics[14, 23-25]. Schwartz and colleagues demonstrated significant excess mortality from several amenable conditions among African American compared to their white counterparts in US[26]. Similarly researchers in New Zealand found mortality rates from conditions amenable to medical care being about 2.5 times higher among Maori compared to non-Maori population[14]. Similarly in Europe significant differences by social class were found for avoidable mortality[27, 28].

Although findings suggest a fairly consistent pattern of higher risk of death from amenable conditions among people with lower education and income, this knowledge remains fragmentary with studies limited to particular geographical regions or targeting particular population groups. In addition, previous studies have limited comparability due to differences in the definition of avoidable mortality, studied periods and age-groups, and use of different socio-economic indicators. It is of interest to learn whether the magnitude of avoidable mortality is equally large in countries with different type of healthcare system. Detailed analysis by cause of death may help identify whether there are specific causes of death for which inequalities are large in all countries. Such causes would point to specific problems with healthcare delivery that require extra attention in throughout Europe. Country differences in avoidable mortality, on the other hand, can indicate a possible role of national health care systems, and thus suggest priority areas for more in depth investigations.

The objective of this study is to estimate the magnitude of educational inequalities in avoidable mortality in different European countries and to prepare such an overview for a wide array of “avoidable” causes of death. In addition, we measure the contribution of these avoidable causes of death to the total mortality in different countries. Focusing on causes amenable by medical care only (i.e. through secondary and tertiary prevention), we thus aim to obtain indications on the role of the healthcare system in instigating socioeconomic inequalities in health.

Methods

Data

Mortality data from 16 populations were selected for this study. They included four North European countries (Finland, Sweden, Norway, and Denmark), two West European countries (Belgium and Switzerland), two South European countries (Italy and Spain), four Central Eastern European (CEE) countries (Slovenia, Hungary, Czech Republic, and Poland) and two Baltic countries (Lithuania and Estonia). All data cover whole national populations, with the exceptions of mortality data for Italy (data for Turin city only) and Spain (data for the Madrid, Barcelona and Basque regions only). Subpopulations were excluded in two datasets: foreigners in Switzerland and people deceased outside Catalonia in Barcelona. Data for most West European countries came from longitudinal follow up studies, in which socioeconomic status as determined during a census has been linked to mortality. Mortality data for CEE and Baltic countries, except Slovenia, come from cross-sectional unlinked mortality studies, in which information on socioeconomic data is derived separately from death certificates and census records. Numbers from mortality registries and census determined the numerator and denominator of mortality, respectively.

Selection of causes of death

For this study, we selected causes of death that could be averted through medical interventions only i.e. conditions that are amenable to treatment, including those subject to early detection programs. For that reason we excluded causes of death that were avoidable through only primary prevention such as lung cancer or injuries. We based our list of avoidable causes of deaths on the original list developed by Rutstein (ref). Specifically, our list included diseases of infectious origin, selected types of cancer, selected acute conditions, and selected cardio-respiratory conditions. For the full list of all causes of death selected for this study and their ICD codes please refer to Table 2.

The definition of avoidable mortality has evolved since its introduction in 1970s. Evidence exists that the death from a larger number of conditions than are in the original list of Rutstein can be avoided with current medical care, e.g. ischemic heart disease, and diabetes[14, 29, 30]. Some of these additional conditions to a considerable extent also relate to lifestyle factors such as smoking, alcohol consumption, obesity, etc. These lifestyle factors are well known to largely determine socioeconomic inequalities in mortality from these conditions. The scope of our study, however, is to investigate to what extent socio-economic differences in mortality can be related to medical care. For the causes of death with strong effect of life style factors, it would be very difficult beyond general speculations to separate the extent that the observed inequalities are caused by lifestyle factors from the characteristics of medical care. For that reason we have excluded these causes of death from our list.

The numbers of maternal deaths and deaths caused by prostate hyperplasia were too small to be investigated separately, therefore, these causes of death were included only in the group of all avoidable mortality combined.

Analysis

The analysis of longitudinal studies was performed among people aged 30-64 at the start of follow-up. To approximate all populations in terms of average age at death we performed our analysis on slightly older age-groups at base-line for all countries with cross-sectional design (35-69) and for countries with shorter follow up period (35-69 for Madrid that contained 2-year follow up data and 30-69 for Belgium and the Basque region that both contained 5-year follow up data).

We used educational level as a measure of socio-economic status. Education was categorized into four classes, which correspond to the ISCED (International Standard Classification of Education) classification: (1) no education or primary education, (2) lower secondary education, (3) upper secondary education, and (4) post-secondary and tertiary education. For unlinked cross-sectional mortality data in our analysis we distinguished only three educational classes (by combining the two lowest educational groups) in order to reduce the extent of numerator/denominator bias. The percentage of missing values for education was low in all populations (6% and less). These subjects were excluded from the analysis.

The linkage between census data and mortality registries was achieved for more than 96 percent of all deceased persons in almost all populations except Madrid (70 percent), the Basque region (93 percent) and Barcelona (94.5 percent). In these populations however, no variation in this percentage was found according to age, sex, or socioeconomic position, therefore, estimates of relative inequalities in mortality are not likely to be biased to an important extent. In addition, we adjusted estimates of the absolute mortality rates by increasing these with correction factors (1/0.70, 1/0.93 and 1/0.945 respectively).

We estimated the magnitude of socioeconomic inequalities in mortality in both absolute and relative terms. To estimate the absolute level of socioeconomic inequalities we computed age-standardized mortality rates (ASMR) using European population as a standard. To estimate relative inequalities, we computed relative indices of inequality (RII). RII is a regression-based measure that takes into account the distribution of the population by educational groups[31]. It assesses the association between mortality rate and the relative position of each educational group. This relative position is measured as the cumulative proportion of each educational group within the educational hierarchy with 0 and 1 as the extreme values. The resulting measure, the RII, can be interpreted as the risk of death at the very top of the educational hierarchy as compared to the very lowest end of the educational hierarchy. This measure can be compared between age groups and countries, provided that a detailed and hierarchical classification of educational levels is used in each country. For this paper, the RII was estimated with log linear regression with control for 5-year age group. The regression model had a log link function and assumed a Poisson error distribution, using the Genmod procedure of SAS. Analyses were conducted for each population separately.

In addition we calculated difference in partial life expectancy between higher and lower educational groups between the 35th and 70th birthday (with a maximum of 35 years) and the contribution of each avoidable condition to this difference using the cause elimination life table.

Results

We found large inequalities in total avoidable mortality in all countries combined (Table 2): less educated people were 2.23 times more likely to die from an avoidable cause than higher educated people. Educational inequalities were larger for diseases of infectious origin (RII=5.12) and acute conditions (RII=4.90), and smaller for malignant diseases (RII=1.23). In absolute terms inequalities were the largest in the group of cardio-respiratory conditions.

Inequalities in all avoidable mortality were present in all European populations included in this study (Table 3). Compared to the inequalities in total mortality, inequalities in all avoidable mortality were slightly smaller in all populations. Smaller inequalities in avoidable mortality were observed in south European populations, while larger inequalities were found in Central-Eastern European (CEE) and Baltic countries. Relative inequalities were the largest in Czech Republic (3.54) and the smallest the region of Madrid (1.17). In absolute terms the largest inequalities in avoidable mortality were observed in Estonia and the smallest in the Basque and Madrid regions. Among CEE and Baltic countries Slovenia had the smallest level of inequalities for all avoidable conditions, while Czech Republic had the largest level of inequalities.

We observed large inequalities favouring more educated people in the group of infectious diseases (Table 4). For all infectious diseases combined inequalities were larger in CEE and Baltic countries. Among western European countries particularly large inequalities were found in Denmark (RII 5.07) and the Basque region (8.22). Nearly all countries had consistently larger inequalities for Tuberculosis than for other infectious diseases. Inequalities for Tuberculosis were the largest in CEE and Baltic countries, Norway and Denmark were RIIs peaked at values above 13.

Small or no inequalities were found in all avoidable malignant conditions (Table 5). RIIs for Northern and Western European countries were around 1.05 and reached significance level only in Sweden and Switzerland. RIIs for South European countries were below 1 and significantly lower in the Basque region (0.76). CEE and Baltic countries on the other hand stood out with larger RIIs favouring more educated women. Breast cancer and colorectal cancer had the largest level of absolute inequalities, while cervix cancer had the largest level of relative inequalities.

All countries had inequalities by education for all cardio-respiratory conditions combined (Table 6). These inequalities varied between 1.0 and 3.0 in Southern, Northern and Western European countries and between 3.0 and 6.0 in CEE and

Baltic countries. In most countries the level of inequalities for all cardio-respiratory conditions was slightly higher than for all avoidable mortality, but much lower than that for infectious disease mortality. Inequalities were approximately equally large for all cardio-respiratory conditions combined, cerebro-vascular conditions, and CRHD, but were slightly larger for asthma.

Large relative inequalities in all avoidable acute conditions favouring higher educated people were present in all countries of Europe (Table 7). The magnitude of inequalities did not vary considerably between specific acute diseases, but fluctuated largely between countries: CEE and Baltic countries had larger level of inequalities and Spanish regions - smaller inequalities in all types of acute diseases. Poland, Czech Republic, Hungary, and Turin had the largest inequalities in all avoidable acute conditions combined (all RIIs above 5.00).

In absolute terms the largest life expectancy difference between high and low educational groups was in CEE and Baltic countries where it varied between 1.72 years in Czech Republic to 5.07 years in Lithuania (Table 8). Avoidable causes of death had the largest contribution to the inequalities in total mortality in the Basque region and Switzerland (45 and 30% respectively). In other countries this contribution to the difference in life expectancy was between 13% and 26%. Acute conditions contributed the least to the difference in life expectancy for all avoidable mortality in all European countries (13% and less of the total contribution of avoidable mortality). On the contrary, cardio-respiratory conditions contributed the most to the difference in life expectancy between higher and lower educated groups with exception of the Basque region (23 to 73 % from the total avoidable mortality, corresponding to an absolute difference range of 13-125 days). Infectious diseases were the second largest contributors to the difference in life expectancy between higher and lower educated groups in most of the populations except Baltic countries where they were the largest contributors (50% in Estonia and 60% in Lithuania corresponding to an absolute difference in life expectancy between lower and higher educational groups of 165 and 219 days respectively).

Discussion

Educational inequalities in avoidable mortality were present in all countries of Europe and in most types of avoidable causes of death with exception of avoidable malignant conditions. Especially large educational inequalities were found for all infectious diseases and acute conditions in all countries of Europe. Inequalities were larger in CEE and Baltic countries, followed by Northern and Western European countries and smaller in the Southern European regions. This geographic pattern was present in almost all types of avoidable conditions. Avoidable mortality inequalities contributed between 1/6 and 1/3 to the difference in life expectancy between high and low educated groups. Infectious diseases and cardio-respiratory conditions were main contributors to this difference in life expectancy.

In our data education was available in a comparable form for a large number of countries. Owing its wide availability, education continues to be a preferred socio-economic measure for international comparative studies. It allows classification of individuals regardless of whether they are inside or outside of the labour force market and partially averts reverse causation since most of the people acquire their education early in life. We, however, observed large differences between countries in the educational distribution. Partly these differences reflect the real situation of educational attainment in different countries of Europe. However, there is a possibility that ISCED classification is not flexible enough to accommodate different national schemes. To cope with the differences in the population distribution by education we used RII, a measure that takes educational distribution into account. RII estimates can be compared between countries, provided that a detailed and hierarchical classification of educational levels is used in each country. We distinguished 4 educational groups in most countries, except Denmark and Finland where only 3 educational groups were available and all countries with cross-sectional design where we also distinguished only 3 groups (by combining the two lowest educational groups together). We evaluated whether the results were sensitive to the number of educational levels that were distinguished by conducting a similar analysis with 3 educational groups in all countries. We observed no major changes to the results for other countries.

Additional differences between countries are related to the design of the studies. Data from all Western European countries and Slovenia were census-linked mortality follow-ups, while data from other CEE and Baltic countries were cross-sectional unlinked studies. In a study that compares linked and unlinked mortality estimates in Lithuania, Shkolnokov et al demonstrated that mortality inequalities based on unlinked mortality data were overestimated, however, this overestimation was rather limited in the age-group 30-69[32]. Overestimation is also possible in other CEE and Baltic countries with unlinked mortality data. Taken into account a limited age-group of 30-64 used in our study, possible overestimation of mortality inequalities by education is not likely to explain large inequalities observed in our study in CEE and Baltic countries.

Data included in our study differed in length of mortality follow-up and/or calendar-years in which mortality was measured (table 1). We addressed these differences by approximating studied populations in terms of similar age at death. However, subjects may be slightly younger in some countries compared with others. Selection of a younger age group could have resulted in a slight under-estimation of relative socioeconomic inequalities and over-estimation of absolute inequalities. Nevertheless, these effects, if any, are likely to be small.

Although all data came from populations with reliable cause-of-death registries, potential influences of national diagnosing practices should also be considered. The results of our study would be biased only to the extent that coding practices are associated with educational level within populations. The diagnosing and coding practice may have depended on the medical care received before death. Although there are no specific evidences for variations in coding by education, we can not completely rule out such bias. The impact of coding bias if any, however, is likely to be small and would not explain the much higher rates of avoidable mortality among people with lower education.

Despite some limitations, our results are in line with findings from previous studies on a few other countries that also show that mortality from avoidable causes of death is higher for people with lower socio-economic status[23, 27]. The generalised existence of socio-economic inequalities in all European countries indicates that the causes for these inequalities may go beyond structural characteristics of the individual healthcare systems.

One of the potential explanations of variations in mortality is variation in incidence of the diseases. Several researchers explored the influence of disease incidence on social and geographic variations in avoidable mortality[33-35]. These studies generally agree that variations in incidence could partly contribute to the explanation of variations in mortality. Large inequalities in all-cause mortality support the suggestion that inequalities in incidence may play a role. On the other hand, inequalities in incidence do not always justify the occurrence of inequalities in mortality. Death from many conditions (e.g. infectious diseases) could be prevented even after the condition has developed, provided that appropriate and timely treatment is applied. In addition, incidence of some diseases can be modified by medical intervention, as is for example the case with cervical cancer, influenza and cerberovascular disease and thus, variations in incidence of some conditions may be considered as a possible indication of variations in the quality of (preventive) care[34].

Extremely large inequalities in TB mortality observed in our study are most likely to be the reflection of higher incidence and prevalence of TB among people with lower SE status. These inequalities could also be related to health service delays in initiating anti-TB treatment that were described in several countries[36-38]. A well-organized rigorous screening system of people from high-risk groups (such as migrants, homeless, drug users and prisoners), an adequate access to care for those who are sick, maintaining high index of suspicion among healthcare professionals might help in reducing diagnostic delays especially among those with lower education and thus reduce inequalities in mortality from TB.

Cardio-respiratory conditions and cerebro-vascular mortality, as the leading cause of death in this group, were the largest contributors to the inequalities in avoidable mortality between higher and lower educational groups. Although the contribution of behavioural factors such as alcohol consumption, diet, and physical activity can not be neglected in the incidence of stroke and critical levels of blood pressure, a well organized hypertension detection and control is the key measure to prevent death in the population. Some additional opportunities within the healthcare system lie in providing better access to services for people with alcohol-related problems or obesity and involve improving access to emergency care once the condition has developed. Smaller inequalities in cerebro-vascular mortality observed in Southern populations are potentially related to a narrower social stratification in terms of diet and alcohol consumption practiced and is less likely to be connected with achievements of policies within the healthcare system in these countries.

Large inequalities observed in mortality from acute conditions in all European countries is a point of concern and suggest gaps in accessibility, utilization or quality of surgical care among people with lower education. Potential difference in incidence of hernia, peptic ulcer and appendicitis may also play a role. In USA the incidence of perforating appendicitis was associated with insurance related delays in obtaining medical care[39]. It remains unclear what kind of barriers experience people with lower education in European countries. Confidential case reviews might serve as a way to identify and correct possible deficiencies in the country's healthcare system.

The geographical scope of our study is substantially broader than that of other studies because we included a large number of countries including new member states of European Union for which data on socio-economic inequalities in mortality are scarcely documented. We observed that socio-economic inequalities in avoidable mortality in CEE and Baltic countries are larger than in Western European countries. CEE and Baltic countries that inherited Soviet model of the health care system in the 90^{s} were characterized by limited financing, a lack of efficiency and poor quality of health services. These may partly explain the substantially smaller improvements in the mortality from amenable causes in the East than in the West in general[30, 40]. We also observed larger inequalities in CEE and Baltic countries compared to the West European countries. In addition, from table 3 we can see that the difference in mortality between higher educated people in CEE /Baltic countries and North/West/South European countries is smaller than that for lower educated people. All these facts may indicate that the benefit achieved during the last decade in CEE and Baltic countries primarily was mostly limited to people with higher education only, while the health status of those in lower education at best stagnated. If true, a special priority should be given to improving access and quality of health services for those of lower education in CEE and Baltic countries

In conclusion, inequalities in avoidable mortality are universally present in all countries of Europe. Reduction of inequalities in cardio-respiratory and infectious diseases will largely contribute to the reduction of the total avoidable mortality in Europe, especially in CEE and Baltic countries. Taken together, these findings support the view that the observed large inequalities in part reflect inequalities with regards to health care services. Although social inequalities in health are a function of more complex factors, there is nevertheless a role for the system of healthcare services in developing policies to reduce social inequalities in mortality.

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Tables

Table 1. Descriptive information on the data sources

Country	Type of data	Follow up period	Number of person years at risk	Number of all deaths	Educational level (%)		
					Lower secondary or less	Upper secondary	Post secondary
FIN	Longitudinal	1990-2000	22606143	141248	47.2	30.9	21.8
SWE	Longitudinal	1991-2000	36137338	168086	37.3	43.7	19.0
NOR	Longitudinal	1990-2000	16666847	87559	30.2	49.4	20.4
DEN	Longitudinal	1996-2000	11959629	65510	43.1	36.0	20.9
BEL	Longitudinal	1991-1995	22349533	155304	61.6	21.9	16.5
SWZ	Longitudinal	1990-2000	23663177	120137	28.1	56.0	15.9
TUR	Longitudinal	1991-2001	4147548	25579	70.6	20.4	8.9
BAR	Longitudinal	1992-2001	6733310	36923	68.0	15.2	16.8
MDR	CS linked	1996-1997	3216098	12026	63.3	18.9	17.8
BSQ	Longitudinal	1996-2001	5426107	21099	67.2	18.4	14.4
SLO	Longitudinal	1991-2000	8598967	62944	45.5	43.2	11.2
HUN	CS unlinked	1999-2002	17926668	201568	60.4	25.9	13.7
CZR	CS unlinked	1999-2003	22181655	171397	59.5	29.1	11.4
POL	CS unlinked	2001-2003	47673756	394919	53.2	34.5	12.3
LIT	CS unlinked	2000-2002	4436508	46291	22.5	59.5	18.0
EST	CS unlinked	1998-2002	2950765	36374	23.3	58.0	18.7

Table 2. Age and sex standardized mortality rates (ASMR), and Relative index of inequality (RII) by cause of death for all countries combined

Causes of death	ICD-10 code*	N death	ASMR		RII**	95% Confidence Interval
			Lower education	Higher education		
Total mortality		1476221	668.2	441.1	2.82	(2.80-2.84)
Total avoidable mortality		280684	126.4	88.8	2.23	(2.19-2.26)
Diseases of infectious origin		32519	16.4	8.7	5.12	(4.88-5.37)
Tuberculosis	A15-19, B90	4698	2.7	0.9	17.26	(14.90-20.00)
Pneumonia/Influenza	J10-J18	16647	8.6	4.1	6.11	(5.71-6.55)
Other infectious & parasitic diseases	A00-09, A20-99, B00-89, B91-99	11174	5.1	3.7	2.67	(2.47-2.88)
Malignant diseases		126417	51.2	46.1	1.23	(1.21-1.26)
Colorectal cancer	C18-C21	50996	20.8	18.8	1.33	(1.28-1.38)
Breast cancer	C50	49968	19.1	18.7	0.93	(0.89-0.96)
Cancer cervix uteri	C53	9710	4.7	2.7	3.90	(3.59-4.24)
Cancer of testis	C62	700	0.4	0.2	2.32	(1.68-3.20)
Hodgkin & Leukemia	C81, C91-C95	15042	6.2	5.6	1.32	(1.23-1.40)
Acute conditions		11144	5.7	2.8	4.90	(4.51-5.32)
Appendicitis, hernia & peptic ulcer	K25-K28, K35-K38; K40-K46; K56	9674	5.0	2.4	5.12	(4.69-5.60)
Cholecystitis, -lithiasis	K80-K83	1470	0.7	0.4	3.49	(2.80-4.37)
Cardio-respiratory conditions		110476	53.0	31.1	3.30	(3.22-3.38)
Hypertension and Cerebrovascular conditions	I10-I15, I60-I69	101869	48.8	28.7	3.24	(3.16-3.33)
Chronic Rheumatic Heart Disease (CRHD)	I00-I09	3753	1.9	1.0	3.54	(3.07-4.07)
Asthma	J45-J46	4725	2.3	1.3	4.60	(4.06-5.22)

* For earlier years respective ICD-9 codes were used
** Adjusted for age, sex, and country

Table 3. Numbers of death (N), Age and sex standardized mortality rates (ASMR), and Relative index of inequality (RII) for all cause mortality and all avoidable mortality by country

Country	All cause mortality					All avoidable mortality				
	N	ASMR		RII*	95% Confidence Interval	N	ASMR		RII*	95% Confidence Interval
		Lower educatio	Higher educatio				Lower educatio	Higher educatio		
FIN	141248	778.11	529.01	**2.42**	(2.37-2.48)	25658	137,6	100,6	**1.98**	(1.88-2.09)
SWE	165512	564,7	404,5	**2.01**	(1.97-2.05)	30808	99,6	78,5	**1.61**	(1.54-1.68)
NOR	87559	702,1	490,2	**2.56**	(2.49-2.64)	17420	132,2	100,4	**1.86**	(1.74-1.98)
DEN	65510	673,6	492,3	**2.30**	(2.23-2.37)	12268	121,9	95,2	**1.61**	(1.50-1.73)
BEL	155304	730,6	563,2	**1.95**	(1.90-1.99)	29045	133,9	110,9	**1.52**	(1.45-1.59)
SWZ	120137	581.43	486.22	**2.28**	(2.23-2.33)	23331	120,1	91,2	**1.79**	(1.70-1.89)
TUR	25579	581.60	475.57	**1.66**	(1.59-1.75)	5136	115,4	96,3	**1.36**	(1.22-1.52)
BAR	39101	561.67	488.47	**1.72**	(1.65-1.79)	8322	117,6	101,5	**1.31**	(1.20-1.43)
MDR	17180	569,7	532,1	**1.56**	(1.47-1.66)	3433	112,8	108,1	**1.17**	(1.02-1.35)
BSQ	22681	427,3	442,9	**1.56**	(1.45-1.69)	4675	90,7	86,4	**1.54**	(1.30-1.82)
SLO	62944	845.51	690.97	**2.29**	(2.23-2.36)	13993	193,6	145,9	**2.05**	(1.93-2.18)
HUN	201568	1351,6	687,0	**4.21**	(4.12-4.31)	43554	283,3	160,1	**3.33**	(3.18-3.49)
CZR	171397	969,6	505,9	**4.36**	(4.26-4.47)	36625	204,7	115,6	**3.54**	(3.37-3.72)
POL	394919	1124,4	551,2	**4.07**	(4.01-4.13)	76902	211,4	119,0	**3.24**	(3.14-3.35)
LIT	46291	1859,2	839,9	**3.50**	(3.37-3.64)	9409	344,5	177,6	**2.92**	(2.68-3.18)
EST	36374	1851,8	997,1	**2.90**	(2.79-3.03)	8344	400,4	232,7	**2.73**	(2.50-2.97)

* Adjusted for age and sex

Table 4. Numbers of death (N), Age and sex standardized mortality rates (ASMR), and Relative index of inequality (RII) for group of diseases of infectious origin by country

Country	All diseases of infectious origin					Tuberculosis		Pneumonia/Influenz		Other infectious	
	N	ASMR		RII*	95% CI**	RII*	95% CI	RII*	95% CI	RII*	95% CI
		Lower educatio	Higher educatio								
FIN	4053	24,40	13,05	**4.21**	(3.65-4.86)	**2.73**	(1.68-4.44)	**5.72**	(4.79-6.84)	**2.00**	(1.50-2.68)
SWE	2955	11,5	6,4	**3.17**	(2.75-3.66)	**4.75**	(2.09-10.77)	**3.80**	(3.15-4.57)	**2.30**	(1.83-2.90)
NRW	1536	13,2	8,0	**3.36**	(2.69-4.21)	**13.15**	(4.99-34.61)	**3.40**	(2.50-4.62)	**2.74**	(1.93-3.88)
DEN	1136	14,0	6,8	**5.07**	(3.97-6.48)	**14.54**	(4.13-51.22)	**6.23**	(4.20-9.25)	**4.02**	(2.91-5.55)
BEL	3646	17,22	12,17	**2.26**	(1.97-2.60)	**3.14**	(1.74-5.67)	**4.03**	(3.21-5.04)	**1.37**	(1.13-1.66)
SWZ	3950	23,44	14,94	**3.77**	(3.32-4.28)	**7.47**	(3.05-18.30)	**5.55**	(4.39-7.03)	**3.10**	(2.66-3.61)
TUR	336	8,29	4,93	**3.84**	(2.43-6.05)	**5.48**	(5.48-5.48)	**4.12**	(2.22-7.65)	**2.90**	(1.35-6.22)
BAR	1001	15,89	10,92	**3.32**	(2.52-4.36)	**9.85**	(4.46-21.78)	**2.65**	(1.68-4.19)	**2.89**	(1.97-4.23)
MDR	550	19,2	15,3	**2.04**	(1.42-2.91)	**4.42**	(1.09-17.93)	**2.46**	(1.37-4.39)	**1.61**	(1.00-2.60)
BSQ	965	23,00	14,74	**8.22**	(5.56-12.15)	**3.73**	(0.36-38.10)	**1.50**	(0.54-4.20)	**10.31**	(6.74-15.77)
SLO	1253	19,80	10,66	**5.16**	(4.18-6.37)	**13.42**	(7.17-25.10)	**5.38**	(4.18-6.92)	**2.18**	(1.31-3.61)
HUN	2268	16,59	5,69	**9.07**	(7.21-11.42)	**15.38**	(10.18-23.22)	**10.13**	(7.11-14.45)	**3.07**	(1.95-4.84)
CZR	3298	19,44	8,04	**7.62**	(6.34-9.16)	**24.05**	(10.52-55.00)	**7.38**	(6.03-9.04)	**5.06**	(3.01-8.52)
POL	7724	23,51	8,44	**8.12**	(7.23-9.10)	**45.47**	(32.39-63.83)	**8.22**	(7.02-9.64)	**2.98**	(2.44-3.63)
LIT	1541	106,40	20,93	**19.05**	(14.94-24.30)	**39.46**	(27.82-55.97)	**12.12**	(8.23-17.86)	**3.53**	(1.84-6.78)
EST	1378	98,87	33,38	**6.81**	(5.44-8.53)	**12.97**	(8.39-20.05)	**5.82**	(4.42-7.65)	**2.09**	(0.90-4.86)

* Adjusted for age and sex
** CI=Confidence interval

Table 5. Numbers of death (N), Age and sex standardized mortality rates (ASMR), and Relative index of inequality (RII) for group of malignant diseases by country

Country	All avoidable malignant					Breast cancer		Colorectal cancer		Cervix cancer		Leukemia & Hodgkin disease	
	N	ASMR Low	ASMR High	RII*	95% CI**	RII*	95% CI	RII*	95% CI	RII*	95% CI	RII*	95% CI
FIN	9157	43,9	42,1	**1.05**	(0.97-1.15)	**0.92**	(0.82-1.05)	**1.04**	(0.91-1.19)	**5.06**	(2.91-8.80)	**1.37**	(1.09-1.72)
SWE	15685	45,5	43,4	**1.09**	(1.03-1.15)	**0.92**	(0.84-1.01)	**1.20**	(1.10-1.32)	**2.93**	(2.19-3.93)	**1.09**	(0.93-1.28)
NOR	9045	61,2	56,1	**1.06**	(0.98-1.15)	**0.79**	(0.68-0.93)	**1.15**	(1.01-1.31)	**4.58**	(3.32-6.33)	**0.90**	(0.68-1.17)
DEN	6796	63,0	55,7	**1.06**	(0.97-1.17)	**0.91**	(0.79-1.05)	**1.16**	(1.00-1.34)	**2.28**	(1.55-3.34)	**1.05**	(0.78-1.41)
BEL	14595	65,8	62,2	**1.05**	(0.99-1.13)	**0.87**	(0.79-0.96)	**1.18**	(1.06-1.31)	**3.27**	(2.24-4.79)	**1.12**	(0.93-1.35)
SWZ	12367	60,2	49,4	**1.09**	(1.01-1.17)	**0.94**	(0.84-1.04)	**1.19**	(1.06-1.34)	**2.03**	(1.39-2.97)	**1.27**	(1.03-1.56)
TUR	2665	59,5	53,0	**0.99**	(0.85-1.16)	**0.76**	(0.61-0.95)	**1.21**	(0.96-1.53)	**3.68**	(1.08-12.52)	**1.13**	(0.74-1.73)
BAR	4421	61,2	57,1	**0.91**	(0.81-1.03)	**0.75**	(0.61-0.91)	**0.99**	(0.83-1.18)	**1.95**	(0.98-3.88)	**1.11**	(0.78-1.57)
MDR	1804	57,9	58,9	**0.87**	(0.72-1.05)	**0.62**	(0.46-0.85)	**0.83**	(0.63-1.09)	**3.23**	(1.07-9.72)	**1.86**	(1.09-3.18)
BSQ	2221	40,7	42,5	**0.76**	(0.62-0.92)	**0.52**	(0.40-0.75)	**0.79**	(0.60-1.05)	**-**	-	**1.27**	(0.70-2.33)
SLO	5457	68,7	64,2	**0.98**	(0.89-1.09)	**0.80**	(0.68-0.95)	**1.10**	(0.95-1.27)	**1.89**	(1.25-2.86)	**1.14**	(0.84-1.54)
HUN	15621	90,8	77,7	**1.39**	(1.30-1.49)	**0.85**	(0.76-0.96)	**1.81**	(1.64-2.01)	**3.35**	(2.60-4.32)	**1.60**	(1.30-1.97)
CZR	16816	87,2	63,5	**1.99**	(1.85-2.13)	**1.29**	(1.13-1.46)	**2.52**	(2.29-2.77)	**4.12**	(3.11-5.46)	**1.70**	(1.41-2.07)
POL	27334	65,9	54,3	**1.66**	(1.58-1.75)	**1.24**	(1.14-1.35)	**1.61**	(1.49-1.74)	**5.21**	(4.51-6.02)	**1.68**	(1.47-1.92)
LIT	3003	84,2	66,9	**1.42**	(1.23-1.64)	**1.05**	(0.82-1.35)	**1.08**	(0.86-1.35)	**8.27**	(5.40-12.68)	**1.58**	(1.08-2.31)
EST	2007	66,2	69,3	**1.15**	(0.97-1.36)	**0.96**	(0.73-1.26)	**1.19**	(0.92-1.54)	**4.32**	(2.40-7.76)	**0.84**	(0.52-1.35)

* Adjusted for age and sex
** CI=Confidence interval

Table 6. Numbers of death (N), Age and sex standardized mortality rates (ASMR), and Relative index of inequality (RII) for cardio-respiratory conditions by country

Country	All cardio-respiratory conditions					Hypertension & Cerebrovascular disease		CRHD		Asthma	
	N	ASMR		RII*	95% CI**	RII*	95% CI	RII*	95% CI	RII*	95% CI
		Lower education	Higher education								
FIN	10947	60,1	40,9	**2.40**	(2.20-2.60)	**2.35**	(2.15-2.56)	**2.36**	(1.22-4.57)	**5.13**	(3.04-8.63)
SWE	10883	34,8	22,1	**2.21**	(2.06-2.38)	**2.14**	(1.99-2.31)	**2.48**	(1.50-4.09)	**4.00**	(2.88-5.55)
NOR	6226	37,5	26,2	**3.03**	(2.74-3.35)	**2.69**	(2.42-2.99)	**4.71**	(2.28-9.74)	**7.45**	(5.42-10.23)
DEN	3697	52,6	33,0	**2.25**	(1.97-2.56)	**2.08**	(1.82-2.38)	**3.82**	(3.82-3.82)	**6.19**	(3.61-10.61)
BEL	9971	37,8	28,2	**2.21**	(2.03-2.41)	**2.20**	(2.01-2.41)	**1.24**	(1.24-1.24)	**2.54**	(1.92-3.37)
SWZ	6399	33,0	24,6	**2.59**	(2.34-2.86)	**2.47**	(2.22-2.74)	**3.87**	(1.99-7.52)	**4.03**	(2.81-5.79)
TUR	1964	43,6	36,7	**1.58**	(1.32-1.89)	**1.60**	(1.33-1.92)	**1.56**	(1.56-1.56)	**1.41**	(0.47-4.27)
BAR	2687	37,4	31,1	**1.64**	(1.39-1.93)	**1.53**	(1.29-1.81)	**2.43**	(1.39-4.22)	**3.66**	(1.45-9.23)
MDR	997	33,0	31,1	**1.43**	(1.10-1.86)	**1.21**	(0.91-1.60)	**4.52**	(1.85-11.06)	**3.99**	(0.69-22.95)
BSQ	1372	24,9	26,6	**1.01**	(0.78-1.30)	**1.02**	(0.78-1.33)	**0.79**	(0.32-1.96)	**-**	-
SLO	6647	95,8	64,7	**3.01**	(2.75-3.29)	**3.07**	(2.80-3.38)	**1.97**	(1.27-3.05)	**2.84**	(1.62-5.00)
HUN	23555	161,5	69,8	**6.08**	(5.68-6.52)	**6.12**	(5.70-6.57)	**4.57**	(2.93-7.14)	**6.69**	(3.77-11.90)
CZR	15059	89,5	40,5	**6.02**	(5.53-6.56)	**6.12**	(5.61-6.68)	**3.76**	(2.45-5.78)	**7.29**	(4.02-13.24)
POL	38946	113,2	52,8	**4.57**	(4.36-4.80)	**4.55**	(4.33-4.78)	**4.20**	(3.35-5.27)	**6.90**	(5.05-9.43)
LIT	4501	140,3	82,8	**2.76**	(2.45-3.12)	**2.63**	(2.31-2.99)	**3.91**	(2.52-6.04)	**6.83**	(2.69-17.33)
EST	4645	217,8	121,8	**3.08**	(2.74-3.45)	**3.11**	(2.77-3.50)	**2.11**	(1.14-3.91)	**3.14**	(1.51-6.51)

* Adjusted for age and sex
** CI=Confidence interval

Table 7. Numbers of death (N), Age and sex standardized mortality rates (ASMR), and Relative index of inequality (RII) for group of acute conditions by country

Country	All avoidable acute conditions					Appendicitis, hernia,		Cholecistitis	
	N	ASMR		RII*	95% CI**	RII	95% CI	RII	95% CI
		Lower educatio	Higher educatio						
FIN	1479	9,1	4,38	**5.21**	(4.06-6.67)	**5.28**	(4.05-6.88)	**4.72**	(2.38-9.36)
SWE	1265	5,0	2,6	**3.77**	(3.03-4.68)	**3.82**	(3.02-4.84)	**3.44**	(1.92-6.16)
NOR	597	5,1	3,0	**3.62**	(2.61-5.02)	**3.89**	(2.72-5.56)	**2.46**	(1.09-5.55)
DEN	632	7,0	4,4	**3.28**	(2.36-4.55)	**3.23**	(2.26-4.61)	**3.60**	(1.56-8.30)
BEL	811	4,0	2,39	**3.03**	(2.22-4.14)	**3.02**	(2.13-4.28)	**3.08**	(1.50-6.32)
SWZ	600	3,4	2,14	**3.97**	(2.87-5.50)	**3.94**	(2.76-5.63)	**4.13**	(1.89-9.05)
TUR	170	4,0	1,53	**5.80**	(2.92-11.54)	**-**	-	**-**	-
BAR	210	3,0	2,27	**2.29**	(1.27-4.14)	**2.40**	(1.20-4.83)	**2.03**	(0.67-6.14)
MDR	80	2,6	2,7	**1.98**	(0.77-5.13)	**3.39**	(0.98-11.69)	**-**	-
BSQ	105	1,9	2,4	**1.55**	(0.58-4.09)	**0.92**	(0.30-2.80)	**5.74**	(0.74-44.55)
SLO	626	9,2	6,25	**2.98**	(2.22-4.00)	**3.05**	(2.23-4.18)	**2.50**	(1.09-5.71)
HUN	2086	14,2	6,80	**5.19**	(4.15-6.49)	**5.63**	(4.43-7.17)	**2.81**	(1.56-5.09)
CZR	1438	8,4	3,58	**7.72**	(5.83-10.22)	**7.32**	(5.45-9.82)	**12.29**	(4.84-31.21)
POL	2879	8,6	3,49	**6.64**	(5.53-7.98)	**6.61**	(5.44-8.03)	**6.67**	(3.82-11.62)
LIT	357	13,4	6,88	**2.75**	(1.79-4.22)	**2.99**	(1.87-4.79)	**1.72**	(0.60-4.89)
EST	303	17,2	7,86	**3.36**	(2.13-5.29)	**3.94**	(2.41-6.44)	**1.23**	(0.38-3.98)

* Adjusted for age and sex
** CI=Confidence interval

Table 8. Contribution of causes of death to the difference between low and high educational groups in temporary life expectancy (35-69)

	LE at age 35 for people with lower secondary education or less	**LE at age 35 for people with upper secondary education or higher**	**Δ LE 35-69, in years (days)**	**All avoidable mortality**	**Diseases of infectious origin**	**Malignant diseases**	**Cardio-respiratory conditions**	**Acute conditions**
				Δ LE days (%)*	*Δ LE days (%**)*	*ΔLE days (%**)*	*Δ LE days (%**)*	*Δ LE days (%**)*
FIN	31.95	33.00	1.05 (382)	60 (16)	21 (35)	4 (7)	28 (47)	8 (13)
SWE	32.90	33.57	0.67 (241)	32 (13)	10 (31)	3 (9)	16 (50)	4 (11)
NRW	32.42	33.31	0.88 (322)	46 (14)	8 (17)	9 (19)	27 (59)	3 (6)
DEN	32.52	33.36	0.83 (304)	46 (15)	16 (36)	12 (26)	14 (31)	4 (9)
BEL	32.96	33.50	0.54 (197)	26 (13)	4 (15)	8 (31)	13 (50)	2 (6)
SWZ	32.72	33.23	0.51 (187)	56 (30)	22 (39)	20 (36)	13 (23)	2 (3)
TUR	32.87	33.37	0.50 (182)	33 (18)	5 (16)	12 (36)	14 (43)	2 (7)
BAR	32.71	33.19	0.48 (176)	30 (17)	12 (40)	5 (16)	13 (41)	2 (5)
MDR	32.80	33.12	0.32 (116)	22 (19)	12 (52)	5 (23)	6 (25)	0 (1)
BSQ	33.59	33.76	0.17 (62)	28 (45)	32 (116)	-2 (-6)	-3 (-9)	0 (0)
SLO	31.78	32.61	0.84 (315)	79 (26)	16 (20)	13 (16)	46 (58)	6 (7)
HUN	29.86	32.46	2.59 (947)	172 (18)	21 (12)	18 (10)	125 (73)	13 (8)
CZR	31.58	33.30	1.72 (629)	117 (19)	20 (17)	33 (28)	59 (50)	8 (7)
POL	30.78	33.02	2.24 (816)	128 (16)	27 (21)	17 (13)	79 (61)	8 (7)
LIT	26.56	31.63	5.07 (1849)	365 (20)	219 (60)	48 (13)	96 (26)	15 (4)
EST	27.28	31.16	3.88 (1418)	328 (23)	165 (50)	2 (1)	152 (46)	21 (6)

LE – Observed life expectancy
Δ LE – Difference in life expectancy between the higher and lower educated groups
* % from the total mortality
** % from all avoidable mortality

Chapter 9

Socio-economic inequalities in diabetes mellitus across Europe at the turn of the century

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Abstract

Background
To determine and quantify socioeconomic position (SEP) inequalities in diabetes mellitus in different areas of Europe at the turn of the century for men and women aged 30 to 74 years old.

Method
It is a study that combines cross-sectional European health surveys and longitudinal mortality registers of Europe. This study is part of European project, *Tackling Health Inequalities in Europe* (EUROTHINE). We analysed 10 representative national health surveys and 14 mortality European registers. For national health surveys the dependent variable is to have diabetes and for mortality registers the dependent variable is to die for diabetes. The independent variable is educational level (SEP) for both cases. Age-adjusted Prevalence Ratio (PR) and Relative Risk (RR) by SEP were obtained through Binomial and Poisson regression models.

Results
In all the countries, low educational level is related with having diabetes. The inequalities by educational level are greater in women than in men. For example in Italy men with less than primary studies have a PR of 1,7 (IC95%: 1.3-2.2) compared to those of higher educational level, whereas in women the PR is of 3,0 (IC95%: 2.0-4.7). In all countries, having a disadvantaged SEP is related to a higher mortality from diabetes and also it can be appreciated a relationship with educational level, increasing mortality as SEP decreases. In mortality the effect of gender seems to be important as in the majority of countries women have more socioeconomic inequalities by diabetes mortality. The RR of dying from diabetes in women in low SEP from all the countries is 3.46 (95% CI: 2.61, 4.56) while in men is 2.03 (95% CI: 1.73, 2.38). Finally, it was observed that in women these inequalities are more accentuated in Eastern countries.

Conclusions
Important inequalities were found in the mortality and morbidity by diabetes according to educational level in most areas of the European Union. The reduction of these inequalities in diabetes should be a priority of the policies of health of Europe.

Introduction

Diabetes mellitus is one of the most important health problems world-wide, because of its high prevalence. In the year 2000 there were 171 millions of people aged 20 or older with diabetes (1), and in 2003 it was the eight cause of dead in developed countries (2). Moreover the economic cost of this disease is very high (3,4). Diabetes is an important risk factor for several causes of death. In different studies it has been observed that the majority of people who have diabetes are at higher risk for dying than people who do not have it (5,6). The majority of deaths are attributable to complications of the diabetes when patients are 30 years or older (7). The St Vincent declaration references the need and urgency for improving the epidemiological knowledge in each European country in order to establish strategies for diminishing prevalence of diabetes and its complications and negative outcomes like mortality (8).

The concept of health inequality refers to differences in health opportunities of people from different social classes, gender, race or territory (9). Several studies in Europe have analysed the relationship between socioeconomic inequalities and chronic diseases (10-12) or mortality (10,13-15) and an association between health and socioeconomic position (SEP) has been found: among populations of disadvantaged socioeconomic positions health indicators are worse.

There are some studies that found that the risk to have diabetes mellitus is associated with a disadvantaged SEP in developed countries as well as in developing countries (16,17). This association was found in some diabetes morbidity studies (10,17-20) and in some diabetes mortality studies (21-23). Recent studies have found that this association is caused in part by health behaviours and obesity (18,24-26). In this sense, cigarette smoking is associated with low glomerular filtration rate (24) and dietary patterns may influence the risk of type 2 diabetes (25) and these health behaviours, as well as obesity, are related with socioeconomic position (27,28).

The majority of studies that analyse the relationship between diabetes and SEP are carried out in one country (16,17,19-23) and those that compare the inequalities for SEP among different countries include several chronic diseases and, therefore, are not focussed only in diabetes (10). As far as we know there are no studies that analyse socioeconomic inequalities in prevalence and mortality by diabetes in different areas of Europe. With this study we pretend to determine and quantify SEP inequalities in diabetes mellitus in different settings of Europe at the turn of the century for men and women aged 30 to 79 years.

Methods

Design, population studied and sources of information

It is study that combines cross-sectional European health surveys and longitudinal mortality registers from different areas of Europe. The population studied was men and women residents in the selected countries aged 30-64 years in the morbidity study (National health surveys) and aged 30-74 years in mortality study (Mortality registers). This study is part of a European project, *Tackling Health Inequalities in Europe* (EUROTHINE). The overall aim of this project is to facilitate such mutual learning by collecting and analysing information from different European countries that will help policy-makers at the European and national level to develop rational strategies for tackling socioeconomic inequalities in health. A national health surveys dataset, joining variables of national health surveys, was created as well as a mortality dataset joining variables of mortality registers of different settings of Europe (harmonized files). We analysed 10 representative European national health surveys in some years around 2000 (Spain, Italy, Belgium, Switzerland, Finland, Denmark, Norway, Czech Republic, Lithuania and Estonia) and 13 mortality European registers around 2000 (Barcelona, Turin, Belgium, Switzerland, Sweden, Finland, Denmark, Norway, Slovenia, Poland, Czech Republic, Lithuania and Estonia).

The surveys include samples representative of each country. Ten mortality registers were linked with the census. Year of surveys, years of mortality registers and linked and unlinked mortality registers are shown in table 1.

Variables

-Dependent Variables:
Diabetes morbidity: the dependent variable was the declaration of having diabetes. This variable was built from questions about diabetes in each country. The categories of harmonized files of this variable are 1”currently yes” 2”currently no”.
Diabetes mortality: dependent variable is the number of deaths for diabetes. The underlying cause of death was coded by the International Classification of Disease 9th (ICD-9) and the International Classification of Disease 10th (ICD-10) depending on the country and the year, being the codes for ICD-9: 250 and ICD-10: E10-E14.
-Independent Variables:
Sex: Men and women.
Age: Age was a categorical variable (groups of 5 years).
Country: For national health surveys we analysed 10 settings and for mortality registers 13 countries (see table 1).
Educational level as a measure of SEP: For national health surveys and for mortality registers educational level was measured as the highest level of education that was completed by the subject. It was coded using the International Standard Classification of Education (ISCED) which was designed by UNESCO and it is an instrument suitable for assembling, compiling and presenting statistics of education both within individual countries and internationally. The categories were: Lower than secondary (ISCED 1-2), secondary (ISCED 3) and tertiary (ISCED 4-5-6).

Data analysis

For national health surveys, if it was necessary, a weight was used to take into account the sample design of that country. All the analyses were done separately for men and women (29) and for each country. First of all, we described all the variables for European health surveys and for mortality registers. Second, we calculated prevalence and mortality rates age-standardized by the direct method using the whole sample for 10 (health national surveys) and 13 (mortality registers) countries as standard population.

For diabetes morbidity, Binomial regression models were adjusted to show the association between diabetes and educational level and age in each country. The associations with educational level are presented as age adjusted Prevalence Ratios (PR) and 95% confidence intervals (95%CI).

For diabetes mortality, Poisson regression models were adjusted to show the association between mortality rates and educational level and age in each country. The associations with educational level are presented as age adjusted Relative Risk (RR) and 95% confidence intervals (95%CI). To know the difference in incidence mortality rates from diabetes between low than secondary and tertiary and upper than secondary educational level it has been calculated attributable risks (AR).

Finally, a Binomial regression and a Poisson regression model were adjusted to show the association between diabetes (morbidity and mortality) and educational level in all the countries together.

Results

In table 1 it is shown a description of the morbidity datasets (national health surveys) and a description of the mortality register in each country for both men and women. Regarding morbidity, it can be observed that in both men and women the distribution of educational level varies according to the country. Spain is the country with more percentage of individuals with studies lower than secondary education (63.1% in men and 71.3% in women) and Sweden one of the countries with highest proportion of individuals with high educational level (30.7% in men and 34.8% in women). Finally it can be observed that missing values of educational level are less than 4%. The majority of deaths had disadvantaged SEP. For example in Denmark 91.6% of men and 94.3% of women who died for diabetes are individuals with a low educational level. In general, missing values of educational level are below 10%.

Morbidity from diabetes is described in table 2. In all countries, having a disadvantage SEP is related to a higher prevalence of diabetes. In the majority of the countries, people with an advantaged SEP have a prevalence of diabetes around 3% (the rank fluctuates between 1.5 and 5.4 in men and 0.6 and 4.1 in women), while people with a disadvantaged SEP have a higher prevalence, around 5% (the rank fluctuates 2.5-8.5 in men and 2.7-8.8 in women). Inequalities in SEP are bigger in women than in men. In men, the majority of countries have weak associations between SEP and diabetes while in women these associations are clearer. Finally it can be observed that in women as well as in men these differences are more accentuated in Western countries.

Mortality from diabetes is shown in table 3. In all countries, having a disadvantaged SEP is related to a higher mortality from diabetes and also it can be appreciated a gradient with educational level, increasing mortality as SEP decreases. The RR of dying from diabetes is significantly higher in both men and women with low SEP than those with high SEP for the majority of countries. The effect of gender seems to be very important as in the majority of countries women have more socioeconomic inequalities by diabetes mortality. The RR of dying from diabetes in women with low SEP from all the countries is 3.46 (95% CI: 2.64, 4.52) while in men is 2.02 (95% CI: 1.74, 2.36). Finally, it seems to be remarkable that in Eastern countries socioeconomic inequalities by diabetes mortality in women are bigger than in Western countries. For example, the RR of dying from diabetes in women from the Czech Republic is 7.82 (95% CI: 3.27, 18.72) for those with low SEP, while in Sweden this RR is 2.89 (95% CI: 2.19, 3.81).

If the data of all the countries are analysed together it is appreciable that both mortality and morbidity in men and women are unequal according to educational level (figure 1).

Discussion

The four main findings of this study are: one, inequalities in morbidity and mortality in diabetes mellitus by educational level are present in all countries, two, the inequalities in diabetes prevalence are smaller than inequalities in diabetes mortality according to SEP, three, we could appreciate that SEP inequalities in mortality are higher among women than among men and in Eastern countries for women, and finally, inequalities in diabetes morbidity seems to be more similar between men and women than inequalities in mortality across the countries.

Limitations

The data of this study have several limitations it is necessary to highlight. First of all, as we have mentioned before, some Eastern countries do not have a linkage between mortality and the census, becoming the possibility of a numerator/denominator bias if the information of educational level of the death certificate and of the census do not agree. This bias could exist but it seems unlikely as there is not different pattern in SEP inequalities in Eastern countries. For this reason and because there are few studies that analyse socioeconomic inequalities in diabetes in eastern countries, we think it is important to keep them in the study.

Another limitation of this study is the sub-register of diabetes as a cause of death and the different magnitude of this sub-register among countries (30) or self-reported diabetes. The former would not be important in detecting socioeconomic inequalities because we do not have any evidence that this sub-register is differential by SEP. Respect to the declaration of diabetes in health interview surveys, some studies conclude that educational differences in misreporting of diabetes were small or absent (31). Moreover diabetes health surveys only report diagnosed diabetes, which only represents 50% of total diabetes. Recently one study concludes that socioeconomic status, as measured by education, is not associated with having undiagnosed diabetes(32). Finally, it is worth mentioning that we couldn't calculate attributable risks in diabetes morbidity because the questions of the surveys were not strictly comparable (33).

Strengths

An strength of this paper is to have presented socioeconomic inequalities in 10 countries of Europe for diabetes morbidity and 14 countries for diabetes mortality. This study is the first one that compares SEP inequalities in diabetes morbidity and mortality in several European settings. Previous studies focussed only in one country. This study will be useful to design strategies to reduce health inequalities in Europe. Is important to know how diabetes inequalities are present in Western countries and it has special interest diabetes in Eastern countries because in these places diabetes have been less studied.

Inequalities in diabetes morbidity and mortality in Europe

There are some studies that analysed diabetes prevalence world-wide. Wild et al esteem that in year 2000 the diabetes prevalence was 2.8% and in 2030 will be around 4.4% (1) this data are in accordance with our results. Moreover, Wild described that the worst health indicators are more accentuated in disadvantaged social classes. In our case we could see a socioeconomic health gradient in each country and in all the countries together. In accordance with other studies we have found that diabetes morbidity is associated with having a disadvantaged SEP (10,12,16-20). Previous studies that have analysed inequalities in diabetes mortality also have found that people with lower socioeconomic position have more risk to die due to diabetes (21-23). However, diabetes morbidity and mortality inequalities change across the countries, probably depending on characteristics of the community (accessibility of healthy foods, access to places to exercise and neighbourhood safety, transportation and environmental exposures) and the country (welfare state, labour force, power resources and socioeconomic inequalities and wealth) like it has been described in studies focussing on diabetes (18) and in other studies focussing in other health outcomes (34,35). As it is described in Goday's review, diabetes mellitus is more present in societies that haven't traditional live-styles or that have become industrialized in a relatively short period of time (36). In accordance with King et al we found that Eastern countries have bigger diabetes mortality inequalities by educational level (37) but this does not occur for diabetes morbidity.

We have found that SEP inequalities in diabetes were higher among women than among men. Some studies found that socioeconomic inequalities in prevalence of common chronic diseases, among them diabetes, are more accentuated in women than in men (10,38,39). This study gives support to these findings. Recent studies found similar results in diabetes mortality (38,40). This different pattern found among women can be explained by the existence of inequalities in health behaviours, because people of disadvantage SEP has higher prevalences of obesity, of lower physical activity and of high psychosocial risks, being these inequalities higher among women than among men (39,41-44). Cavelaars et al found that SEP inequalities in obesity in some countries of Europe were higher among women (45). These inequalities could explain, partially, the different pattern of SEP inequalities found for men and women in this study. In accordance with our study, Steenland et al found in the United States, that men died more from diabetes mellitus than women during the period 1984-1997. However, their results were in discordance with ours because they found more inequalities by socioeconomic position in men than in women (46). The temporal difference between their and our study could partly explain these discordant results, as during the 80^s and 90^s there have been changes by SEP in some health behaviours that are highly related with diabetes morbidity and diabetes mortality, such as smoking, obesity and physical activity (18,41-43,47,48).

Conclusions and recommendations

In this study we have found important socioeconomic inequalities in diabetes morbidity and mortality. The reduction of inequalities in diabetes has to be a priority of health policies in Europe, because of its rises in morbidity and in mortality rates. For this reason it would be interesting to undertake another study including contextual variables to determine how country characteristics affect diabetes morbidity and mortality and socioeconomic inequalities across different countries.

The knowledge of how inequalities in diabetes mellitus change between countries can be useful to implement policies to reduce the incidence of the disease and to control the mortality associated with diabetes mellitus in equal way for all the population. Moreover, it may be helpful to evaluate the impact of different public policies focussed to diminish social class inequalities in diabetes.

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Table 1: Characteristics of the health surveys (year, sample size and distribution of educational level) and of mortality registers (years of register, person at risk, mortality by diabetes, distribution of educational level in diabetes mortality). Men and women in 15 Europe settings

	NATIONAL HEALTH SURVEYS[1]							MORTALITY REGISTERS							
Men	Years survey	Surveys sample size	Tertiary education	Upper secondary	Lower secondary	Total	Missing values of SEP	Years Register	Persons at risk (census data)	N mortality	Tertiary education of deaths	Upper secondary of deaths	Lower secondary of deaths	Total deaths	Missing value of SEP deaths
		Number of cases	%	%	%	%	%		N*year	Number of cases	%	%	%	%	%
Barcelona[a]								92-01	3,690,860	845	9.8	9.1	76.4	100	4.4
Turin[b]	99/00	33,219	8.9	31.7	59.3	100	-	91-01	2,261,987	522	6.3	10.5	83.1	100	-
Belgium[b]	97/01	5,353	31.1	30.7	38.2	100	3.09	91-95	11,500,000	1371	6.3	11.0	73.2	100	8.7
Switzerland[b]								90-00	12,900,000	3314	11.9	48.7	39.4	100	0.1
Sweden[b]	00/01	3,318	30.7	50.7	18.6	100	0.09	91-00	21,200,000	4339	7.4	8.7	81.1	100	2.7
Finland[b]	94/98/00/02/04	7,123	18.6	50.4	31.0	100	1.84	90-00	12,400,000	1639	10.5	20.1	69.4	100	-
Denmark[b]	00	4,976	21.7	60.1	18.2	100	0.94	96-00	6,893,050	1841	2.1	6.4	91.6	100	-
Norway[b]	02	2,143	29.7	58.1	12.3	100	1.12	90-00	9,760,897	1676	9.2	37.8	50.5	100	2.5
Slovenia[b]								91-00	4,550,897	1242	9.2	43.2	45.9	100	1.7
Poland[c]								01-03	28,200,000	4061	4.9	19.5	75.0	100	0.6
Czech Rep[c]	02	666	16.8	27.4	55.8	100	-	99-03	12,300,000	1577	2.0	13.5	84.4	100	0.1
Lithuania[c]	94/98/00/02/04	3,274	16.4	33.7	49.8	100	1.80	00-02	2,554,194	271	7.7	46.7	45.2	100	0.4
Estonia[c]	02/04	1,208	16.8	36.3	46.9	100	0.17	98-02	1,645,595	200	11.5	48.0	40.5	100	-

	NATIONAL HEALTH SURVEYS[1]							MORTALITY REGISTERS							
Women	Years survey	Surveys sample size	Tertiary education	Lower secondary	Upper secondary	Total	Missing values of SEP	Years Register	Persons at risk (census data)	N mortality	Tertiary education of deaths	Upper secondary of deaths	Lower secondary of deaths	Total deaths	Missing value of SEP deaths
		Number of cases	%	%	%	%	%		N*year	Number of cases	%	%	%		
Barcelona[a]								92-01	4,460,950	733	2,3	3,5	86,2	100	7,4
Turin[b]	99/00	34,325	8.3	29.9	61.8	100	-	91-01	2,611,159	500	1,2	4,6	94,2	100	-
Belgium[b]	97/01	5,342	30.1	29.0	40.9	100	3.56	91-95	12,100,000	1592	2,6	4,9	84,5	100	7,4
Switzerland[b]								90-00	15,000,000	3073	1,7	27,5	70,7	100	0,1
Sweden[b]	00/01	3,470	34.8	50.0	15.2	100	0.03	91-00	21,900,000	2959	3,9	2,0	91,1	100	2,9
Finland[b]	94/98/00/02/04	8,097	21.5	54.0	24.5	100	1.78	90-00	13,500,000	1759	4,1	11,9	84,0	100	-
Denmark[b]	00	5,027	22.5	56.7	20.8	100	0.86	96-00	7,033,276	1106	0,9	4,8	94,3	100	-
Norway[b]	02	2,064	31.9	54.0	14.1	100	1.41	90-00	10,200,000	1338	3,8	27,5	67,4	100	1,3
Slovenia[b]								91-00	5,096,571	1560	0,9	17,8	79,1	100	2,1
Poland[c]								01-03	30,900,000	4179	1,8	13,9	83,8	100	0,5
Czech Rep[c]	02	716	13.7	35.2	51.0	100	-	99-03	13,300,000	1452	0,1	8,5	91,4	100	-
Lithuania[c]	94/98/00/02/04	4,283	19.1	40.2	40.6	100	1.26	00-02	3,073,899	300	1,7	32,3	66,0	100	-
Estonia[c]	02/04	1,783	22.2	39.5	38.3	100	0.45	98-02	2,038,455	267	4,5	42,2	53,0	100	0,4

1 aged 30-64 [2] aged 30-74 / [a]Cross-Sectional linked [b]Longitudinal [c]Cross-sectional Unlinked

Table 2: Age-standardized prevalence in % and prevalence ratio of diabetes by educational level for age group. Men and women 30-64 years of age, 10 European settings

MEN	Prevalence (95%CI)			Prevalence Ratio (95% CI)		
	Tertiary education	Upper secondary	Lower secondary	r	Upper secondary	Lower secondary
Spain	2.7 (1.6, 3.8)	1.8 (1.0, 2.5)	4.9 (4.2, 5.6)	1	0.7 (0.4, 1.3)	1.3 (0.8, 1.9)
Italy	1.9 (1.4, 2.3)	2.2 (1.9, 2.5)	4.3 (4.1, 4.6)	1	1.3 (1.0, 1.8)	**1.7 (1.3, 2.2)**
Belgium	1.5 (0.9, 2.1)	2.1 (1.4, 2.8)	4.4 (3.5, 5.3)	1	1.4 (0.8, 2.3)	**2.2 (1.4, 3.5)**
Sweden	1.8 (1.0, 2.6)	2.4 (1.7, 3.1)	4.7 (3.0, 6.4)	1	1.3 (0.8, 2.3)	1.9 (1.0, 3.5)
Finland	2.7 (1.8, 3.6)	3.1 (2.5, 3.7)	5.5 (4.6, 6.5)	1	1.1 (0.8, 1.6)	1.3 (0.9, 2.0)
Denmark	1.8 (0.9, 2.6)	2.4 (1.8, 2.9)	3.5 (2.2, 4.8)	1	1.3 (0.7, 2.1)	1.7 (0.9, 3.1)
Norway	1.9 (0.8, 3.0)	3.0 (2.1, 4.0)	6.9 (3.8, 10.0)	1	1.6 (0.8, 3.0)	**3.2 (1.6, 6.4)**
Czech Rep	5.4 (1.2, 9.5)	4.4 (1.4, 7.4)	8.5 (5.5, 11.2)	1	0.7 (0.3, 2.0)	1.2 (0.5, 2.8)
Lithuania	3.2 (1.7, 4.7)	1.8 (1.0, 2.6)	2.5 (1.7, 3.3)	1	0.7 (0.3, 1.2)	0.7 (0.4, 1.2)
Estonia	2.0 (0.1, 3.9)	3.0 (1.4, 4.6)	5.3 (3.5, 7.2)	1	1.7 (0.6, 5.2)	2.3 (0.8, 6.5)

WOMEN	Prevalence (95%CI)			Prevalence Ratio (95%CI)		
	Tertiary education	Upper secondary	Lower secondary	r	Upper secondary	Lower secondary
Spain	1.1 (0.3, 1.8)	0.8 (0.2, 1.4)	5.1 (4.5, 5.8)	1	0.8 (0.3, 2.1)	**2.7 (1.3, 5.5)**
Italy	0.7 (0.4, 1.0)	1.0 (0.8, 1.2)	3.9 (3.6, 4.1)	1	1.4 (0.9, 2.3)	**3.0 (2.0, 4.7)**
Belgium	1.2 (0.7, 1.8)	2.0 (1.3, 2.7)	4.6 (3.7, 5.5)	1	1.5 (0.9, 2.7)	**2.7 (1.7, 4.5)**
Sweden	0.6 (0.2, 1.0)	1.7 (1.1, 2.3)	2.7 (1.3, 4.0)	1	**2.6 (1.2, 6.0)**	**2.7 (1.1, 6.8)**
Finland	1.3 (0.8, 1.9)	2.2 (1.8, 2.7)	3.9 (3.0, 4.7)	1	1.5 (0.9, 2.3)	**1.8 (1.1, 2.9)**
Denmark	1.3 (0.6, 2.0)	1.6 (1.1, 2.1)	3.5 (2.4, 4.7)	1	1.2 (0.6, 2.2)	1.9 (1.0, 3.7)
Norway	1.5 (0.6, 2.5)	3.0 (2.0, 4.0)	4.9 (2.4, 7.4)	1	1.8 (0.9, 3.5)	2.2 (1.0, 5.0)
Czech Rep	4.1 (0.2, 8.0)	2.0 (0.3, 3.7)	8.8 (5.9, 11.7)	1	0.5 (0.1, 1.7)	1.5 (0.6, 4.3)
Lithuania	1.2 (0.5, 2.0)	1.5 (0.9, 2.0)	3.1 (2.3, 4.0)	1	1.3 (0.6, 2.6)	1.5 (0.8, 2.9)
Estonia	4.1 (2.1, 6.0)	5.7 (4.0, 7.4)	8.2 (6.2, 10.3)	1	1.5 (0.8, 2.6)	1.7 (1.0, 2.9)

[1]reference category: Tertiary education

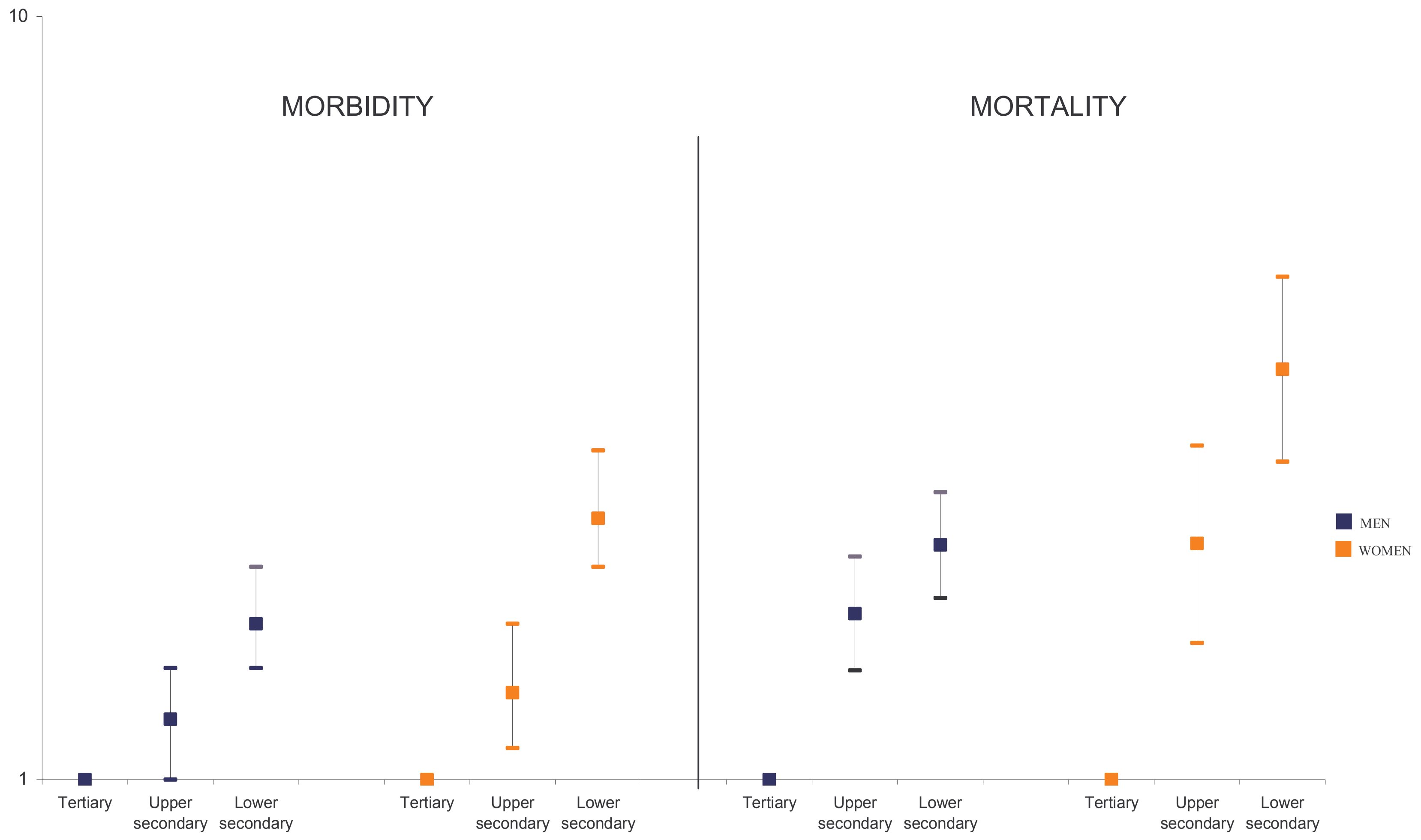
Table 3: Age-standardized diabetes mortality rate x 100,000 habitants, Attributable Risk x 100,000 respect to tertiary education and Relative Risk for all ages. Men and women 30-74 years of age, 14 European settings.

MEN	**Mortality Rate**			**Attributable Risk**			**Relative Risk (95% CI)**	
	Tertiary education	Upper secondary	Lower secondary	Upper secondary	Lower secondary	r[1]	Upper secondary	Lower secondary
Barcelona	17.8	18.1	24.1	0.3	6.3	1	1.03 (0.76,1.39)	**1.38 (1.10,1.72)**
Turin	19.1	17.1	27.1	-2.0	8.0	1	0.96 (0.62,1.48)	**1.48 (1.04,2.10)**
Belgium	7.7	10.0	14.4	2.3	6.7	1	1.29 (1.00,1.66)	**1.93 (1.56,2.38)**
Switzerland	17.5	26.8	37.9	9.3	20.4	1	**1.58 (1.36,1.82)**	**2.17 (1.86,2.52)**
Sweden	11.4	14.6	23.9	3.2	12.5	1	**1.34 (1.06,1.68)**	**2.20 (1.84,2.63)**
Finland	9.6	14.4	18.3	4.8	8.7	1	**1.63 (1.21,2.21)**	**1.97 (1.51,2.57)**
Denmark	10.6	18.6	32.3	8.0	21.7	1	1.63 (0.98,2.70)	**2.96 (1.90,4.61)**
Norway	11.0	16.4	24.0	5.4	13.0	1	**1.57 (1.32,1.87)**	**2.23 (1.88,2.65)**
Slovenia	35.9	44.0	40.3	8.1	4.4	1	**1.32 (1.01,1.73)**	1.27 (0.97,1.66)
Poland	7.0	12.9	18.5	5.9	11.5	1	**1.84 (1.33,2.53)**	**2.71 (2.02,3.65)**
Czech Rep	3.2	7.7	16.6	4.5	13.4	1	2.42 (0.82,7.12)	**5.18 (1.92,13.96)**
Lithuania	6.3	12.7	12.4	6.4	6.1	1	**2.20 (1.25,3.89)**	**1.96 (1.10,3.49)**
Estonia	8.8	14.3	14.9	5.5	6.1	1	1.60 (0.79,3.24)	1.46 (0.70,3.01)
TOTAL	11.1	17.7	21.7	6.6	10.6	1	**1.64 (1.39,1.96)**	**2.03 (1.73,2.38)**

WOMEN	**Mortality Rate**			**Attributable Risk**			**Relative Risk (95% CI)**	
	Tertiary education	Upper secondary	Lower secondary	Upper secondary	Lower secondary	r[1]	Upper secondary	Lower secondary
Barcelona	5.8	7.5	14.3	1.7	8.5	1	1.38 (0.76,2.49)	**2.51 (1.57,4.01)**
Turin	7.0	8.0	19.0	1.0	12.0	1	1.37 (0.41,4.56)	**3.15 (1.07,9.27)**
Belgium	4.8	5.9	13.9	1.1	9.1	1	1.20 (0.56,2.59)	**2.75 (1.46,5.18)**
Switzerland	8.1	13.8	23.8	5.7	15.7	1	1.66 (1.26,2.20)	**2.89 (2.19,3.81)**
Sweden	4.6	7.1	13.4	2.5	8.8	1	1.57 (0.72,3.41)	**3.00 (1.89,4.78)**
Finland	4.9	8.8	15.6	3.9	10.7	1	1.75 (0.82,3.73)	**2.92 (1.48,5.75)**
Denmark	6.9	7.6	16.7	0.7	9.8	1	0.85 (0.28,2.61)	1.96 (0.70,5.50)
Norway	5.4	8.8	15.5	3.4	10.1	1	**1.69 (1.15,2.47)**	**2.89 (1.99,4.20)**
Slovenia	8.4	27.8	36.7	19.4	28.3	1	**3.27 (1.52,7.05)**	**4.28 (2.01,9.10)**
Poland	3.8	6.9	15.8	3.1	12.0	1	**2.01 (1.33,3.05)**	**4.64 (3.12,6.90)**
Czech Rep	1.5	4.9	11.0	3.4	9.5	1	**3.32 (1.35,8.18)**	**7.82 (3.27,18.72)**
Lithuania	1.1	7.8	15.9	6.7	14.8	1	**6.61 (1.66,26.36)**	**10.65 (2.68,42.41)**
Estonia	3.6	11.1	16.4	7.5	12.8	1	**3.19 (1.76,5.79)**	**4.10 (2.26,7.46)**
TOTAL	4.6	9.4	15.9	4.8	11.3	1	**2.03 (1.51,2.74)**	**3.46 (2.61,4.56)**

[1]reference category: Tertiary education

Figure 1: Prevalence Ratio and Relative Risk of diabetes by educational level age-adjusted. Men and women in all European settings.



Part III

Self-reported health; welfare regimes

Chapter 10

Health inequalities according to educational level in different welfare regimes: a comparison of 23 European countries

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Abstract

Socio-economic inequalities in health are substantial in advanced industrial societies. The object of this study was to determine whether the magnitude of educational health inequalities varies between European countries with different welfare regimes. The data source is based on the first and second wave of the European Social Survey (ESS), comprising more than 80,000 respondents. Two health indicators were applied. The first describes people's mental and physical health in general, while the second reports cases of any limiting longstanding illness. Educational inequalities in health were measured as the difference in health between people with average number of years of education and people whose educational years lay one standard deviation below the national average. South European welfare regimes had the largest health inequalities (with an exception of the rate difference for limiting longstanding illness), while countries with Bismarckian welfare regimes tended to demonstrate the smallest. Although the other welfare regimes ranked relatively close to each other, the Scandinavian welfare regimes were placed less favourably than the Anglo-Saxon and East European. Thus, this study showed an evident patterning of magnitudes of health inequalities according to features of European welfare regimes. Although the greater distribution of welfare benefits within the Scandinavian countries are likely to have a protective effect for disadvantaged in these countries, other factors such as relative deprivation and class patterned health behaviours might be acting to widen disparities in health.

Introduction

Recent studies using data collected in national health surveys or national longitudinal mortality studies have indicated that considerable socio-economic inequalities in morbidity and mortality are present across Europe [1-13]. Rather surprisingly, given that their overall population health is amongst the best in the world, countries that emphasise egalitarian principles, such as Sweden and Norway, do not seem to offer any exceptions in this respect. This has generated public debate and political mobilization within the Social Democratic welfare states, as well as extensive discussion as to how social inequalities in health should be tackled and measured [14]. This also leaves open to question to what extent socio-economic inequalities in health in European countries are related to the type of welfare state. Previous studies have shown that overall population health differs substantially by welfare regime [15-18]. Therefore, in this study we examine whether the magnitude of socio-economic inequalities (assessed using the proxy measure of educational level) in self-assessed health varies by welfare regime. Specifically, we examine the following two hypotheses:

(1) Different types of welfare regimes are associated with differences in overall levels of health, and relative and absolute health inequalities.
(2) The cross-national variation in health and inequalities in health is smaller *within* specific welfare regimes than *between* different welfare regimes.

Educational inequalities in health in Europe

People with lower educational attainment have poorer self-reported health, higher rates of infectious disease and shorter life expectancy than the better educated [19-21]. Although people's socioeconomic position may be more accurately expressed by occupation or income, we might argue that education lies at the heart of people's position in society because it is a fundamental determinant of both occupation and income [22, 23]. Education is a widely applied measure of socioeconomic position and reflects people's material and non-material resources and shapes the likelihood of being unemployed [5]. Within Europe, the size of educational inequalities in health varies, and it has been shown that health inequalities by educational level are relatively large in the welfare states of Sweden, Norway and Denmark, while inequalities in Spain, Switzerland and West Germany are smaller. Intermediate positions have been observed for Finland, UK, France, and Italy [1]. A Finnish study comparing the Nordic welfare states, found that educational health inequalities in 1994 were largest in Norway [13]. More recent international studies have also documented that the size of educational health inequalities varies between countries [4, 5]. However, no study has yet specifically tested differences in inequalities in health between countries according to welfare regime theory.

Welfare regimes

In the *Three Worlds of Welfare Capitalism* [24], Esping-Andersen presents the first serious attempt to classify welfare states. His typology is based upon the operationalization of three principles: decommodification (the extent to which an individual's welfare is reliant upon the market), social stratification (the role of welfare states in maintaining or breaking down social stratification), and the private-public mix (the relative roles of the state, the family and the market in welfare provision). The application of these principles leads to the division of welfare states into three ideal regime types (Figure 1): Liberal, Conservative, and Social Democratic. The modal examples of the three regimes are USA (Liberal), Germany (Conservative), and Sweden (Social Democratic). In the Liberal regime countries, state provision of welfare is minimal, benefits are modest and often attract strict entitlement criteria, and recipients are usually means-tested and stigmatized [24]. The Conservative welfare state regime is distinguished by its 'status differentiating' welfare programs in which benefits are often earnings related, administered through the employer, and geared towards maintaining existing social patterns. The role of the family is also emphasized and the redistributive impact is minimal [24]. The Social Democratic regime is the smallest regime cluster. Welfare provision is characterized by universal and comparatively generous benefits, a commitment to full employment and income protection, and a strongly interventionist state used to promote equality through a redistributive social security system.

There has been extensive scholarly debate about the theoretical and empirical value of the Three Worlds [25]. Numerous critiques exist about the range of countries and regimes most notably the misclassification of the Southern European welfare states as immature Conservative ones or placing the Antipodean welfare states in the Liberal regime [17, 26-29]; the absence of gender in the typology [30-32]; the methodology; the analytical focus on cash benefits [33-37], and the creation of regimes that generalize about all forms of social policy provision from this base [35, 36, 38].

As a result of this criticism, modified or alternative typologies have been proposed by others [17, 26-29, 35, 39-41], most of which place emphasis on those characteristics of welfare states not extensively examined by Esping-Andersen. The welfare ideal-types of Esping-Andersen have also been tested empirically [42-46]. Although the findings were not totally consistent, the major concern was that Esping-Andersen's typology does not fully capture country range and variation and that therefore, the insertion of a fourth 'Southern European' regime is required [26, 28, 29, 43]. However, we have yet to see a new categorisation, which has been generally accepted as the new standard typology of welfare regimes, although Ferrera's four-fold typology has been highlighted as one of the most accurate [43]. Ferrera focuses on different dimensions of how social benefits are granted and organised, and makes a distinction between the Scandinavian (Social Democratic), Anglo-Saxon (Liberal), Bismarckian (Conservative) and Southern countries (Figure 1). Although there are clear similarities between Ferrera's and Esping-Andersen's typologies, Ferrera's classification is intended to account for differences in the way welfare is delivered whilst Esping-Andersen's still tends to emphasise the quantity of welfare provided [26, 43]. In this way, the additional Southern regime is characterised by a fragmented system of welfare provision which consists of diverse income maintenance schemes that range from the meagre to the generous and a health care system that provides only limited and partial coverage. There is also a strong reliance on the family and charitable sector [28].

One new challenge to conventional welfare regime typologies concerns the Eastern European countries (Czech Republic, Estonia, Hungary, Poland, Slovakia, and Slovenia). According to Esping-Andersen [47], these countries comprise clearly the most under defined and understudied region. These countries have experienced extensive economic upheaval and have undertaken comprehensive social reforms throughout the 1990s [48]. They have emphasised the Liberal regime approaches of marketisation, decentralization and the reform of health insurance schemes [49]. In comparison with the other member states of the European Union, they have limited health service provision and overall population health is relatively poor. It will therefore be interesting to see how these countries rank in comparison to more established Western European welfare states.

Our study utilises survey data from 23 European countries, which we categorise into five regimes based upon Ferrera's [28] classification, plus an additional category for Eastern Europe (Table 1).

Data and Methods

This study was conducted as part of the European Union funded 'Tackling Health Inequalities in Europe (Eurothine)' project [50]. It is based on data from the first and second wave of the European Social Survey (ESS), fielded in 2002 and 2004, comprising more than 80,000 respondents in 23 countries. The main objective of the ESS is to provide high quality data over time about changing social attitudes and values in Europe. The data and extensive documentation are freely available for downloading at the Norwegian Social Science Data Services (NSD) web site [51]. A total number of 77805 respondents were available in the sample after deleting cases listwise by each variable in our analysis. It should be noted that we have data for only one year with respect to Italy, Slovakia, and Estonia, which makes the sample size smaller in these countries compared to the others, as shown in Table 1. Response percentages are also given in Table 1. Most countries have a sufficient response, but we are left with some uncertainty regarding the low response percentage of Switzerland in the first ESS-round (33.5 %). Another methodological issue is that our sample comes from two sweeps of the ESS. We therefore tested the effect of combining these data by means of a sensitivity analysis. This analysis (not shown in tables) showed that our main results could be replicated on the basis of each survey separately.

We used both indicators of morbidity available in the ESS: self reported general health and limiting longstanding illness. Self reported general health was constructed from a variable asking; 'How is your (physical and mental) health in general?'. Eligible responses were 'very good', 'good', 'fair', 'bad', and 'very bad'. We dichotomized the variable into 'very good or good' health versus 'less than good' health ('fair', 'bad', and 'very bad'). As for limiting longstanding illness, people were asked if they were hampered in daily activities in any way by any longstanding illness or disability, infirmity or mental health problem. Eligible responses were 'yes a lot', 'yes to some extent' and 'no'. We dichotomized this variable into 'yes' (regardless of whether to some extent or a lot) and 'no'.

Computation and interpretation of the measure of educational inequalities in health

The ESS-data file provides two variables of educational attainment – the first is a recoded variable that focuses on levels of education achieved, while the second gives years of full-time education. Analysing education as highest attained level complicates comparisons between countries as the population distribution across the levels of education strongly differs between countries [5]. One solution would be to adjust for the size of each educational group by calculating the RII [10]. However, we prefer to use the second available variable on education in our sample - full-time education in years – because there is a higher degree of international comparability and flexibility in its use. We also have to take into account the extent of variations of reported years of education in different countries, because the variation is larger in for example southern countries compared to the northern. We did this by applying a *total impact* measure of education. First, for each country separately, we standardised the continuous variables of educational attainment, such that the national average was equal to 0 and the standard deviation equal to 1 year of education. Second, we reverted this variable by multiplying it with a factor of -1, such that higher values corresponded with lower educational levels. Next, the standardised variable was introduced as an independent variable in a logistic regression analysis, controlled for age, with health variables as the dependent variable. Finally, we transformed the odds ratios of each regression coefficient by calculating their exponential functions. The odds ratios should be interpreted as the health difference between people with average years of education and those whose number of year of education is one standard deviation below the national average.

The first hypothesis that is tested in our study states that welfare regimes are associated with both absolute and relative measures of health inequalities. Firstly, we calculated the (age-adjusted) percentages of the total sample reporting fair/poor general health and limiting longstanding illness in each country. Secondly, we calculated the rate differences (RD) between the higher and lower education group using the median of the total impact measure within each country as cut-off point. Both measures were age-standardized using the weighted European population average as a basis.

To assess the extent to which cross-national differences in the magnitude of health inequalities could be explained by grouping countries according to welfare type we performed one-way ANOVA tests. We specifically tested whether the between group variance of the three statistical measures (overall prevalence, absolute difference, and relative inequalities) differed significantly from the within group variance. In addition, we calculated R squares by dividing the between group sums of squares (SSb) with the total sums of squares (SSt), in order to determine the percentages of between-country variance that is explained by the welfare regime clusters.

The analysis is based on responses from people aged 18 or over. A weight has been applied (dweight) to correct for design effects due to sampling designs in countries where not all individuals in the population have an identical selection probability.

Results

Table 2 shows that East European welfare regimes have the highest prevalence of ill-health for men and women with respect to both health indicators. South European welfare regimes have the second highest prevalence of self-assessed fair/poor general health, while they have the lowest prevalence of limiting longstanding illness. The dissimilar reporting of ill-health between limiting longstanding illness and self-assessed fair/poor health in the South is relatively large. Although the prevalence of fair/poor self-assessed health is larger than those of limiting longstanding illness within all other welfare regimes, the difference is largest in the South. This might suggest that self-assessed health is comprehended differently the South than elsewhere. The Anglo-Saxon welfare regimes demonstrate the smallest prevalence rates for fair/poor general health and the second smallest for limiting longstanding illness.

Furthermore, Table 2 shows that health inequalities are significant for both men and women, according to both health indicators, and within all welfare regimes. South European welfare regimes have the largest health inequalities, both with respect to rate differences and odds ratios, with the exception of the rate difference for limiting longstanding illness. Clearly, Bismarckian welfare regimes were observed with the smallest health inequalities, even though the prevalence rates were only average. Although the other welfare regimes rank relatively close to each other, the Scandinavian welfare regimes are placed less favourably than the Anglo-Saxon and Eastern European. Our results refer to the point estimates however, and it should be noted that the confidence intervals of the welfare types overlap, meaning that they cross-regime variations in health inequalities might be attributable to chance fluctuations. Country-specific results are shown in Table 3. Prevalence rates and odds ratios were also converged into scatter plots (Figure 2 and 3), showing graphically whether the countries cluster within each welfare regime.

Figure 2 and Figure 3 give the results for men and women's reporting of limiting longstanding illness and fair/poor general health respectively. The Scandinavian countries are pretty tightly clustered. The only divergence from this pattern was found with respect to the reporting of fair/poor general health among Finnish (high OR compared to other Scandinavian countries) and Swedish (low OR compared to other Scandinavian countries) men. The South European countries, which do not appear to cluster markedly with respect to the results of self-assessed fair/poor health, reported fewest cases of longstanding illness, but had relatively large relative health inequalities. However, it should be remarked that Italian men and women, together with Spanish men, demonstrate smaller odds ratios than the other South European countries.

Bismarckian countries are fairly clustered below the x-axis, which indicates average odds ratios. The only exception is with regard to the high odds ratios reported among Luxembourg men concerning the reporting of fair/poor general health. With respect to the Anglo-Saxon welfare regime, Ireland seems to have lower prevalence rates than those of Great Britain, but both countries are advantageously placed with regard to both sexes and both health indicators. Although men and women living in East European countries reported poorer general health and more cases of limiting longstanding illness than people in other European countries, they demonstrated average magnitudes of odds ratios. However, a few exceptions should be mentioned. First, Polish men have higher odds ratios with respect to the results of limiting longstanding illness. Secondly, Hungarian women have highest odds ratios for self-assessed health, while the odds ratios are among the smallest for Slovak men and women with regard to self-assessed health. Generally, for limiting longstanding illness among both men and women, the countries cluster according to welfare typologies. For fair/poor general health, however, the clustering is not as strong.

The one-way ANOVA-test showed that within welfare group variance is significantly smaller than the between welfare group variance for measures of limiting longstanding illness (except from the RD-measure of men), but not with regard to fair/poor general health (except from the prevalence) (see Table 4). This implies that the Ferrera welfare typology explains at least 50% of the cross-national variations with regards to longstanding illness, but not with regard to general health.

Discussion

Our results have provided evidence for the hypothesis that welfare regimes are associated with cross-national differences in the overall level of self-reported health, and with absolute and relative educational health gaps. We observed that East European welfare regimes have the highest prevalence of both health indicators, while South European welfare regimes have the second highest prevalence of self-assessed poor general health, and the lowest prevalence of limiting longstanding illness. Apart from the low prevalence in the South for limiting longstanding illness, the Anglo-Saxon welfare regimes have the lowest prevalence for both health indicators and for both sexes. Furthermore, Southern European welfare regimes have the largest health inequalities (with an exception of the rate difference for limiting longstanding illness), while countries with Bismarckian welfare regimes tend to demonstrate the smallest. Although the East European, Anglo-Saxon and Scandinavian welfare regimes rank relatively close to each other, the Scandinavian welfare regimes are placed less favourably than the Anglo-Saxon and Eastern European. Furthermore, countries within each welfare regime seem to cluster strongly according to most measures of longstanding illness.

There are some important methodological issues that may have influenced our results. Firstly, the ESS response rates vary strongly between countries, as shown in Table 2. This is especially the case for the first wave in Switzerland, which had a response rate of only 33.5 %. This number is critically small, and it could be the reason why Switzerland has lower prevalence rates, absolute differences and odds ratios than the average scores for both health indicators and for both sexes. If the non-response is related to health and socio-economic position, then this would produce biased inequality measures.

Secondly, we found that the country clustering in 5 welfare regimes is more evident for the results of longstanding illness compared to those of less than good general health. This seems reasonable, because people's view on general health is profoundly shaped by their national cultural background [52-54]. The differences in absolute levels of health between countries may suggest that the question on general health is perceived differently across countries, and is thus sensitive to cultural variations. We have already noted that self-assessed health might be comprehended differently in the South than elsewhere, and this would bias the odds ratios if the comprehension of health also varies across educational levels. However, a growing number of studies have shown that measures of self assessed health are strongly correlated with more objective measures such as mortality [55, 56]. We also calculated Pearson's correlation between subjective health measures (age-adjusted percentage of people with fair/poor health and limiting longstanding illness) with adult mortality, using data collected from the WHO. The results demonstrated that high age-adjusted prevalence of fair/poor general health (R_{men}=0.82, R_{women}=0.58) and limiting longstanding illness (R_{men}=0.45, R_{women}=0.48) is associated with higher adult mortality for men and for women, but particularly with respect to men's fair/poor general health. Previous studies have also shown that the apparent association of self-assessed health with mortality does not, or only slightly, differ between socio-economic groups [57-59].

Welfare state regimes, health and health inequalities

We observed that countries with lowest average years of education, namely the Southern and Eastern European countries, have the largest overall prevalence rates of ill-health (except for the lower prevalence of limiting longstanding illness in the South), whilst the Anglo-Saxon countries have the lowest prevalence rates. This is in keeping with the majority of previous research into variations in population health (such as infant mortality or total mortality) by welfare state regimes [16-18, 42].

We observed that grouping welfare regimes explained a meaningful part of the variance in the prevalence, and absolute and relative health gaps of limiting longstanding illness of the relevant European populations. This partly confirms our second hypothesis that grouping countries into welfare types decreases the variation of health inequality measures significantly. The country clustering in five welfare regimes was more evident for the results of limiting longstanding illness compared to those of less than good general health.

A recent review on studies of morbidity differences [60] did not find a patterning of health inequalities according to features of welfare regimes. However, their study rested on Esping-Andersen's typology, it was based on measures of relative inequalities only, and in addition, national data sources were used, with a lower degree of international variation, which comprised fewer countries than the ESS.

It appeared that health inequalities in our study were smallest in Bismarckian countries and largest in Southern Europe. This finding is in keeping with other studies. Two previous studies of general self-reported health by level of education using the European Community Household Panel (ECHP) support these findings. In a study of older men and women, Huisman et al. [4] found lowest health inequalities in Bismarckian countries (Belgium, France and Belgium) and largest in the south (Italy, Greece and Spain). Denmark, which was the only Nordic country in this study, had large inequalities for men, but smaller inequalities among women. They also found rather large inequalities in the two Anglo-Saxon countries. Using the same survey, Van Doorslaer & Koolman [61] found particularly large income related health inequalities in self-assessed health in Portugal and relatively low inequalities in Netherlands and Germany.

With regard to chronic conditions, Dalstra et al. [62] compared results from eight national health surveys and did not find higher or smaller health inequalities with respect to nine chronic disease groups in the South (Italy and Spain) compared to Bismarckian countries (Belgium, France and the Netherlands). However, they observed smaller inequalities in heart disease prevalence. Cavelaars et al. [1] did not reveal a pattern between Bismarckian and South European countries, but they found a tendency for inequalities to be relatively large in the North (Sweden, Norway and Denmark).

The studies on morbidity are largely confirmed by previous comparative studies on mortality differences by educational level. Mackenbach et al. [10] reported average-size inequalities in the Nordic countries, while Huisman et al. [63] found smaller inequalities in total mortality in men and women aged 40 or more in Turin and Barcelona & Madrid compared to Belgium, Austria and Switzerland.

We should be aware that those reports were based on different data sources, covering different periods and partly different age groups. Only a few of these studies found that South European countries had large inequalities, compared to Bismarckian countries. A generalised finding though is that inequalities in the Nordic countries are not among the smallest.

The Scandinavian welfare regime

Notably, in terms of educational health inequality, countries in the Scandinavian welfare regime were placed less favourably than those in the Anglo-Saxon and Eastern European regimes. Only Sweden shows relatively small inequalities from an international perspective, perhaps reflecting the longevity of the Swedish welfare state. These results are surprising, as we would have expected the Scandinavian welfare states, given that they provide the most extensive welfare provision (for example, they are the most decommodifying [24]), to be some of the best performing countries in terms of the degree of health equity. Not only did we find that relative inequalities in the Scandinavian regimes were not among the smallest, but worryingly, this was also the case with regard to absolute inequalities.

This finding requires attention. Drawing upon the work of Dahl et al. [60], we speculate that relative deprivation, and class related health behaviours may be factors behind our findings. In addition, we suggest that social exclusion may be a contributory mechanism.

Relative deprivation is result of expectations and comparisons with other individuals and groups [60]. Relative deprivation will occur in all societies, in which there is inequality, including the Scandinavian welfare states. Following Dahl and colleagues, it is possible to speculate that the effects of relative deprivation may be more extensive in the Scandinavian welfare states because of the high levels of expectation of upward social mobility and prosperity that they generate amongst the less privileged, expectations that are seldom met [64]. This may increase health inequalities especially in stress related conditions, such as heart disease or indeed self-assessed health.

Dahl and colleagues also suggest that the relatively large socio-economic differences in smoking prevalence in the Scandinavian countries [65] may well contribute to health inequalities.

Furthermore, the previously homogenous Scandinavian countries have experienced considerable immigration over the last decade. Immigrants are often marginalised within the Scandinavian welfare states, and are without entitlement to the full benefits of the universalistic system and are more likely to experience unemployment and social exclusion. Such groups are also most likely to be amongst the least educated in society. A study comparing immigrants from Poland, Turkey, and Iran with Swedish born persons revealed a strong association between ethnicity and poor self reported health, which was mediated by socioeconomic status, poor acculturation, and discrimination [66]. Another study found a large diversity of self-rated health, prevalence of diabetes and distress between ethnic Pakistanis and native Norwegians [67]. However, further research into the ethnic make up of people with the lowest education would be useful to explore this explanation.

Although these different explanations are somewhat speculative, they point to causal mechanisms in which education may play a role. Finding empirical evidence for these causal mechanisms should be explored in future studies.

Conclusion

The prevalence of ill-health, and absolute and relative educational inequalities in health in European countries appears to cluster according to the welfare regimes to which these countries belong. This was especially the case with regard to the reporting of limiting longstanding illness. Welfare is provided in dissimilar fashion both qualitatively and quantitatively across welfare regimes. In addition to comparing countries individually, forthcoming research might thus derive advantage from adapting a welfare regimes point of view.

Our results suggest that the “South European” (excluding Italy) family-oriented welfare system does not sufficiently buffer ill-health among disadvantaged groups. Italy pioneered the welfare state expansion in the South by the end of the 1940s, while democracy consolidated in the late 1970s (and welfare state expansion even later) in Portugal, Spain and Greece in a highly compressed time [68]. Although the South European countries have fully caught up with the traditional Western democracies in terms of economic growth and rapid expansion of the welfare system, they entered the epoch of modernity in a state of socio-economic and political decline [69].

Although the Eastern European countries had the highest prevalence rates, they moreover held an average position in Europe, both with regard to absolute and relative educational inequalities in health. Future research would benefit from considering Eastern European countries as a separate welfare state regime and to look at the health effects of specific distributive policies and mechanisms within these countries.

The Scandinavian countries, except from Sweden, had rather large relative and absolute inequalities in health and only intermediate prevalence rates. The distribution of welfare benefits within the Scandinavian countries certainly has a protective effect for disadvantaged groups compared to those in other welfare regimes. However, we should question to what extent this is counteracted by some unintended mechanisms, such as expectations of upward social mobility and prosperity that might tend to inadvertently widen educational inequalities in health.

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Tables and figures

Figure 1: Welfare state typologies

Author	**Welfare Regimes**			
Esping-Andersen (1990)	*Liberal*	*Conservative*	*Social Democratic*	
	Australia Canada Ireland New Zealand UK USA	Finland France Germany Japan Italy Switzerland	Austria Belgium Netherlands Denmark Norway Sweden	
Ferrera (1996)	*Anglo-Saxon*	*Bismarckian*	*Scandinavian*	*Southern*
	Ireland UK	Austria Belgium France Germany Luxembourg Netherlands Switzerland	Denmark Finland Norway Sweden	Greece Italy Portugal Spain

Table 1
Country statistics (N = 77805)

Welfare regime	Country	Sample size (N)					Response rate		Years of education	
		2002		2004		Included in the analysis			Men	Women
		Achieved interviews	Missing data	Achieved interviews	Missing data		2002	2004	Average (s.deviation)	Average (s.deviation)
Scandi-navian	Denmark	1506	4.12 %	1487	5.18 %	**2854**	67.7	64.3	13.43 (3.64)	13.18 (3.58)
	Finland	2000	5.70 %	2022	5.09 %	**3805**	73.2	70.7	12.05 (3.91)	12.49 (4.11)
	Norway	2036	1.62 %	1760	3.92 %	**3694**	65.0	66.2	13.33 (3.54)	13.25 (3.64)
	Sweden	1999	4.95 %	1948	4.77 %	**3755**	69.5	65.9	12.13 (3.46)	12.23 (3.51)
Anglo-Saxon	Ireland	2046	9.24 %	2286	8.09 %	**3958**	64.5	59.7	12.82 (3.61)	12.98 (3.32)
	United K.	2052	3.36 %	1897	4.27 %	**3799**	55.5	54.6	12.66 (3.38)	12.50 (3.09)
Bism-arckian	Austria	2257	5.49 %	2256	9.44 %	**4176**	60.4	62.4	12.51 (3.04)	12.09 (2.94)
	Belgium	1899	10.48 %	1778	5.01 %	**3389**	59.2	61.2	12.52 (3.79)	12.14 (3.79)
	France	1503	5.32 %	1806	4.21 %	**3153**	43.1	43.6	11.88 (4.05)	11.82 (4.08)
	Germany	2919	6.41 %	2870	8.82 %	**5349**	55.7	51.0	13.48 (3.39)	12.62 (3.29)
	Luxembourg	1552	15.53 %	1635	8.13 %	**2813**	43.9	50.1	12.33 (4.24)	11.80 (4.20)
	Netherlands	2364	3.17 %	1881	2.60 %	**4121**	67.9	65.1	13.20 (3.93)	12.28 (3.61)
	Switzerland	2040	3.87 %	2141	3.08 %	**4036**	33.5	48.6	10.89 (3.37)	10.62 (3.15)
Southern	Greece	2566	3.43 %	2406	2.83 %	**4816**	80.0	78.8	10.57 (4.60)	9.33 (4.53)
	Italy	1207	6.05 %	n.a.	n.a.	**1134**	43.7	n.a.	11.04 (4.64)	10.27 (4.92)
	Portugal	1511	4.77 %	2052	3.95 %	**3410**	68.8	71.2	7.73 (4.55)	6.93 (4.74)
	Spain	1729	13.01 %	1663	6.55 %	**3058**	53.2	59.7	11.14 (5.45)	10.53 (5.65)
Eastern	Czech R.	1360	6.03 %	3026	10.44 %	**3988**	43.3	55.3	12.68 (2.51)	12.24 (2.52)
	Estonia	n.a.	n.a.	1989	6.18 %	**1866**	n.a.	79.1	11.96 (3.11)	12.19 (3.71)
	Hungary	1685	5.16 %	1498	5.27 %	**3017**	69.9	65.4	12.09 (3.38)	11.64 (3.52)
	Poland	2110	7.73 %	1716	6.99 %	**3543**	73.2	73.7	11.63 (3.23)	11.42 (3.49)
	Slovakia	n.a.	n.a.	1512	12.04 %	**1330**	n.a.	64.2	12.36 (3.06)	11.84 (2.93)
	Slovenia	1519	5.46 %	1442	9.50 %	**2741**	70.5	69.7	11.81 (3.34)	11.10 (3.50)

Table 2
Odds ratios (95% CI), prevalence rates and absolute differences for each welfare system separately (N=77805)

Welfare regime	Limiting longstanding illness						Fair/poor general health					
	Men			Women			Men			Women		
	Prev	RD	OR (95% CI)	Prev	RD	OR (95% CI)	Prev	RD	OR (95% CI)	Prev	RD	OR (95% CI)
Scandinavian	24.7	9.5	**1.37 (1.29 – 1.45)**	28.5	8.1	**1.34 (1.26 – 1.43)**	26.0	10.5	**1.44 (1.35 – 1.53)**	28.5	12.1	**1.54 (1.44 – 1.64)**
Anglo-Saxon	20.4	5.9	**1.31 (1.19 – 1.43)**	19.9	6.4	**1.23 (1.12 – 1.34)**	20.8	9.6	**1.35 (1.23 – 1.48)**	21.5	8.2	**1.29 (1.18 – 1.41)**
Bismarckian	21.6	4.2	**1.16 (1.10 – 1.21)**	23.5	4.0	**1.17 (1.12 – 1.23)**	26.8	6.4	**1.19 (1.14 – 1.24)**	30.9	5.7	**1.25 (1.20 – 1.30)**
Southern	13.7	5.7	**1.38 (1.26 – 1.51)**	19.2	9.5	**1.63 (1.49 – 1.78)**	30.5	14.8	**1.57 (1.47 – 1.69)**	40.2	17.3	**1.69 (1.58 – 1.81)**
Eastern	29.7	5.4	**1.26 (1.19 – 1.33)**	30.7	10.5	**1.42 (1.34 – 1.50)**	44.4	11.0	**1.39 (1.32 – 1.47)**	50.4	12.8	**1.54 (1.46 – 1.63)**

Prev = age-adjusted prevalence of ill-health. **RD =** age-adjusted rate difference (percentage) between high and low socioeconomic group.

Table 3
Prevalences and absolute differences for each country separately, adjusted for age. Odds ratios (95% CI). N = 77805

Welfare regime	Country	Limiting longstanding illness						Fair/poor general health					
		Men			Women			Men			Women		
		Prev	RD	OR (95% CI)	Prev	RD	OR (95% CI)	Prev	RD	OR (95% CI)	Prev	RD	OR (95% CI)
Scandi-navian	Denmark	20.6	10.9	**1.37 (1.20 – 1.57)**	25.1	6.4	**1.39 (1.21 – 1.59)**	21.0	11.0	**1.41 (1.23 – 1.61)**	23.4	10.7	**1.47 (1.27 – 1.69)**
	Finland	29.5	7.1	**1.36 (1.21 – 1.54)**	29.7	6.8	**1.33 (1.18 – 1.51)**	34.9	15.2	**1.62 (1.43 – 1.84)**	32.7	9.4	**1.45 (1.28 – 1.66)**
	Norway	22.8	10.1	**1.35 (1.20 – 1.51)**	27.4	8.2	**1.31 (1.16 – 1.48)**	23.6	10.8	**1.45 (1.29 – 1.63)**	27.1	12.1	**1.55 (1.36 – 1.76)**
	Sweden	24.9	4.7	**1.20 (1.07 – 1.35)**	30.3	5.9	**1.25 (1.11 – 1.40)**	23.5	-2.1	1.09 (0.97 – 1.22)	28.5	12.1	**1.47 (1.30 – 1.67)**
Anglo-Saxon	Ireland	16.3	6.7	**1.33 (1.16 – 1.54)**	15.7	6.2	**1.32 (1.15 – 1.50)**	15.1	7.6	**1.40 (1.21 – 1.63)**	16.5	6.6	**1.31 (1.15 – 1.49)**
	United K.	24.2	5.1	**1.30 (1.15 – 1.48)**	24.0	5.5	**1.14 (1.01 – 1.29)**	26.4	10.2	**1.32 (1.18 – 1.49)**	26.9	6.8	**1.25 (1.11 – 1.41)**
Bism-arckian	Austria	21.9	2.8	1.10 (0.98 – 1.24)	24.4	7.1	**1.28 (1.14 – 1.45)**	21.5	4.2	1.11 (0.98 – 1.25)	26.7	5.1	**1.38 (1.22 – 1.55)**
	Belgium	19.9	6.6	**1.18 (1.04 – 1.34)**	20.9	4.3	**1.25 (1.09 – 1.44)**	21.0	10.0	**1.28 (1.13 – 1.45)**	25.2	10.0	**1.50 (1.32 – 1.71)**
	France	20.2	3.7	**1.31 (1.13 – 1.51)**	22.6	3.0	**1.22 (1.06 – 1.40)**	35.4	11.4	**1.32 (1.16 – 1.49)**	39.4	12.4	**1.41 (1.25 – 1.59)**
	Germany	26.1	3.6	**1.20 (1.09 – 1.32)**	27.0	6.8	**1.38 (1.25 – 1.53)**	38.6	5.7	**1.24 (1.14 – 1.35)**	39.9	7.7	**1.40 (1.28 – 1.53)**
	Luxembourg	19.7	7.9	**1.26 (1.08 – 1.45)**	16.3	6.3	**1.22 (1.03 – 1.46)**	32.2	15.9	**1.59 (1.40 – 1.81)**	39.8	11.7	**1.32 (1.17 – 1.49)**
	Netherlands	21.5	7.6	**1.27 (1.13 – 1.44)**	28.5	2.1	**1.16 (1.04 – 1.29)**	22.9	8.5	**1.36 (1.21 – 1.54)**	29.1	2.8	**1.15 (1.03 – 1.28)**
	Switzerland	18.6	5.1	**1.18 (1.04 – 1.34)**	19.6	0.4	1.12 (0.99 – 1.27)	14.5	5.5	**1.22 (1.06 – 1.41)**	17.3	5.5	**1.33 (1.16 – 1.53)**
Southern	Greece	14.3	6.2	**1.45 (1.26 – 1.68)**	21.6	10.8	**1.50 (1.31 – 1.71)**	19.3	9.7	**1.60 (1.40 – 1.83)**	28.9	14.4	**1.60 (1.42 – 1.81)**
	Italy	14.2	5.4	1.30 (0.96 – 1.75)	11.0	7.1	**1.51 (1.06 – 2.15)**	32.1	13.2	**1.40 (1.12 – 1.76)**	41.8	7.8	**1.22 (1.00 – 1.49)**
	Portugal	12.4	4.5	**1.54 (1.23 – 1.93)**	19.0	10.8	**1.96 (1.61 – 2.38)**	43.1	14.6	**1.58 (1.38 – 1.82)**	54.1	18.3	**1.55 (1.37 – 1.76)**
	Spain	13.8	7.7	**1.48 (1.22 – 1.79)**	18.4	8.8	**1.80 (1.49 – 2.18)**	33.3	5.6	**1.19 (1.04 – 1.35)**	40.6	11.1	**1.52 (1.33 – 1.75)**
Eastern	Czech R.	29.8	5.6	**1.13 (1.02 – 1.26)**	32.3	10.2	**1.37 (1.23 – 1.54)**	39.1	8.1	**1.23 (1.11 – 1.37)**	41.9	11.2	**1.43 (1.29 – 1.60)**
	Estonia	26.8	3.5	1.17 (0.99 – 1.40)	25.5	10.4	**1.57 (1.23 – 1.54)**	55.3	16.1	**1.53 (1.27 – 1.85)**	53.7	14.0	**1.56 (1.32 – 1.84)**
	Hungary	29.4	6.2	**1.27 (1.11 – 1.44)**	29.2	8.2	**1.37 (1.21 – 1.55)**	50.4	10.6	**1.46 (1.29 – 1.67)**	55.4	15.8	**1.71 (1.51 – 1.93)**
	Poland	29.5	10.6	**1.49 (1.31 – 1.71)**	31.5	10.9	**1.42 (1.24 – 1.63)**	44.7	13.9	**1.54 (1.36 – 1.73)**	53.6	16.6	**1.63 (1.43 – 1.86)**
	Slovakia	25.1	3.7	**1.26 (1.04 – 1.52)**	27.2	13.3	**1.45 (1.19 – 1.77)**	41.5	3.0	1.07 (0.90 – 1.27)	48.2	6.6	**1.26 (1.05 – 1.50)**
	Slovenia	34.8	7.1	**1.24 (1.08 – 1.41)**	34.6	13.9	**1.41 (1.23 – 1.62)**	40.6	15.6	**1.53 (1.34 – 1.75)**	51.3	17.0	**1.60 (1.41 – 1.83)**

Prev = age-adjusted prevalence of ill-health. **RD =** age-adjusted rate difference (percentage) between high and low socioeconomic group.

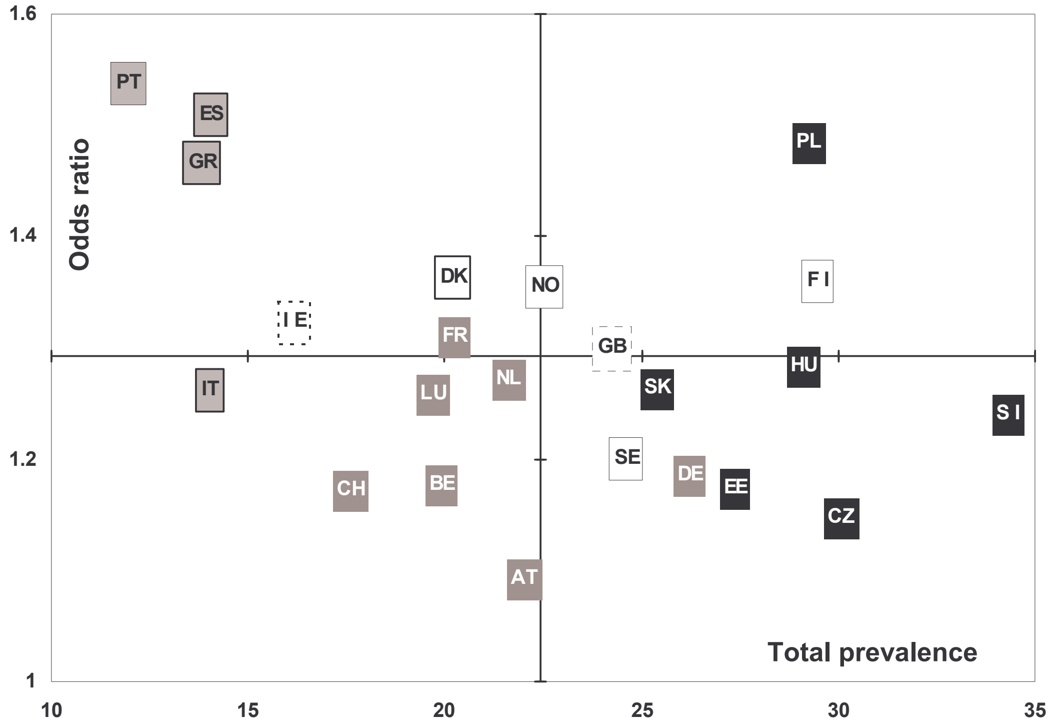
Table 4[a]
The proportion of between-country variance in health measures that can be explain by the countries' grouping according to the Ferrera[b] welfare regime typology

Statistical measure	Typology	Limiting longstanding illness		Fair/poor general health	
		Men	Women	Men	Women
		R^2 (sig)	R^2 (sig)	R^2 (sig)	R^2 (sig)
Overall prevalence	Ferrera	**0.788 (0.000)**	**0.640 (0.001)**	**0.595 (0.002)**	**0.689 (0.000)**
Absolute difference (RD)	Ferrera	0.194 (0.395)	**0.698 (0.000)**	0.062 (0.874)	0.409 (0.041)
Relative inequalities (OR)	Ferrera	**0.473 (0.016)**	**0.707 (0.000)**	0.090 (0.775)	0.355 (0.081)

[a] R^2 and significance were calculated on basis of one-way ANOVA tests. R^2 gives the percent of between-country variance explained and is calculated by dividing the between group sums of squares (SSb) with the total sums of squares (SSt).
[b] *Ferrera*: Scandinavian (NO, SE, DK, FI), Bismarckian (AT, BE, CH, DE, FR, LU, NL), Anglo-Saxon (IE, UK),
Southern (ES, GR, IT, PT), Eastern (CZ, EE, HU,PL, SI, SK).

Figure 2:
Odds ratios (Y-axis) and national **prevalence rates** (X-axis) for having **limiting longstanding illness** (self-reported) among European **men** and **women**. Axes lines represent unweighted average values.

Men



Women

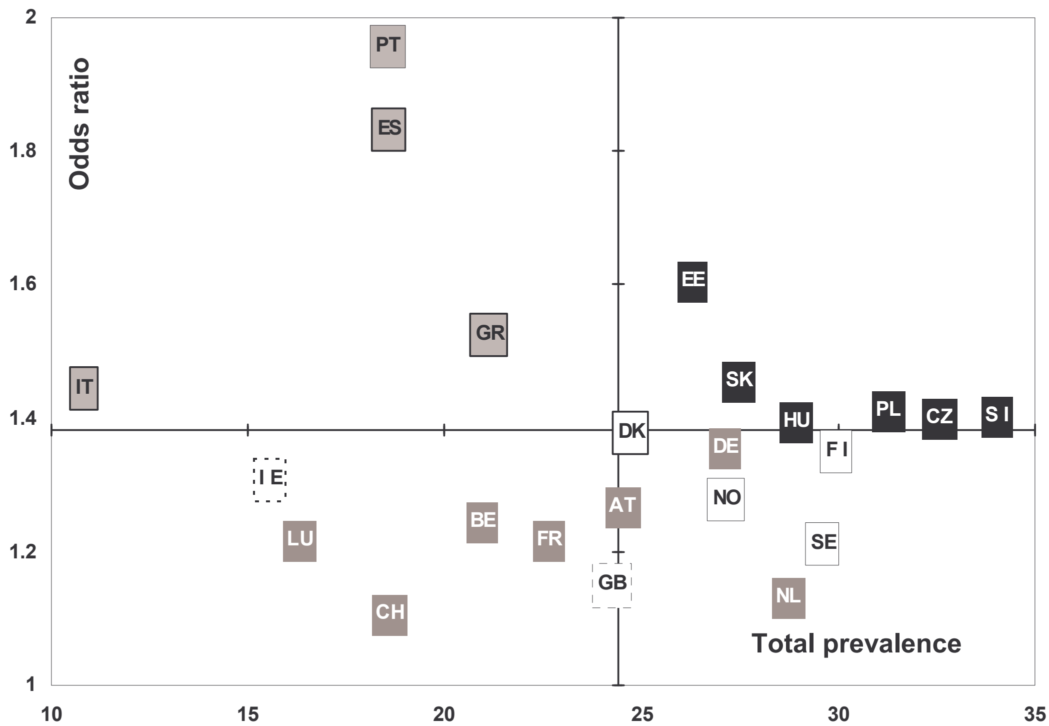
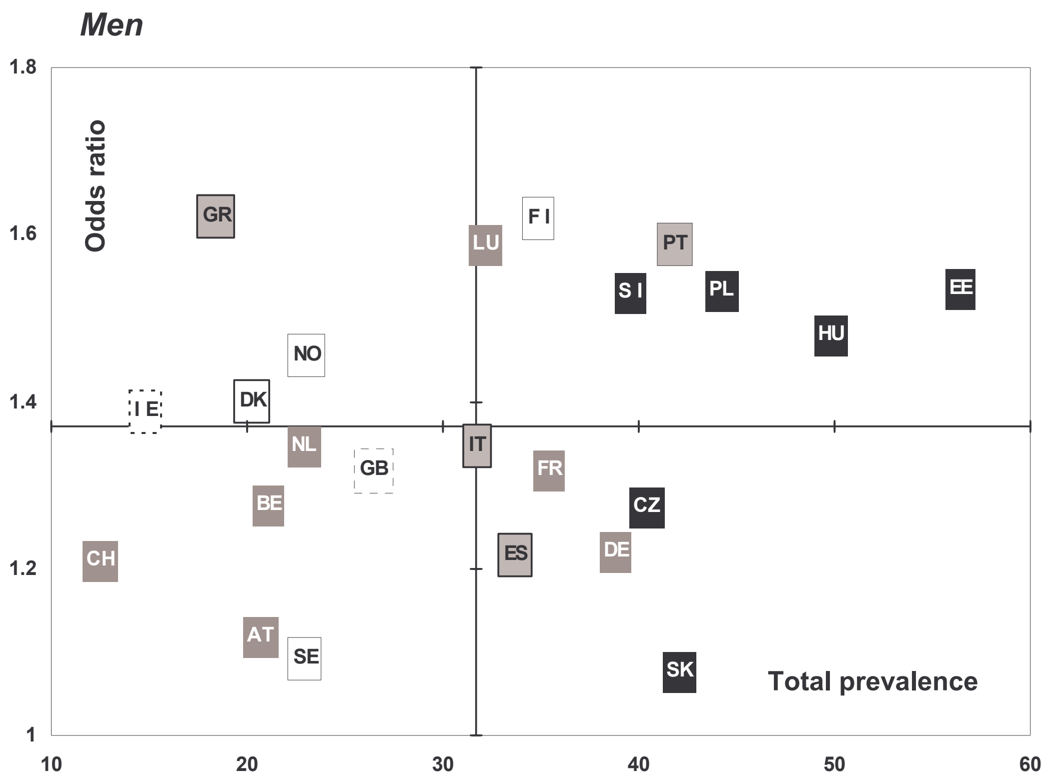
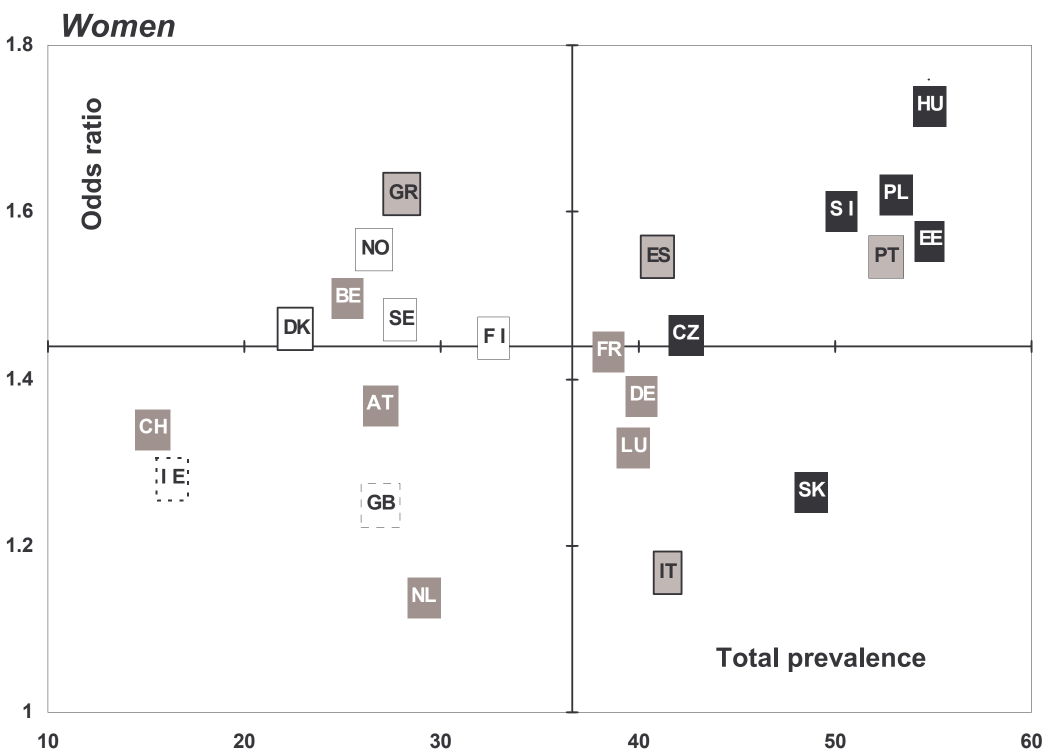


Figure 3:
Odds ratios (Y-axis) and national **prevalence rates** (X-axis) for having **fair/poor general health** (self-reported) among European **men** and **women**. Axes lines represent unweighted average values.





Chapter 11

Inequalities in health by social class dimensions in European countries of different political traditions

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Abstract

Background: to compare social class inequalities in self-perceived health, in 2004, in nine European countries grouped according to political tradition.

Method: cross-sectional design, including data of the Survey of Health, Ageing and Retirement in Europe (Sweden, Denmark, Austria, France, Germany, Netherlands, Spain, Italy and Greece). 50-74 years of age population was included. Logistic regressions models were fitted in order to study the relationship between dependent variables (poor self-reported health and having a long-term illness) and independent ones (political tradition, social class dimensions, employment status and age).

Results: health inequalities by social class dimensions are found in the three political traditions, but these differences are more marked in late democracies and mainly among women. For example the OR of poor self-perceived health comparing low educated women with high educated women, was 2.43 (95%CI: 1.71 – 3.44) in late democracies and 1.60 (95%CI: 1.10 – 2.32) in social democracies.

Conclusion: this study is one of the first to show the impact of different political traditions on social class inequalities in health. These results emphasize the need to evaluate the impact of the implementation of public policies.

Introduction

Political factors such as the political party in government (either alone or as a majority partner in a coalition) for long periods of time are important in influencing a country's labor market and welfare state policies (1) and therefore social inequalities and health indicators (2). These political forces represent the interests of classes and other social actors and differ in their redistributive and labour market policies. Social democratic parties that have governed as a majority for long periods since World War II, have generally been the most committed to redistributive policies, contributing to better health indicators (3). Social policies constitute the most important mechanism for redistribution of state wealth, as they can increase social protection and reduce social inequalities (4). Table 1 shows variables of power resources, welfare state, labour market and income inequality by political tradition in the nine countries included in this study and illustrates some differences by political tradition. The variables chosen were the ones present in all the countries studied in this article and if, it was possible, that were available for several years before the survey.

The majority of international studies of inequalities in health do not include political variables although some recent studies suggest that political and welfare state variables could also be important determinants of health. The majority of these published studies refer to the impact of political variables on mortality data(5-8) or on low birth weight rate (9;10). Moreover, Raphael and Bryant found evidence that the welfare states of Denmark and Sweden are clearly beneficial to women and enhance their quality of life (11). One study found relationship between socioeconomic inequality in political participation and poor self-rated health in United States (12). Recently, Dahl et al. (2006) have tried to assess whether class inequalities in health diminish in welfare state regimes, reviewing the empirical evidence of published comparative studies. The authors conclude that health inequalities are not consistently, significantly or systematically smaller in social democratic countries than in other European countries belonging to liberal or christian democratic welfare regimes (13).

Although the relationship between socioeconomic position and health in Europe has been extensively described using a variety of morbidity and mortality indicators of social class inequalities (14-16), the impact of different political traditions on social class inequalities in health has rarely been studied. This is important because a country's political outlook is the main predictor of its tolerance for social inequalities (17) and the different social structural contexts and historical settings shape the patterns of socioeconomic inequalities in health (18). Therefore, the objective of this study was to compare inequalities in self-perceived health, in 2004, using Wright's social class dimensions, in nine European countries grouped according to the three main political traditions described above.

Methods

Design, study population, sample and data collection

We used a cross-sectional design. The population frame was comprised of individuals aged 50 to 74 years living in nine European countries. Data were collected by the Survey of Health, Ageing and Retirement in Europe (SHARE) (19) carried out in 2004. The study generated a representative stratified sample for nine countries that represents various regions in Europe ranging from Scandinavia (Denmark and Sweden) through Central Europe (Austria, France, Germany and the Netherlands) to the Mediterranean (Spain, Italy and Greece). The sample size was 16,901 individuals between 50-74 years of age. We were able to analyse 16,194 individuals because we had 0.96% of missing data in men and 6.8% of missing data in women in the social class dimensions. Each country selected its own sample and for this reason the type and size of samples were different in each country but the data was comparable (19).

Variables

Dependent variables
Self-reported health status was measured through a single question: “Would you say your health is very good, good, fair, poor or very poor?” A dichotomous outcome variable was created (Poor=fair, poor or very poor; Good=very good, good). Self-reported health is related with objective health and also it is a valid predictor of mortality (20).

Long-term illness was measured with a dichotomous question: do you have any long-term health problems, illness, disability or infirmity? (1=yes; 0=no).

Independent variables
Countries were grouped according to their political tradition. We formed three groups according to the typology of Huber, Ragin and Stephens(21), further elaborated by Navarro, Schmitt, and Astudillo (22) taking into account the years and months that Social democrats parties, Christian democrats parties, liberal parties and non democratic parties have been in the government since 1950. Thus we obtained three different typologies of countries: Social democratic, including Sweden, Denmark and Austria, Christian democratic, including The Netherlands, Germany, France and Italy and Late Democratic countries, including Portugal and Spain.

Social class dimensions were measured through a modification of Erik Olin Wright’s class locations (23;24). We obtained class positions using three class relational dimensions; ownership, credentials and management. Class positions in the ownership dimension were obtained according to being self-employed, employed or civil servant. This dimension differentiates owners and workers. Owners were defined as self-employed, and civil servant and employed were considered workers. Class positions in the education dimension were obtained through the question of educational level. This dimension differentiates people having secondary or more level and people having less than secondary level. The last dimension was management. This social class dimension differentiates workers with subordinates and workers without subordinates. Managers were defined as the workers having one or more employees at their charge. People who have not worked or have not studied were assigned the social class of the head of household (0.9% of men and 9.7% of women).

Employment status was a categorical variable including “employed”, “unemployed”, “retired”, “homemaker” and “disabled” categories.

Age was treated as a continuous variable.

Data analysis

All the analyses were done separately for men and women (25) and for each political tradition. We first described all the variables included (number of cases and percentages). Secondly, the age-standardised prevalence (direct method with the whole sample aged 50-74 as standard population) of dependent variables for each dimension of social class was obtained. Prevalence differences of the different categories for all social class dimensions were calculated.

Three logistic regression models (for each sex and political tradition) were fitted to determine the association between each dependent variable and each social class dimension. The associations are presented as adjusted odds ratios (OR) and 95% confidence intervals (95%CI). The independent variables included were: social class dimension (one dimension in each model), age and employment status (first part of table 4). Finally, for more robust and solid results we fitted one logistic regression model (for each sex and political tradition) to determine the association between the dependent variable and all social class dimensions in the same model as well as age and employment status (second part of table 4). Reference categories in the models were the highest class in each dimension.

To determine whether the association between the dependent variable and social class dimension was different in each political tradition we fitted models pooling together all the political traditions, including also the interaction between political tradition and social class dimensions (p values are shown in table 4). If the interaction had statistical significance the ORs were considered to be different.

Results

Social democratic countries accounted for 7.7% of men and 8.1% of women of the sample. Christian democrats represented 75.2% of men and 76.8% of women and Late democratic countries 17.1% of men and 15% of women.

Table 2 describes the main variables of the study for men and women in each political tradition. Men had a prevalence of poor self-perceived health of 35.8% and women of 39.5%. Women in Late democracies had the highest prevalence of poor perceived health (45%). The prevalence of having a long-term illness was 47.1% for men and 50.0% for women, being similar in the different political traditions. Employment status differed by political tradition and sex, the percentages of women doing housework being higher in Late democracies (44.6% compared to 6.9% in Social democrats and 21% in Christian democrats).

Table 3 shows the prevalence of poor self-perceived health and long-term illness in each social class dimension for men and women according to the political tradition of the countries and the difference between prevalences in each social class dimensions. Table 4 shows the association between poor health and long term-illness with social class dimension.

Self perceived health status

Women always presented poorer health status than men. With regard to poor self-perceived health status in the ownership dimension, men and women in the workers class always reported poorer health than owners. The highest difference was in the Late democracies among women with a difference of 10.1 points(table 3), that is equivalent to OR 1.51 (95%CI: 1.10 – 2.06) in the fully adjusted model. The OR of political traditions were not different among men but statistical significance is borderline for women (p=0.08 in both models) (table 4).

People with low educational level had poorer health than people who have a higher educational level, the prevalence differences being higher in Late democracies (18.9% in men and 24.2% in women). The OR was also higher in Late democracies for men and women (OR 2.31, 95%CI: 1.68 – 3.20 for men and OR 2.43, 95%CI: 1.71 – 3.44 for women in the fully adjusted model). The OR differed by political tradition in all models (p<0.05).

The managerial dimension also discriminated the status of perceived health, and in all cases people with no personnel in their charge had poorer health than people who have personnel in their charge. Among women, the inequalities were different in the three political traditions (p<0.04 in the age and employment status adjusted model), the largest inequalities were found in the Late democrats (OR 1.79, 95%CI: 1.30 – 2.47) and the smallest in the Christian democrats (OR 1.17, 95%CI: 1.03 – 1.34). This statistically significant difference was lost in the fully adjusted model.

Long-term illness

Women consistently had higher age-standardized prevalence of long-term illness. In the Ownership dimension workers had higher prevalence rates of long-term illness than owners, independently of sex. However, in this case the difference was higher in the Christian democrat countries (men 9.9% and women 13%) (table 3). The inequalities were also larger in these countries, although no statistical differences were found among political traditions (table 4).

People with low educational level had more long-term illness than people with a higher educational level. Men and women in Late democracies presented the highest absolute differences (13.6% and 14% respectively) and relative differences (OR of 1.49, 95%CI : 1.12-1.99 for men and 1.56, 95%CI : 1.14-2.13 for women in fully adjusted models).

Regarding the managerial dimension, a higher proportion of people without personnel in their charge reported a long-term illness than people with personnel in their charge. In this case the highest difference was found between Late democracies men, with 10.3 points of difference. The OR were not different in the three political traditions (p>0.05) in any of the models.

Discussion

This study has shown how health inequalities in the adult population may be explained by several social class dimensions, in nine European countries belonging to different political traditions (Social democrats, Christian democrats and Late democrats), but that these differences are more marked in Late democracies and mainly among women. Inequalities are more evident in educational level than in other dimensions of social class (ownership and management). The results are more pronounced in poor perceived health than in long-term illness indicators. These findings are also important taking into account that health inequalities tend to be smaller in old populations(26), suggesting that inequalities in younger age groups are even larger

The impact on social inequalities and on health of political forces has rarely been studied. The majority of studies used mortality as the dependent variable (6;7;27;28). Moreover, the present study is focused on the impact on social class inequalities in self perceived health and long-term illness.
Our results are in accordance with the review of Dahl et al. (2006) that did not find that health inequalities were smaller in the social democratic countries than in Christian Democratic countries and Liberal countries. But it is necessary to emphasize that Dahl's review is based on the results of comparative studies including different countries, since they could not find any studies specifically designed to analyse differences by political tradition. Similar results were found in another study that compared mortality in Sweden, Italy and England and Wales as examples of Social democratic, Christian democratic and Liberal traditions(29). In that study class inequalities in Social democracy and Christian democracy were also similar. The welfare state literature includes authors who consider the Social democratic type of country rather more re-distributive than the Christian democratic type (30). However, Esping-Andersen considers Christian democracies (the conservative corporatist type) similar to Social democracies. In public health, a similar argument has been advanced by authors who defend that a capitalist economy cannot function with substantial levels of class equality (31;32), putting a limit to the capacity of Social democracies to redistribute wealth. In that sense class inequality should be thought of as the fundamental feature of capitalist economy, without which capital cannot expand (33).

It is worth mentioning that social class inequalities differ more by political tradition in the case of women compared to men, inequalities being higher in late democracies. In self-perceived health, among women, differences by political tradition are found in the 3 social class dimensions. For long-term illness differences appear with the educational dimension. As Raphael and Bryant highlight, women's health and wellbeing are particularly sensitive to decisions made in relation to the spending priorities of governments, the extent to which services are provided and the degree to which women are supported in moving towards equity. Countries with a stronger social welfare orientation impact more positively on women's quality of life (34;35). Social democratic countries are characterised by their implementation of full-employment policies, which facilitate the integration of women into the labour force, integration that is much lower in Late democracies (36). Moreover, late democracies have a widespread and strong Christian tradition and for this reason women have had the care and the responsibility of family members as well of as domestic labour (37), factors that have been related with worse health, mainly among women of disadvantaged socioeconomic position (38).

Another fact to take into account is that the educational distribution of southern European countries is very different than for the other countries, specially among women. In the late democracies, it is compared a minority with high educational level to a majority, while in other countries it is compared a majority with high educational level to a minority with low educational level. This low educational level of southern women reflects the effects of the former dictatorship on women's position, which may help to understand the large health inequalities among women in these countries.

This paper was the first to use the social class dimensions proposed by Wright (2000) in many European countries. Social stratification refers to the ranking of individuals along a continuum of economic attributes such as income or years of education. These rankings are known as "gradient indicators" in Epidemiology (39). Most researchers use several measures of social stratification simultaneously because single measures have been insufficient to explain social inequalities in the health of populations. However, despite their usefulness in predicting health outcomes, these measures do not reveal the social mechanisms that explain how individuals come to accumulate different levels of economic (and political or cultural) resources (32). Social class, understood as social relations linked to the production of goods and services (40) is conceptually and empirically distinct from social stratification / socioeconomic status. Some studies on social class inequalities, including relations of property and control over the labour process, have found associations with health. Thus, social class is associated with health over and above socioeconomic indicators (41;42).

Limitations

Several limitations on the data and methods of this study need to be mentioned. A first limitation with the SHARE dataset is that samples can be different in the countries although SHARE made great efforts to deliver truly comparable data, in order to permit reliably studying how difference in cultures, living conditions and policy approaches shape the quality of life of Europeans just before and just after retirement(19). Moreover, we have excluded about 4% of the cases due to missing social class dimension in men and women. Also, our original surveys were not designed to capture class relations and our proxy indicator only captures a minimum portion of class variability because the sample size was not big enough to be able to study the 12 social class positions proposed by Wright (2000). This was especially problematic in the case of ownership, because it was not possible to separate capitalists from petty bourgeoisie, populations that have been shown to have different health outcomes (43). The gradient within supervision/management is also lost as is the differentiation between managers in terms of policy setting functions(44). This approach could produce a stronger finding with educational level (a standard valid indicator) and the less well measured class positions related to management and property.

Self perceived health has been described as a good indicator to compare health in different countries (45;46). However, a recent study found differences in self-reported health across countries related to the cross-cultural differences in reporting styles (47). But in our study we didn't only compare the absolute rate of self-perceived health by social class dimension, we also compared relative inequalities in self-perceived health, a measure which is less affected by differences in prevalence between countries.

We limited the population studied to 50-74 years old, because institutionalisation of elderly may change by type of country, and therefore we excluded the people with higher probability of being institutionalised.

Conclusions and recommendations

This study is one of the first to show how health inequalities by social class position, in the adult population, change by gender and political tradition. Inequalities are more important in Late democracies and mainly among women.

These results emphasize the need to evaluate the impact of the implementation of public policies in social class inequalities in health. More research is needed to have a better measurement of social class dimensions, the inclusion of liberal countries, more measures of other health outcomes and in all age groups.

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Table 1. Variables of power resources, welfare state, labour market and income inequality by political tradition in the nine countries.

		POWER RESOURCES[1]	WELFARE STATE[2]		LABOUR MARKET[2]		INCOME INEQUALITY[3]	
		Total years in government between 1946-2000 by social democratic parties	Total public and private expenditure for educational institutions, % 1994	Total Social Expenditure, % GDP, 1994	Total unemployment, % 1994	Female in the labour force, % 1994	Gini coefficient 2001	Inequality of income distribution (income P90/p10 ratio) 2000
Social democrats	Sweden	45	6.7	35.4	4,9	48	24.3	2.8
	Denmark	35	7.1	33.1	4,3	46	22.5	2.7
	Austria	31	5.6	26.7	2,7	43	25.2	3.3
Christian democrats	France	13	6.2	29.3	5,3	45	27.3	3.4
	Germany	15	5.8	26.9	4,2	42	27.7	3.5
	Italy	10	4.8	24.4	4,5	36	34.7	4.6
	Netherlands	14	4.9	27.2	3,4	41	25.1	3.0
Late democrats	Spain	14	5.7	22.0	9,9	37	32.9	4.1
	Greece	15	2.4	21.2	3,5	37	34.5	4.8

[1]Elaborated by Navarro et al. (2003b).
[2] OECD HEALTH DATA 2005, June 05.
[3] OECD. (Förster & Mira, 2005).

Table 2. Description of study variables in men and women, aged 50-74, by political tradition.

	MEN								WOMEN							
	Social democrats		Christian democrats		Late democrats		Total		Social democrats		Christian democrats		Late democrats		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Dependent variables																
Self- perceived health																
Good	420	71.1	3650	63.3	852	64.9	4922	64.2	422	67.7	3579	60.8	635	55.0	4636	60.5
Poor	171	28.9	2114	36.7	461	35.1	2746	35.8	201	32.3	2312	39.2	519	45.0	3032	39.5
Long-term illness																
No	318	52.9	3045	52.9	688	52.4	4051	52.9	310	49.7	2975	50.5	553	47.9	3838	50.0
Yes	272	47.1	2715	47.1	625	47.6	3612	47.1	314	50.3	2916	49.5	601	52.1	3831	50.0
Independent variables																
Social class dimension																
Ownership																
Owner	92	15.6	950	16.5	347	26.4	1389	18.1	52	8.3	713	12.1	279	24.2	1044	13.6
Worker	499	84.4	4814	83.5	965	73.6	6278	81.9	571	91.7	5178	87.9	875	75.8	6624	86.4
Educational level																
High education	407	69.5	3663	63.8	357	27.4	4427	58.0	398	64.4	3317	56.5	275	24.0	3990	52.3
Low education	179	30.5	2078	36.2	946	72.6	3203	42.0	220	35.6	2549	43.5	872	76.0	3641	47.7
Management																
With personnel	247	41.9	2527	43.8	476	36.3	3250	42.4	143	23.0	1294	22.0	234	20.3	1671	21.8
Without personnel	343	58.1	3237	56.2	837	63.7	4417	57.6	480	77.0	4598	78.0	920	79.7	5998	78.2
Age group																
50-59	255	43.1	2468	42.8	538	41.0	3261	42.5	294	47.2	2637	44.7	551	47.8	3482	45.4
60-69	252	42.6	2436	42.3	515	39.3	3203	41.8	230	36.9	2308	39.2	419	36.3	2957	38.6
70-74	84	14.3	860	14.9	259	19.7	1203	15.7	99	15.9	946	16.1	183	15.9	1228	16.0
Employment status																
Employed	254	43.1	2100	36.6	511	39.0	2865	37.5	229	36.8	1694	28.8	285	24.7	2208	28.8
Unemployed	22	3.7	276	4.8	49	3.7	347	4.5	20	3.2	224	3.8	50	4.3	294	3.8
Retired	288	48.9	3052	53.1	668	51.0	4008	52.4	302	48.5	2497	42.4	247	21.4	3046	39.8
Permanently sick	16	2.7	206	3.6	50	3.8	272	3.6	17	2.7	129	2.2	32	2.8	178	2.3
Homemaker	1	0.2	24	0.4	5	0.4	30	0.4	43	6.9	1238	21.0	514	44.6	1795	23.4
Other Situation	8	1.4	87	1.5	28	2.1	123	1.6	12	1.9	102	1.8	25	2.2	139	1.9
Total	591	7,70	5764	75,2	1313	17,1	7668	100.0	623	8,1	5892	76,8	1154	15,0	7669	100.0

Missing values are excluded.

Table 3. Age-standardised prevalence (%) and 95% confidence interval (95%CI) of poor health and of long-term illness by social class dimensions and difference of prevalences (dif). Men and women, aged 50-74 years, by political tradition.

	MEN						WOMEN					
	Social democrats		Christian democrats		Late democrats		Social democrats		Christian democrats		Late democrats	
	% 95%CI	dif	% 95%CI	dif	% IC95	dif	% 95%CI	dif	%	dif	% 95%CI	dif
Poor Health												
Ownership												
Owner	23.8 (19.3,28.3)		31.9 (27.1,36.7)		33.1 (27.0,39.1)		31.5 (25.4,37.6)		36.5 (31.2,41.8)		38.1 (32.3,43.9)	
Worker	30. 0(27.9,32.1)	6.2	37.8 (35.6,40.0)	5.9	35.1 (31.4,38.8)	2.0	32.4 (30.5,34.3)	0.9	39.4 (37.4,41.4)	2.9	48.2 (55.6,51.7)	10.1
Educational level												
High education	25.1 (22.9,27.3)		32.6 (30.2,35.0)		20.9 (15.7,26.0)		28.0 (25.8,30.2)		33.6 (30.9,36.2)		27.0 (21.0,33.0)	
Low education	38.4 (34.7,42.2)	13.3	43.8 (40.1,47.4)	11.2	39.8 (35.9,43.8)	18.9	41.7 (38.4,44.9)	13.7	46.3 (43.5,49.3)	12.7	51.2 (47.7,54.7)	24.2
Management												
With personnel	25.5 (22.7,28.4)		30.1 (27.2,33.0)		26.7 (22.1,31.3)		28.0 (24.3,31.6)		35.2 (31.2,39.3)		32.7 (26.8,38.7)	
Without personnel	31.4 (28.9,34.0)	5.9	42.0 (39.2,44.7)	11.9	38.8 (34.7,43.0)	12.2	33.7 (31.6,35.8)	5.7	40.3 (38.2,42.5)	5.1	48.6 (45.2,52.2)	15.9
Long-Term illness												
Ownership												
Owner	39.3 (34.0,44.5)		39.0 (34.1,43.9)		45.5 (39.3,51.7)		46.7 (40.1,53.3)		41.5 (36.0,46.9)		49.4 (43.4,55.4)	
Worker	47.4 (45.1,49.7)	8.1	48.9 (46.7,51.2)	9.9	47.6 (43.8,51.4)	2.1	50.7 (48.7,52.8)	4.0	50.5 (48.5,52.6)	13	53.9 (50.4,57.4)	4.5
Educational level												
High education	44.3 (41.8,46.9)		47.2 (44.7,49.3)		37.1 (31.1,43.2)		47.8 (45.3,50.3)		48.8 (46.0,51.5)		41.9 (35.2,48.7)	
Low education	51.4 (47.6,55.3)	7.1	47.3 (43.6,51.0)	0.1	50.7 (46.6,54.7)	13.6	55.7 (52.4,59.0)	7.9	50.8 (47.9,53.8)	2.0	55.9 (52.5,59.4)	14.0
Management												
With personnel	45.1 (43.1,49.6)		45.1 (42.0,48.2)		40.7 (35.6,45.7)		51.1 (47.1,55.2)		48.3 (44.2,52.5)		45.6 (39.2,51.9)	
Without personnel	48.9 (43.0,48.5)	3.8	48.9 (46.1,51.6)	3.8	51.0 (46.8,55.2)	10.3	50.2 (48.0,52.4)	9.1	49.7 (47.6,51.9)	1.4	54.6 (51.2,58.0)	9.0

Dif: Prevalence difference in percentage of social class dimensions.

Table 4. Association between Poor health and long-term illness and social class dimensions by political tradition. Models adjusted by age and employment status and fully adjusted models. Men and women, aged 50-74 years.

	MEN							WOMEN						
	Social democrats		Christian democrats		Late democrats		p-value (**)	Social democrats		Christian democrats		Late democrats		p-value (**)
	OR	95%CI	OR	95%CI	OR	95%CI		OR	95%CI	OR	95%CI	OR	95%CI	
Models adjusted by one dimension of social class, age and employment status														
Poor Health														
No Ownership	1.21	(0.71-2.07)	1.09	(0.93-1.27)	1.05	(0.79-1.38)	0.84	0.95	(0.51-1.78)	0.98	(0.83-1.16)	1.45	(1.07-1.95)	0.08
Low education	1.75	(1.18-2.60)	1.48	(1.32-1.67)	2.52	(1.84-3.44)	0.02	1.64	(1.14-2.37)	1.62	(1.45-1.81)	2.48	(1.77-3.47)	0.02
No Supervision	1.30	(0.89-1.90)	1.66	(1.47-1.87)	1.65	(1.27-2.14)	0.57	1.30	(0.85-1.99)	1.17	(1.03-1.34)	1.79	(1.30-2.47)	0.04
Long-Term illness														
No Ownership	1.31	(0.82-2.09)	1.37	(1.18-1.59)	0.99	(0.76-1.30)	0.34	1.09	(0.61-1.95)	1.37	(1.16-1.61)	1.17	(0.88-1.56)	0.49
Low education	1.24	(0.86-1.79)	0.90	(0.80-1.01)	1.60	(1.22-2.11)	0.00	1.26	(0.89-1.78)	1.01	(0.90-1.13)	1.58	(1.17-2.14)	0.01
No Supervision	0.95	(0.68-1.33)	1.11	(1.00-1.24)	1.40	(1.09-1.78)	0.12	0.94	(0.64-1.37)	1.00	(0.88-1.14)	1.35	(1.00-1.83)	0.16
Models adjusted by all dimensions of social class, age and employment status														
Poor Health														
No Ownership	1.22	(0.71-2.10)	1.05	(0.89-1.24)	1.06	(0.79-1.41)	0.79	0.89	(0.47-1.69)	1.02	(0.86-1.22)	1.51	(1.10-2.06)	0.08
Low education	1.70	(1.14-2.54)	1.35	(1.19-1.53)	2.31	(1.68-3.20)	0.02	1.60	(1.10-2.32)	1.61	(1.43-1.80)	2.43	(1.71-3.44)	0.02
No Supervision	1.21	(0.82-1.79)	1.56	(1.38-1.76)	1.37	(1.03-1.80)	0.34	1.18	(0.76-1.85)	1.11	(0.96-1.28)	1.37	(0.97-1.92)	0.51
Long-Term illness														
No Ownership	1.32	(0.82-2.11)	1.32	(1.14-1.54)	1.00	(0.75-1.32)	0.51	1.10	(0.61-2.00)	1.41	(1.19-1.67)	1.18	(0.88-1.59)	0.45
Low education	1.26	(0.87-1.82)	0.89	(0.79-1.01)	1.49	(1.12-1.99)	0.00	1.28	(0.90-1.83)	1.03	(0.92-1.16)	1.56	(1.14-2.13)	0.02
No Supervision	0.91	(0.65-1.29)	1.13	(1.01-1.26)	1.27	(0.98-1.65)	0.40	0.88	(0.59-1.31)	0.95	(0.83-1.08)	1.18	(0.86-1.62)	0.43

OR: Odds Ratio
95% CI: 95% confidence intervals
** P-value of the difference of the OR among the political traditions

Chapter 12

Explaining variations between political traditions in the magnitude of socio-economic inequalities in self-perceived health

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Abstract

Background: The objectives of this study are to describe the variations between political traditions in the magnitude of inequalities in self-perceived health by educational level in men and women of Europe and to analyse if these variations change when contextual variables of welfare state, labour market and wealth and income inequalities of the country are taken into account.

Methods: It is a cross-sectional design. The population of men and women aged 25 to 64 of 13 European countries was studied. Individual data were obtained from the Health Interview Surveys of each country and contextual variables from the Organisation for Economic Co-operation and Development. The dependent variable was having less than good self-reported health status (poor health). Individual independent variables were age, sex and educational level. Four political traditions were considered (socialdemocracies, christiandemocracies, liberals and late democracies). Variables of welfare state, labour market, income inequality and wealth were also included. Logistic models were fitted in order to study the relationship of poor health and educational level in each political tradition and sex. In a second step, contextual variables were introduced in the models.

Results: Educational level inequalities of self-perceived health exist in all countries and also in all political traditions among women and men. Countries grouped by political tradition show that late democracies have the highest inequalities (RII=7.53; 95%CI:6.54-8.67 among women and RII=6.48; 95%CI:6.50-7.64 among men) and social-democratic countries the lowest. When the contextual variables were taken into account, educational level inequalities diminished in all political traditions and the differences between them became smaller in the case of men and disappeared in the case of women.

Conclusion: This paper has shown how inequalities in self-perceived health by educational level change by political tradition among men and women, being the highest inequalities in Late democracies, although there exist variations among countries. Contextual factors such as the expansion of welfare state or labour market should be a priority in order to reduce these inequalities.

Introduction

The impact of politics and policies on health and on social inequalities in health has rarely been studied although the scientific literature on social inequalities in health has increased exponentially in recent years. Few studies have analysed the impact of politics on health[1,2]. Infant mortality has been one of the outcomes most studied[3], mainly because it is sensitive over a short period of time, not needing long lag times to find results; it is sensitive to social development and it is sensitive to political and welfare state conditions. These studies found a relationship between the welfare regime and infant mortality, the Social Democratic countries showing better indicators. But, other health outcomes have also been studied comparing countries with different political traditions[1,4,5].

Until now, few studies have analysed the impact of politics on socioeconomic health inequalities. Dahl et al[6] have assessed, reviewing the empirical evidence of articles published analysing health inequalities in several countries, whether class inequalities in health diminish in welfare state regimes. However, the studies included in Dahl et al review had not been focussed on comparing health outcomes of different typologies of countries and they did not conclude that health inequalities are systematically smaller in social democratic countries than in other European countries with different welfare regimes. Muntaner et al[7] also compiled data comparing Sweden, UK, and Italy as examples of Social democratic, Christian democratic and Liberal traditions and found similar results of Dahl et al.

Recently, Espelt et al.[8] showed how perceived health inequalities in adult and older population may be explained by Wright neomarxist social class dimensions, in nine European countries with different political traditions (Social democrats, Christian democrats and Late democrats). Health inequalities were more important in Late democracies and mainly among women, mainly when using educational level dimension than other dimensions of social class (ownership and supervision). The results were clearer with poor perceived health than with long-term illness indicators. But this article, only included population older than 50 years and nine European countries.

The present article is focused on the conceptual model of figure 1, trying to explain socio-economic inequalities in self-perceived health through the political traditions, welfare state and labour market policies and socio-economic inequalities and wealth. Moreover, we broadened the age-spectrum of the population studied and also the number of countries included. Therefore the objectives are : first, to describe the variations between political traditions in the magnitude of inequalities in self-perceived health by educational level in men and women of Europe and second, to analyse if these variations change when contextual variables of welfare state, labour market and wealth and income inequalities of the country are taken into account.

Methods

Design, population studied and sources of information

We used a cross-sectional design. We studied the population of men and women aged 25 to 64 of Norway (year 2002), Sweden (year 2000/01), Finland (year 1994/1998/2000/2002/2004), Denmark (year 2000), England (year 2001), Ireland (year 1995/2002), Netherlands (year 2003/04), Belgium (year 1997/2001), Germany (year 1998), France (year 2004), Italy (year 1999/2000), Spain (year 2001) and Portugal (year 1998/99).

Data were obtained from the Health Interview Surveys of each country and were gathered for the EUROTHINE project. We had data of 196,280 persons ranging the sample sizes in the different countries between 4,781 for Norway and 77,531 for Italy. Contextual variables were obtained from the Organisation for Economic Co-operation and Development (OECD).

Variables

The variables studied are included in figure 1 and are explained in this section.

Dependent variable

Self-reported health status was measured through a single question: "Would you say your health is very good, good, fair, poor or very poor?" A dichotomous outcome variable was created (1=fair, poor or very poor; 0=very good, good). Self-reported health is related with objective health and also it is a valid predictor of mortality[9].

Individual independent variable

Age was grouped in 4 groups (25-34, 35-44, 45-64, 65-74). Educational level measures the highest level of education that was completed by the respondent. It was categorized using the International Standard Classification of Education (ISCED). The categories were: No or only primary education (ISCED 1), lower secondary (ISCED 2), upper secondary and post-secondary non-tertiary (ISCED 3) and tertiary education (ISCED 4).

Contextual independent variables

In this section we include the variables that were obtained for each country. We tried to choose variables of the beginning of the 1990s in order to have a time lag between these variables and health outcomes, but it was not always possible to obtain data of those years.

Political tradition:

The countries were grouped according to their political tradition. We made 4 groups according to the typology of Huber, Ragin and Stephens[10], further elaborated by Navarro, Schmitt, and Astudillo[11] tacking into account the years and months that Social democrats parties, Christian democrats parties, liberal parties and non democratic parties have been in the government since 1950. So we obtained four different typologies of countries: Social democratic, including Denmark, Finland, Norway and Sweden; Christian democratic, including Belgium, France, Germany, Italy; The Netherlands, Liberals, including England and Ireland; and Late Democratic countries, including Portugal and Spain.

Welfare state variables:

- Level of education: Percentage of population having attended ISCED levels 3-4 (>=upper secondary education) in 1994.
- Public Expenditure: Total public social expenditure as a percentage of Gross Domestic Product (GDP)in 1992.

Labour market variables:

- Percentage of participation of women in the labour force in 1993. Percentage of women who are employed or looking for work
- Percentage of people unemployed in 2000. It is the percentage of unemployed persons in respect to the civilian labour force (unemployed and employed).

Income inequality and wealth variables

- Quintile share ratio: The ratio of total income received by the 20% of the population with the highest income (top quintile) to that received by the 20% of the population with the lowest income (lowest quintile). Income must be understood as equivalised disposable income in 2001
- Gini coefficient in 2001: it is a measure of inequality of a distribution. It is defined as a ratio with values between 0 and 1: the numerator is the area between the Lorenz curve of the distribution and the uniform (perfect) distribution line; the denominator is the area under the uniform distribution line. Zero corresponds to perfect income equality and 1 corresponds to perfect income inequality.
- Gross Domestic Product (GDP) in 1993. The GDP of a country is defined as the market value of all final goods and services produced within a country in a given period of time.

Data Analysis

Two type of weights were used in the analyses: a) weights to take into account the sample design for the countries where it was necessary and b) weights to obtain proportionality of each survey to the population of the country in the year 2000.

All analyses were carried out for men and women separately. Firstly, we described all individual and contextual variables. The dependent variable was age-standardised by the direct method using the whole sample for the 13 countries as a standard population.

Logistic regression models were adjusted to show the association between self-perceived health and educational level, adjusting by age-group, in the different countries (table 1). Moreover, logistic regression models were adjusted to show the association between self-perceived health and the independent variables: educational level, political tradition and age group and the interaction between educational level and political tradition (model 1 of tables 3 and 4). Educational level was introduced as a quantitative variable (with 4 values between 0 and 1 which reflect the educational level distribution in the population in each political tradition). Therefore, through this model we can obtain the RII of educational level for each political tradition which can be interpreted as the odds ratio of poor perceived health between the two extremes of the educational spectrum. As a further step, we adjusted 8 different logistic models with the same independent variables of model 1 and also including contextual variables in order to see if this introduction explained the relationship between self-perceived health and educational level in the different political traditions.

Results

Table 1 describes the cases included in this study for each country and the crude percentages of poor perceived health. The distribution of contextual variables among countries is presented in table 2. Late democracies have less than 15% of the population with a level of education equal of higher than ISCED 3-4, percentage much lower than other countries. The highest percentages in public expenditure and in participation of women in the labour force occur in Social Democrats countries. Late Democrats and liberal countries have more income inequalities and less GDP.

Figure 2 shows that the highest percentage of poor-self perceived health (52.6%) was among women of late democracies having less education and the lowest (10.4%) was for men with tertiary education of Christian Democratic tradition. Absolute inequalities by educational level were more important in late democracies. This figure also shows the different distribution of population among political traditions, being social democracies the countries with highest levels of education and late democracies just the opposite.

The association between poor self-perceived health and educational level (age-adjusted) in each country is also shown in table 1. It can be observed the discrepancies existing in countries with same political tradition, for example Portugal has higher RII of poor perceived health for men (RII=7.70; 95%CI:5.37-11.06) and women (RII=6.76; 95%CI:4.62-9.87) than Spain.

Tables 3 and 4 show for women and for men the association between poor self-perceived health and educational level and political tradition (age-adjusted). The association between poor perceived health and educational level changes by political tradition (model I). The RII is higher in Late democracies (RII=7.53; 95%CI:6.54-8.67 among women and RII=6.48; 95%CI:6.50-7.64 among men) followed by Christian democrats, although there were inequalities in all political traditions. When contextual variables of the conceptual model were introduced, the variations of educational level inequalities between political traditions were reduced, with the exception of the introduction of labour market variables that did not reduce the variations. In model IX, that includes all the variables in the model, the RII of educational level among men varies between 3.53 (95%CI:3.27-3.81) for Christian Democrats countries and 4.80 (95%CI:4.11-5.62) for Liberals. Among women the RII of educational level varies between 3.19 (95%CI:2.48-4.10) for Social Democrats countries and 4.26 (95%CI:3.60-5.04) for Late Democrats.

Discussion

This paper has shown how educational level inequalities of self-perceived health exist in all countries and also in all political traditions among women and men. Countries grouped by political tradition show that late democracies have the highest inequalities and social-democratic countries the lowest. It is necessary to take into account that there exist variability among different countries. When the contextual variables of the conceptual model of figure 1 were taken into account, educational level inequalities diminished in all political traditions and the differences between them became smaller in the case of men and disappeared in the case of women.

Data evaluation

Self-perceived health is a variable that represents a multidimensional concept of health[12], is related to morbidity and mortality[9] and has been used in many European studies[13,14]. The question about self-perceived health had 5 possible answers in each country, usually 2 of good health (very good, good) and 3 of poor health (fair, bad, very bad). But in 2 countries (Germany and Netherlands) there were 3 categories of good health (excellent, very good, good) and 2 of poor health. Taking into account that the interviewed chose 1 of 5 categories, this different answers may bias the results. For this reason we repeated the analysis excluding Germany and the Netherlands, finding a smaller RII of educational level for men of Christian democratic countries (RII=4.71, 95% CI: 4.24-5.23 in model I) being not different of the RII of social democratic countries (RII=4.02, 95% CI: 3.14-5.14). The results were similar in the case of women, where social democratic countries had the lowest RII. Moreover, we obtained model I using less than fair health for all countries, excluding Germany and the Netherlands (table 5). In this case, we observe that the highest inequalities are in late democracies and the lowest in social democracies, although 95% confidence intervals were high.

Self perceived health by political tradition

This study has found differences by political tradition, but it is necessary to highlight that within each political traditions, countries had different profiles, for example Portugal and Ireland showed higher inequalities than Spain and England. Few studies have analysed before self-perceived health inequalities by socio-economic position in different political traditions. Two recent studies[8,15] have found higher inequalities by educational level in Late Democracies but, Christian democracies did not have higher inequalities than Social democracies. But these 2 studies used other sources of information, different countries and different ages than the ones of the present study. However, other studies have found a relationship between political factors and other health outcomes, mainly mortality indicators, being the countries governed by parties committed with redistributive polices the ones that have better mortality or health indicators [1,3,5,7,16,17].

A fact to take into account in the present study is the different distribution of the population by educational level. In Late democracies, the majority of the population belongs to the lowest educational levels, while this is just the opposite in other political traditions and mainly in the Social democratic countries. This fact is more evident among women. For this reason, in the late democracies, it is compared a large proportion of population with low education to a small proportion of population with high education, while in other political traditions it is just the opposite. This low educational level of the population of Late democracies is related with the lower degrees of public policies in these countries that occurred during the second half of the XX century and which is occurring also today[17,18].

This study also showed that when contextual variables of welfare state (public expenditure), labour market (unemployment), income inequalities (quintile share ratio) and wealth (GDP) are taken into account in the models, the differences between political traditions become smaller among men and disappear among women. The specific mechanisms that can help to understand how countries more committed to the expansion of welfare state and labour market have less health inequalities can be related with[19,20]:

a) Strong labour movements: A country with strong labour movements will probably have more favourable working conditions and the health of working population related to these conditions will be better.
b) Public benefits are high and are for everyone (universalism): Benefits directed to the whole population facilitate the access to all public goods (education, health care, social care, maternity leave, home care, etc). Moreover, the benefits of welfare state imply being protected in the face of adverse situations such as unemployment or sickness absence which are related with worse health outcomes. Another aspect to take into account is that universalistic health coverage implies better health outcomes and more utilisation of preventive and curative health care services[21,22].
c) Full employment policies and a high percentage of women in the labour force: Having an employment and facilitating the access of women in the labour market are related to health and well-being and especially to women's health[23].
d) The existence of less income inequalities that are related with better health outcomes[24,25].

Conclusions and recommendations

This paper has shown how inequalities in self-perceived health by educational level change by political tradition among men and women, being the highest inequalities in Late democracies, although there exist variations among countries. These inequalities are reduced when contextual variables are taken into account. Contextual factors such as the expansion of welfare state or labour market should be a priority in order to reduce these inequalities.

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Figure 1. Model showing the relationship between power resources, labour market, welfare state, socioeconomic inequalities and self-perceived health inequalities (the variables studied are included). Source: Navarro et al[1]

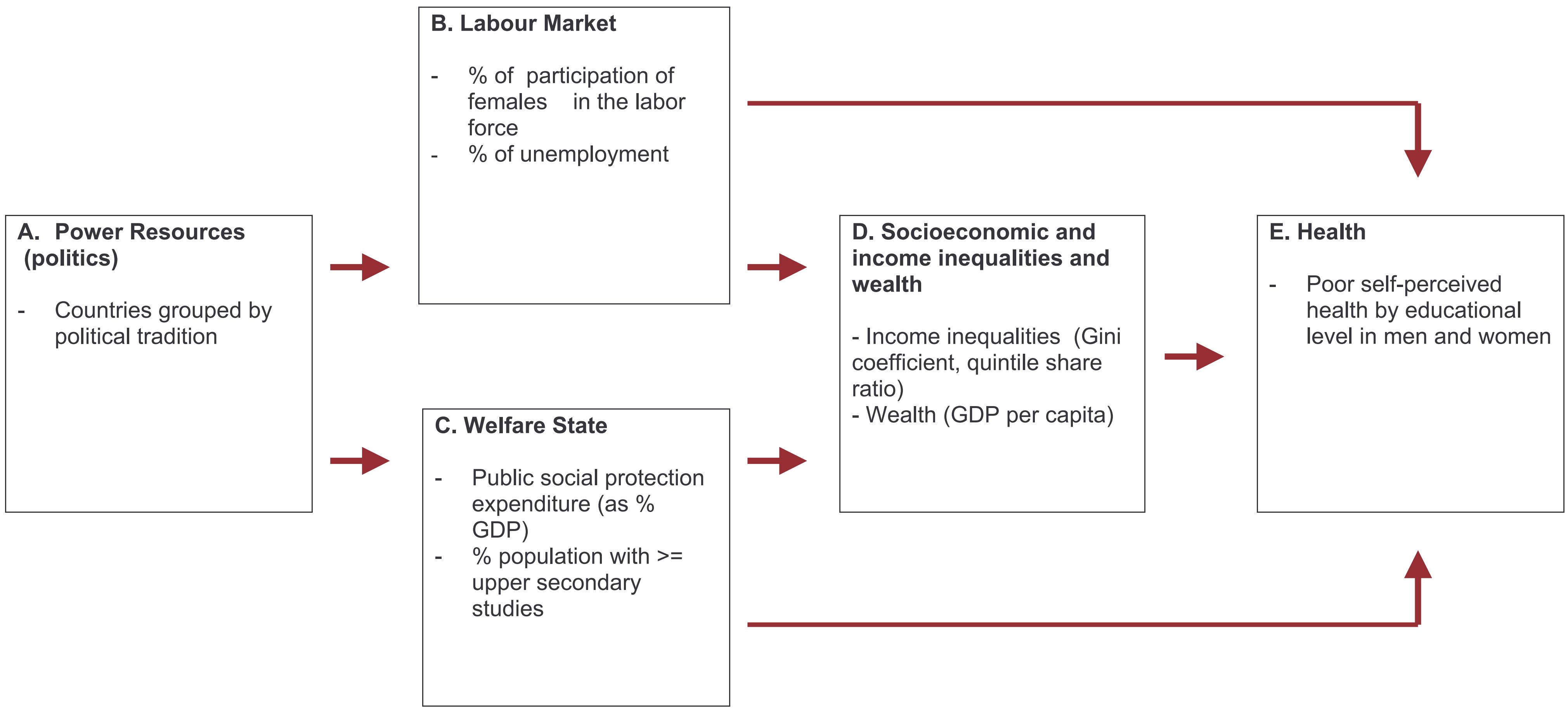

Figure 2. Poor Perceived health according to educational and percentage of population in each educational level grouped by political tradition. Women and men 25-64 years.

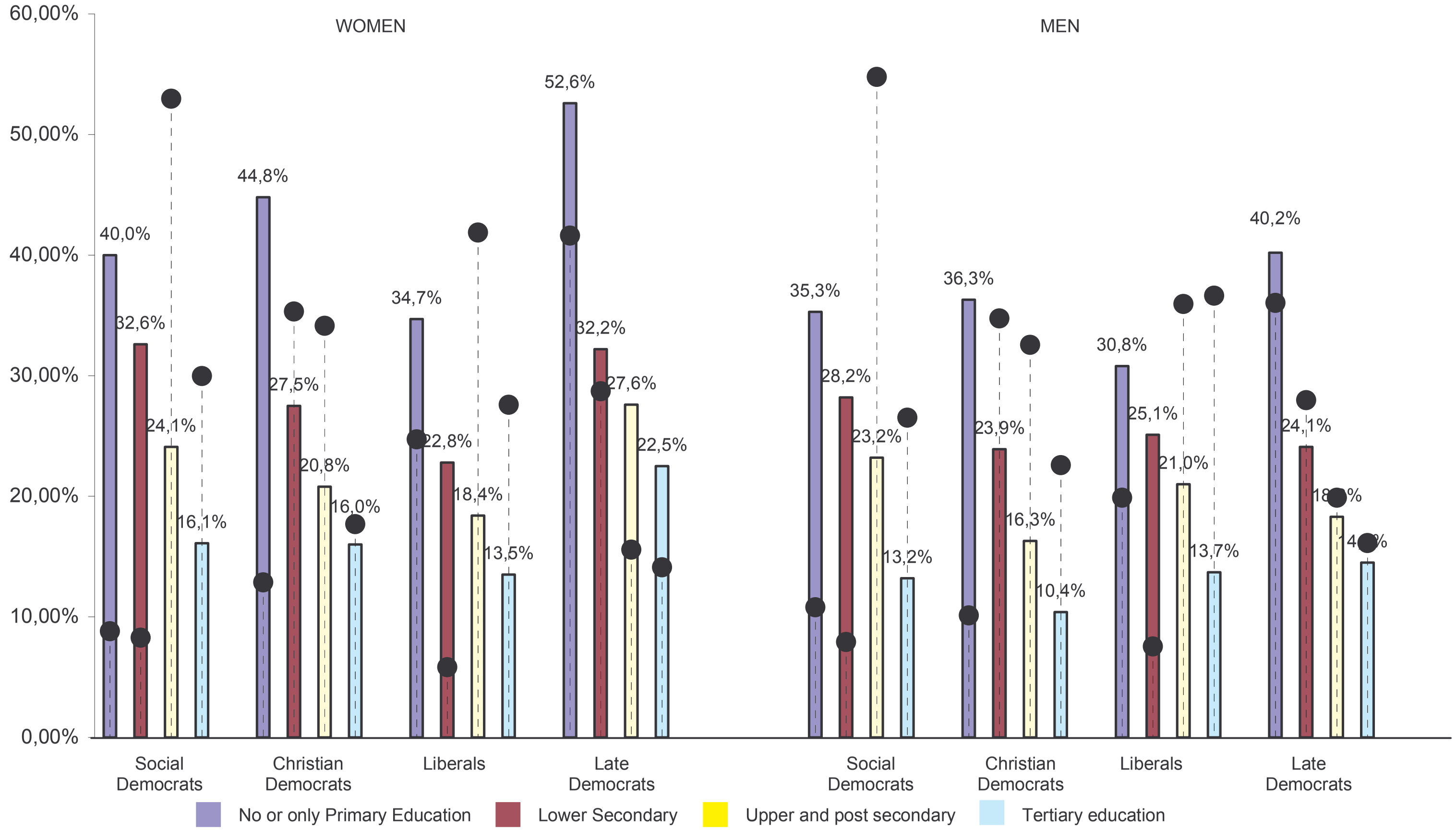

Table 1. Number of cases of the survey of 25-64 years of age, percentage of population with poor perceived health (less than good) and association between poor perceived health (less than good) and educational level in each country grouped by political tradition. Women and men 25-64 years.

		Women					Men				
		n	% poor health	RII	IC 95%		n	% poor health	RII	IC 95%	
Social democrats	Norway	2346	18.3	5.64	3.03	10.48	2435	16.1	4.27	2.17	8.39
	Sweden	3922	24.1	3.55	2.45	5.13	3786	19.8	4.23	2.77	6.46
	Finland	9047	32.3	2.78	1.74	4.42	7916	36.7	2.62	1.63	4.20
	Denmark	5786	20.4	5.82	3.49	9.72	5702	19.1	3.78	2.16	6.60
Christian democrats	Netherlands	5609	12.2	4.84	3.33	7.03	5376	9.2	5.58	4.25	7.31
	Belgium	6015	23.7	5.71	4.01	8.12	5760	19.1	5.92	3.94	8.87
	Germany	2766	17.3	3.09	2.69	3.55	2627	14.7	4.75	4.08	5.54
	France	3339	23.3	3.97	3.38	4.65	2554	18.5	3.93	3.25	4.76
	Italy	39342	44.3	2.71	2.38	3.09	38189	35.4	2.84	2.47	3.26
Liberals	England	5803	21.5	5.35	4.54	6.32	4720	21.6	4.64	3.91	5.50
	Ireland	4555	15.9	9.28	4.52	19.05	3898	14.6	6.23	2.83	13.70
Late democrats	Spain	6675	29.7	3.54	2.96	4.23	6568	20.0	3.81	3.16	4.75
	Portugal	9492	69.3	7.70	5.37	11.06	5252	55.2	6.76	4.62	9.87

RII are age-adjusted

Table 2. Description of contextual variables in the countries. Minimum and maximum value of the countries of each political tradition.

		Welfare state		Labour market		Income inequalities		Wealth
		Level of education 1994 (%)	Public Expenditure 1992[2](%)	Female Labour Force 1993 (%)	Unemployment 2001 (%)	Quintile share ratio[3] 2001	Gini coefficient 2001	GDP 1993[4]
Social democrats	Norway	57.4	26.8	45	1.9	3.5	26.1	21,139
	Sweden	47.9	35.3	48	2.5	3.4	24.3	19,141
	Finland	40.2	33.9	47	4.6	3.7	26.1	17,185
	Denmark	53.1	30.7	47	2.2	3.0	22.5	20,125
Christian democrats	Netherlands	42.1	28.3	41	1.1	4.0	25.1	19,877
	Belgium	30.7	28.4	43	2.6	4.0	27.2	19,803
	Germany	58.3	26.4	42	3.7	3.6	27.7	19,991
	France	40.4	28.0	45	3.9	3.9	27.3	19,888
	Italy	34.2	24.3	36	4.0	4.8	34.7	19,157
Liberals	England	57.2	23.4	44	2.4	5.4	32.6	17,738
	Ireland	34.7	20.4	37	1.7	4.5	30.4	14,898
Late democrats	Spain	14.1	21.4	36	4.6	5.5	32.9	14,443
	Portugal	10.1	15.6	45	2.0	6.5	35.6	12,090

[1]Level of education: Attainment ISCED 3-4, percentage of population
[2]Public expenditure: Total public social expenditure as % GDP
[3]Inequality of income distribution (income quintile share ratio) - The ratio of total income received by the 20% of the population with the highest income (top quintile) to that received by the 20% of the population with the lowest income (lowest quintile). Income must be understood as equivalised disposable income.
[4]GDP per capita in PPP (Million US$, purchasing power parity)

Table 3. Association between poor perceived health (less than good) and independent variables by political tradition. Women 25-64 years.

	Model I	Model II	Model III	Model IV	Model V	Model VI	Model VII	Model VIII	Model IX
INDIVIDUAL VARIABLES									
Educational level: RII by political tradition									
	RII (95% CI)	*RII (95% CI)*	*RII (95% CI)*	*RII (95% CI)*	*RII (95% CI)*	*RII (95% CI)*	*RII (95% CI)*	*RII (95% CI)*	*RII (95% CI)*
Social democrats	3.92 (3.13, 4.90)	3.62 (2.89, 4.54)	4.36 (3.46, 5.49)	3.88 (3.11, 4.87)	3.83 (3.07, 4.80)	3.84 (3.06, 4.81)	3.87 (3.08, 4.84)	3.54 (2.80, 4.47)	3.58 (2.85, 4.50)
Christian democrats	5.64 (5.24, 6.07)	4.41 (4.10, 4.74)	4.68 (4.35, 5.05)	4.89 (4.54, 5.26)	5.54 (5.15, 5.97)	3.61 (3.34, 3.89)	4.56 (3.30, 4.84)	4.67 (4.34, 5.03)	3.53 (3.27, 3.81)
Liberals	4.93 (4.22, 5.76)	4.54 (3.88, 5.31)	4.66 (3.98, 5.44)	4.76 (4.07, 5.56)	4.94 (4.23, 5.77)	5.01 (4.28, 5.85)	4.81 (4.12, 5.63)	4.51 (3.85, 5.28)	4.80 (4.11, 5.62)
Late democrats	7.53 (6.54, 8.67)	6.64 (5.77, 7.64)	5.22 (4.53, 6.01)	9.51 (8.23, 10.98)	8.04 (6.97, 9.28)	4.48 (3.89, 5.16)	5.67 (4.93, 6.53)	4.56 (3.95, 5.26)	4.42 (3.83, 5.10)
p-value[1]<	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002
CONTEXTUAL VARIABLES		*OR (95% CI)*	*OR (95% CI)*	*OR (95% CI)*	*OR (95% CI)*	*OR (95% CI)*	*OR (95% CI)*	*OR (95% CI)*	*OR (95% CI)*
Welfare State									
Level of education[2] 1999		0.960 (0.958,0.962)							
Public Expenditure 1992[3]			0.858 (0.852,0.865)						0.988 (0.979,0.998)
Labour Market									
Female Labour Force 1993				0.946 (0.941,0.950)					
Unemployment 2001					1.056 (1.035,1.077)				1.093 (1.071,1.116)
Income inequality									
Quintile share ratio[4] 2001						3.06 (2.95,3.162)			2.572 (2.449,2.700)
Gini coefficient							1.180 (1.174,1.187)		
Wealth									
GDP 1993								0.593 (0.580,0.607)	0.855 (0.830,0.881)

All models are age-adjusted
[1] p-value of the interaction between educational level and political tradition.
[2]Level of education: Attainment ISCED 3-4, percentage of population
[3]Public expenditure: Total public social expenditure as % GDP
[4]Inequality of income distribution (income quintile share ratio) - The ratio of total income received by the 20% of the population with the highest income (top quintile) to that received by the 20% of the population with the lowest income (lowest quintile). Income must be understood as equivalised disposable income.

Table 4. Association between poor perceived health (less than good) and independent variables by political tradition. Men 25-64 years.

	Model I	Model II	Model III	Model IV	Model V	Model VI	Model VII	Model VIII	Model IX
INDIVIDUAL VARIABLES									
Educational level: RII by political tradition									
	RII (95% CI)	*RII (95% CI)*	*RII (95% CI)*	*RII (95% CI)*	*RII (95% CI)*	*RII (95% CI)*	*RII (95% CI)*	*RII (95% CI)*	*RII (95% CI)*
Social democrats	3.97 (3.11, 5.08)	3.60 (2.81, 4.60)	4.95 (3.83, 6.39)	3.99 (3.12, 5.11)	3.61 (2.82, 4.62)	3.77 (2.95, 4.83)	3.86 (3.01, 4.94)	3.03 (2.36, 3.90)	3.19 (2.48, 4.10)
Christian democrats	6.56 (6.05, 7.12)	5.59 (5.15, 6.07)	5.61 (5.16, 6.09)	5.99 (5.52, 6.50)	5.95 (5.48, 6.46)	4.70 (4.32, 5.11)	4.27 (3.92, 4.65)	5.71 (5.26, 6.20)	4.25 (3.91, 4.63)
Liberals	4.21 (3.58, 4.96)	3.81 (3.24, 4.50)	3.87 (3.29, 4.56)	4.01 (3.40, 4.72)	4.26 (3.61, 5.02)	4.61 (3.91, 5.43)	4.30 (3.65, 5.07)	3.52 (2.99, 4.16)	4.20 (3.56, 4.96)
Late democrats	6.48 (6.50, 7.64)	6.05 (5.13, 7.13)	4.54 (3.85, 5.36)	7.85 (6.64, 9.29)	7.75 (6.55, 9.16)	4.18 (3.54, 4.93)	5.17 (4.38, 6.09)	4.08 (3.46, 4.82)	4.26 (3.60, 5.04)
p-value[1]<	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.280	0.200
CONTEXTUAL VARIABLES		*OR (95% CI)*	*OR (95% CI)*	*OR (95% CI)*	*OR (95% CI)*	*OR (95% CI)*	*OR (95% CI)*	*OR (95% CI)*	*OR (95% CI)*
Welfare State									
Attainment 1999[2]		0.969 (0.967,0.971)							
Public Expenditure 1992[3]			0.860 (0.853,0.868)						0.964 (0.954,0.975)
Labour Market									
Female Labour Force 1993				0.952 (0.947,0.958)					
Unemployment 2001					1.168 (1.145,1.191)				1.178 (1.155,1.201)
Income inequality									
Quintile share ratio[4]						2.688 (2.584,2.797)			2.066 (1.959,2.180)
Gini							1.163 (1.156,1.170)		
Wealth									
GDP 1993								0.627 (0.611,0.643)	0.841 (0.815,0.868)

All models are age-adjusted
[1]p-value of the interaction between educational level and political tradition.
[2]Level of education: Attainment ISCED 3-4, percentage of population
[3]Public expenditure: Total public social expenditure as % GDP.
[4]Inequality of income distribution (income quintile share ratio) - The ratio of total income received by the 20% of the population with the highest income (top quintile) to that received by the 20% of the population with the lowest income (lowest quintile). Income must be understood as equivalised disposable income.

Table 5. Association between poor perceived health (less than fair) and educational level by political tradition (excluding Germany and the Netherlands). Women and men 25-64 years.

	Women RII (95%CI)	Men RII (95%CI)
Social democrats	4.56 (3.10, 6.71)	4.56 (2.96, 7.06)
Christian democrats	6.40 (5.19, 7.90)	5.54 (4.26, 7.20)
Liberals	7.55 (5.57, 10.24)	6.13 (4.57, 8.24)
Late democrats	8.07 (6.20, 10.49)	6.89 (4.99, 9.50)
p-value	0.083	0.469

p-value of the interaction between educational level and political tradition.

Chapter 13

Gender and health inequalities in welfare state regimes: a cross-national study of twelve European countries

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Abstract

Background: Although previous research has examined how health and health inequalities vary by welfare state regime (e.g. Liberal, Corporatist, Social Democratic, Southern), this study is the first to examine the relationship between gender and self-assessed health (SAH), and the extent to which this varies by socio-economic position in different European welfare state regimes.

Objectives: This study had two objectives, to examine: (1) the relationship between gender and SAH across different European welfare states and how this is stratified by socio-economic position; (2) the extent to which such cross-national variations can be explained by welfare state regime theory.

Methods: Representative cross-sectional national household surveys from twelve European countries (conducted between 1998 and 2004) were used to analyse SAH differences by sex and socio-economic position (educational rank) in different welfare states. The sample sizes ranged from 7,124 (Germany) to 118,245 (Italy) and concerned the adult population (aged >= 16 years).

Results: Logistic regression analysis (adjusting for age) identified significant sex differences in SAH in eight European welfare states. In Demark, Sweden, Italy, Netherlands, Norway and Portugal, a significantly higher proportion of women reported that their health was ‘bad’ or ‘very bad’ compared to men. In the UK and Finland, men were significantly more likely to report ‘bad’ or ‘very bad’ health. For some countries, the sex differences in SAH tended to be most prominent in the group with the highest education. For four countries, Belgium, France, Germany and Ireland, there were no significant sex differences in SAH.

Discussion: This study suggests that the relationship between gender and SAH, and the extent to which it varies by socio-economic position, does in fact differ across European welfare states. Some of the differences found confirm previous research into health across welfare states and can be explained by drawing on welfare state regime theory. Other findings though, are less easy to explain in these terms. Such results constitute a challenge to regime theory, and those in public health who use it to inform their research, to engage more with issues of gender.

Introduction

Gender differences in health are well documented both in terms of mortality and morbidity [1-13]. However, the extent to which gender differences in health vary by socio-economic position is less well-documented [14]. Furthermore, whilst welfare state arrangements and social policies are increasingly being acknowledged as important determinants of health and of inequalities in health [15-23], there is little research into how gender differences in health vary by welfare state [24-26].

As part of the EUROTHINE project, this study focused on gender and health inequality in twelve European welfare states, representing four welfare state regimes: Finland, Sweden, Norway, Denmark, Ireland, England, Netherlands, Belgium, Germany, France, Italy, Portugal.

Gender inequalities in health

Over several decades, research on gender differences in mortality and morbidity has highlighted an important paradox. On the one hand, a wealth of evidence suggests that, in socio-economically developed nations, men have shorter life expectancies than women [3, 8, 13, 27-36]. In Britain, for instance, while absolute rates of mortality for women and men have been falling since the 1950s, women have experienced greater improvements in their life chances than men [37]. In Western Europe more widely, this gender difference is largest for violent causes of death [13, 33, 38, 39] and from early adulthood until middle-age [13, 40-42], but remain fairly stable throughout the life course [43, 44]. On the other hand, studies from a large number of countries suggest that women – in contrast to their lower mortality – actually report higher morbidity according to self-assessed indicators, including limiting long-term illness and SAH [1-13]. In particular, women in the West tend to report more chronic and acute conditions, as well as poorer psychosocial health, than men [8, 10-13, 35, 45-47].

Traditionally, this paradox has been explained as the result of sex differences in the distribution of biological, behavioural or psychological traits [10, 48, 49]. For instance, women may be more likely than men to suffer from certain symptoms of illness (e.g., headaches), which result in poorer self-assessed health but contribute little or nothing to mortality risk. An alternative explanation is that women are objectively healthier than men, but tend to report worse symptoms when prompted [50]. A related idea is that women are more accurate in their self-assessment of health than men, perhaps as a result of their greater health care utilisation [10, 51]. More radical commentators suggest that reporting difference may be due to traditional gender roles and a corresponding reluctance amongst men to admit ‘weakness’, that women’s experiences of living in a gendered society in which they are situated as the ‘oppressed’ may impact on their actual morbidity, or that patriarchal attitudes and the medicalisation of women’s lives (most extensively in terms of pregnancy and child birth) may lead to the over and misdiagnosis of morbidity in women as opposed to men, most notably in terms of mental illness [52].

Within the literature, however, there remains some debate as to the best explanation for the paradox in actual mortality and SAH [53, 54]. Furthermore, the relationship between SAH and gender may be complicated by extraneous factors. For instance, some researchers have pointed out that gender differences in SAH become smaller or disappear entirely in older age groups [55-57]. Others have suggested the possibility that gender differences in mortality may differ between different socio-economic groups or across countries [58]. It is therefore possible that gender differences in SAH may also vary by country or indeed, welfare state type. In fact, evidence suggests that gender-equitable social organisation reduces gender inequalities in both self-assessed health [59], and life expectancy [60].

Welfare states, health and health inequalities

Welfare states are important determinants of health and health inequalities as they mediate the extent, and impact, of socio-economic position on health [15-23, 61]. Welfare state provision varies extensively across the Western world, but typologies have been put forward to categorise them into three, four or even five distinctive types or welfare state regimes [24, 62, 63]. In terms of Europe, whilst particular country classification is often contested (e.g. UK, Netherlands, Italy) and the quality of typologies questioned [64], a consensus is gradually emerging that there are four core welfare state regime types [63]: Social Democratic (Denmark, Norway, Sweden and to a lesser extent Finland and Netherlands), Corporatist (Belgium, France, Germany), Liberal (England, Ireland) and Southern (Italy, Spain, Portugal). These roughly represent the three regimes originally proposed by Esping-Andersen [65, 66] plus a separate regime type for the Southern countries [61, 67-69]. Despite debates about how countries should be classified, studies which have examined how health varies by welfare state regime have invariably all concluded that population health is enhanced by the relatively generous and universal welfare provision of the Social Democratic Scandinavian countries [15, 17, 21, 22].

The mainstream comparative welfare state regime literature has only recently begun to seriously consider that the income redistribution, decommodification and other social effects of welfare state arrangements may vary by gender and that separate ‘gendered’ typologies of welfare states may therefore be required [66, 70-75]. However, this debate has not yet filtered through to public health researchers and to date, no studies have examined how gender differences in health vary by welfare state regime [24]. Similarly, cross-national studies of inequalities in health have only recently begun to examine gender differences by welfare state type [25, 26].

In this context, this study is the first to examine the relationship between gender and SAH (with additional stratification by socio-economic position) in different European welfare states, and to what extent this can be explained by welfare state regime theory. Specifically, we examine 2 hypotheses:

1) The relationship between gender and SAH varies across different European welfare states,
2) These cross-national variations can be explained by welfare state regime theory, e.g. gender differences in SAH are smaller in the Social Democratic welfare states and larger in the Southern welfare states.

Methods

This study was conducted as part of the European Union funded ‘Tackling Health Inequalities in Europe (EUROTHINE)’ project (http://mgzlx4.erasmusmc.nl/eurothine/). The EUROTHINE project collated data from various large representative national population surveys (carried out between 1998 and 2004). For the purpose of the current analysis we focused on the thirteen countries from Western Europe participating in the EUROTHINE project. The analysis is restricted to the twelve countries that had collected information pertaining to SAH, sex and age (Spain was excluded for this reason). All the study datasets concerned adults (aged >= 16 years) and the sample sizes ranged from 7,124 (Germany) to 118,245 (Italy).

Self-assessed health (SAH) was measured using a five-point Likert-type scale ranging from ‘very good’ health to ‘very bad’ health. To maximise the efficiency of the analysis, SAH was dichotomised to compare ‘bad and very bad health’ with ‘average to very good health’. Educational status was standardised across countries using the International Standard Classification of Education (ISCED), a four-point ranked scale (lowest rank indicating the most educated and highest rank the least educated). For the purpose of the current analysis educational rank was used as a proxy for socio-economic position.

Two descriptive analyses were conducted. The first explored the relationship between SAH and sex in each country, adjusting for age in years. The second stratified the analysis according to the four educational ranks. Logistic regression analysis was used for both analyses to obtain odds ratios summarising the relationship between SAH and sex. ‘Males’ were the reference group for sex and for the outcome of SAH ‘average to very good health’ was the reference. The odds ratio was deemed an appropriate effect estimate to approximate the relative risk given the low prevalence of ‘bad and very bad’ health for the majority of the participating countries (see Table 1).

Results

The proportion of individuals indicating ‘bad and very bad’ health varied between participating countries (Table 1). For the majority the occurrence of poor health was less than 10%. However, for Germany (17.5%) and Portugal (25.9%), a significantly higher proportion of individuals reported ‘bad and very bad’ health ($p>0.05$).

For all the countries except Ireland, there was a significant relationship between sex and self-reported poor health ($p<0.05$). England and Finland were the only countries to have a higher proportion of men reporting ‘bad and very bad’ health relative to women. The remaining nine countries had a higher prevalence of self-reported poor health in women (Table 1). For all twelve countries educational rank was strongly related to self-reported poor health with the lowest ranks having the highest proportion of individuals reporting ‘bad and very bad’ health.

The main regression analysis describing the relationship between sex and SAH (stratified by educational rank) is shown in Table 2. Statistically significant differences in SAH by sex were observed for eight of the twelve European countries. In Demark, Sweden, Italy, Netherlands, Norway and Portugal, a significantly higher proportion of women reported that their health was ‘bad’ or ‘very bad’ compared to men. The increased risk of poor SAH experienced by women from these countries ranged from a 23% increase in Denmark (OR=1.23; 95%CI=1.08,1.39) to more than a two-fold increase in Portugal (OR=2.01; 95%CI=1.87,2.15). In the UK (OR=0.88; 95%CI=0.78,0.99) and Finland (OR=0.85; 0.77,0.95) men were significantly more likely to report ‘bad’ or ‘very bad’ health. There were no significant sex differences in reporting poor SAH for Belgium, France, Germany and Ireland.

The relationship between sex and SAH, stratified by educational rank, appeared to vary between the countries (Figure 1). For Italy, Portugal and Sweden, the increased risk of poor SAH in women appeared to be greatest in the highest educational rank. For Denmark, Netherlands and Norway there was no clear relationship between the increased risk of poor SAH in women and educational rank. The reduced risk of poor SAH in women from England was only statistically significant (borderline) for educational rank 4 (OR=0.84; 95%CI=0.71,0.99), whereas for women from Finland the only significant association between sex and SAH was for educational rank 1 (OR=0.86; 95%CI=0.78,0.95).

Discussion

The results suggest that the relationship between gender and SAH, and the extent to which it varies by socio-economic position, does in fact differ across European welfare states, thus confirming hypotheses 1. However, in terms of hypothesis 2 (these cross-national variations can be explained by welfare state regime theory e.g. gender differences in SAH are smaller in the Social Democratic welfare states and larger in the Southern ones) the results are mixed. Some of the differences found confirm previous research into health across welfare states, such as the higher rates of self-assessed ‘bad’ or ‘very bad’ health amongst women in Portugal and Italy, and can be explained by drawing on welfare state regime theory. Other findings though, are more challenging to welfare state regime theory, including the lower rates of self-assessed ‘bad’ or ‘very bad’ health amongst women in the UK and Finland, or the comparatively higher rates of self-assessed ‘bad’ or ‘very bad’ health amongst women in the Social Democratic countries (disproving hypothesis 3). Furthermore, the finding that gender differences in SAH are most prominent in the higher educational groups in some countries requires further discussion. In this section we tentatively suggest possible explanations for the results.

Confirming welfare state regime theory

In some ways, how the twelve countries have grouped in terms of our examination of gender inequalities in health reinforces certain aspects of mainstream welfare state regime theory [61, 63-66, 68, 69, 72]. The four-fold typology of welfare states (Liberal, Social Democratic, Corporatist, Southern) is very evident in our results: women who are moderately more likely to report 'bad' or 'very bad' SAH are those in the Social Democratic countries of Denmark, Netherlands, Norway and Sweden; women in the Southern regime countries of Portugal and Italy are highly likely to report worse SAH, whilst those countries in which there appear to be no gender differences in SAH are the Corporatist countries of Belgium, France and Germany.

The only exceptions to this are Finland, England and Ireland. In welfare state regime theory, Finland is something of a hybrid case, with some typologies placing it in the Social Democratic regime [68] whilst others in the Corporatist [65] welfare state regime. This is perhaps a reflection of the shorter history of the welfare state in Finland (which was not developed until the 1970s) compared to the other Nordic welfare states. England and Ireland are almost always placed together in the Liberal regime type. However, this is perhaps an example of how gender matters in welfare state regimes, as in some of the more gendered typologies, Finland and UK are placed together as, for example, they have similar levels of labour market participation by women as well as comparable maternity leave arrangements [71]. Similarly, Ireland is much more comparable in terms of women's economic activity, economic opportunity and educational attainment to the Corporatist countries than England [76].

Welfare state regime theory is therefore able to provide some insight into how the twelve European countries analysed have grouped in terms of gender differences in SAH. However, whilst the high levels of 'bad' or 'very bad' SAH amongst women in the Southern regime countries reinforces research into gender and welfare states regimes, which has long highlighted the lack of support for women and their low economic and political participation in these countries [75], the gender differences in SAH in the other regime types is less easy to explain through reference to this literature.

Challenging welfare state regime theory

Perhaps the most surprising result, in the context of regime theory, is the significant gender difference in SAH found in the Social Democratic countries. Research into population health differences across welfare states have tended to find that health is better in the Social Democratic countries [15-17, 20-22, 61]. Furthermore, the Social Democratic welfare states are widely seen as the most progressive in terms of welfare and women's rights [66, 70-75]. The expectation would therefore be that gender differences in SAH in the Social Democratic countries, would be smaller than in the other regime types. However, the gender differential in SAH was higher in the Social Democratic countries than in some others. What explains this somewhat unexpected finding? One possible explanation is that the mechanisms at play in terms of gender and health cannot be overcome by the traditional Social Democratic welfare interventions of income redistribution and extensive public service provision alone. Indeed, some feminist critiques of the ‘women friendly’ Social Democratic welfare states have suggested that such policies have not actually been as beneficial for women as might be expected, as they have ended up transferring women’s economic dependency from the family to the state – from private to public patriarchy [77, 78]. Alternatively, as Dahl et al [18] suggest, health is not easily redistributed either across socio-economic groups or between men and women. Another competing explanation is that the Social Democratic model of income redistribution has benefited men, and therefore men’s health, more than women. Interlinked with this is the burden of the dual roles experienced by women across all socio-economic groups in Social Democratic states. Women, even lone mothers, are expected to work, and whilst public policy is progressive in terms of child care and paternity leave, women are still responsible for the majority of domestic work and family care [77, 78]. Perhaps another factor behind the results is the proportion of lone mothers in Social Democratic states [79]. For example, in Sweden, lone mothers have worse health than couple mothers [79], and this may in part be because current welfare state provision and public policy is unable to fully compensate for the lack of partner support. Of course, the English and Finnish results, where SAH amongst women was better than amongst men suggests that these relationships may not be consistent across all countries with high labour market participation by women. Further analysis using other measures of health (such as mortality data) would help explore the consistency of this finding.

No significant gender differences in SAH were found in the Corporatist countries (Belgium, France and Germany), or in Ireland. The Corporatist welfare states are often considered to offer a contradictory set of policies and provisions in relation to women and the family [66, 70-75]. On the one hand, they provide some of the best provisions for women (e.g., well-compensated and extensive maternity leave), whilst on the other hand they have much lower levels of labour market participation by women [70, 71, 73-75]. The lack of gender difference in SAH could therefore reflect the fact that fewer women in the Corporatist countries experience dual roles. Similarly, there are lower levels of lone motherhood in the Corporatist countries. This is also the case for Ireland. Conversely, though the cases of Italy and Portugal caution that restrictive traditional gender roles for women can have an extremely adverse effect on gender differences in health.

However, it is likely that there are also variations in SAH between age groups. In addition, different welfare state regimes will have policies that act differentially at various stages in the life cycle as well as by sex. For example, maternity policies and policies that support lone mothers are likely to impact most strongly on the health of women who are of child bearing age. SAH may also be affected by employment opportunities, domestic roles, and access to material resources all of which may be associated with welfare policy, and might also have a different impact at varying stages in the life cycle. Such differences between age groups would not have been apparent in this study, which examined SAH across a wide age range. Future research would benefit from examining reported SAH between different age groups to ascertain whether the patterns reported here vary by age as well as by welfare state regime and level of education.

Welfare state regimes and gender inequality in health

The relationship between gender and SAH, stratified by educational rank (our proxy for socio-economic position), varied extensively across the different countries. It is of note that there appears to be a stronger relationship between gender and SAH in the highest educational rank for a number of the countries. In the Southern regime countries of Italy and Portugal, the increased risk of poor SAH in women appeared to be greatest in the highest educational rank, perhaps due to the higher prevalence of smoking amongst more educated women in the Southern regime countries [80]. This was also the case in Social Democratic Sweden. However in Finland, women in the highest group reported better SAH than men. In the other Social Democratic countries (Denmark, Netherlands and Norway), there was no clear relationship between the increased risk of poor SAH in women and educational rank. In England the reduced risk of poor SAH amongst women was only amongst the lowest educated group. Although it is possible to explain the higher rates of poor SAH amongst more educated women in terms of the pressures of these women's dual roles, the results are inconsistent and are therefore difficult to explain in a coherent way without further research.

Strengths and limitations

The EUROTHINE project provides the unique opportunity to compare gender differences in health across Europe using large, representative cross-sections of the adult population. Comparisons are made easier by the use of standardised classifications of important variables (e.g., educational rank). However, national-level data cannot be used to make predictions at the level of the individual.

One limitation of the analysis relates to the age range of the study sample for two of the countries, which were capped at 79 years (Germany) and 64 years (Finland). This means that for both countries the sample is not truly representative of the adult population. We have, however, adjusted for age in our analysis for each country and so have a summary of the association between gender and SAH, independent of age.

Another limitation is the use of educational rank as a proxy for socio-economic postion. This relationship is unlikely to be uniform across all European countries. Furthermore, and of particular importance for this study, women's educational background may not be a very accurate indicator of their socio-economic position. Indeed research into socio-economic inequalities in health amongst men and women have highlighted the sensitivity of the choice of indicator of socio-economic position [14]. A further issue concerns the possibility that within welfare regimes there could be direct, differential effects of different educational systems on gender inequalities in health.

Although SAH correlates well with other indicators of morbidity [81] and is considered to be a good indicator to compare health across countries [82], it should be acknowledged that there may well be differences in reporting across countries, cultures, socio-economic groups and, of course, by gender [83].

Policy implications

Our results suggest that the nature of gender differences in health vary by country and, to some extent, by welfare state type. Therefore, achieving gender equity in health will require different policy responses in each European welfare state.

Although, the Social Democratic welfare states are widely seen as the most egalitarian, our results suggest that the mechanisms at play in terms of gender and health are not necessarily easily amenable to the traditional Social Democratic interventions of income redistribution and extensive public service provision. It may well be that welfarist policies cannot adequately overcome gender based inequities in health without accompanying changes at the cultural and societal levels. To start, we suggest implementing policies which target gender socialisation and traditional gender roles. A good example of such policies would be the recommendations of the Swedish Education Ministry's Delegation for Gender Equality in Preschool [84], which recently submitted its report to the Swedish government. The high levels of 'bad' and 'very bad' health amongst women in Italy and Portugal reinforce this suggestion, as the gendered and highly restrictive traditional roles experienced by women in these countries appear to be very detrimental to their SAH.

The lack of gender differences in SAH in the Corporatist countries and our suggestion that this may be due to the existence of more dual couples and less dual roles for women implies that public policy interventions need to compensate more adequately for the lack of support experienced by lone mothers and by working women in general. Current state provision, even in the Social Democratic countries, has not yet adequately compensated for the detrimental health effects of lone parenthood [79]. This may require more extensive socialised child care, as well as enhanced flexibility around working hours.

There are some indications in our analysis that in a variety of countries, the increased risk of poor SAH in women appeared to be greatest in the highest educational rank. This may also necessitate policy interventions to support women with dual roles. However, given the data limitations highlighted earlier, further research is required to draw out the full policy implications of this finding.

Conclusion

Current welfare regime theory clearly offers some explanatory insight into gender differences in health. However, until more work on the gendered nature of welfare states has been undertaken and is available for use by public health researchers, regime theory may not be as useful in examining gender and health as it has been in terms of overall population health [15-17, 19-23, 61]. One obvious route to pursue relates to the relationships between gender inequalities in health and gendered public policy indicators and typologies, such as the Gender Equity Index [85].

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Table 1: Characteristics of Western European study datasets

Characteristic	Belgium	Denmark	England	Finland	France	Germany
Number	18,481	16,690	15,767	20,371	17,828	7,124
Age (years):						
range	16-99	16-98	16-100	16-64	16-103	17-79
Mean (sd)	46.9 (18.5)	46.5 (18.2)	47.8 (18.6)	40.5 (13.6)	44.7 (18.1)	45.7 (15.9)
Sex (men):						
no. (%)	8959 (48.5)	8188 (49.1)	7032 (44.6)	9459 (46.4)	8761 (49.1)	3450 (48.4)
Education rank-no. (%):						
1	5175 (29.0)	3070 (18.8)	4019 (27.0)	3830 (19.1)	4765 (27.4)	961 (13.9)
2	5345 (30.0)	8951 (54.8)	5524 (37.2)	11460 (57.2)	3290 (18.9)	2987 (43.1)
3	3688 (20.7)	1008 (6.2)	864 (5.8)	1988 (9.9)	6396 (36.7)	2777 (40.1)
4	3611 (20.3)	3292 (20.2)	4463 (30.0)	2770 (13.8)	2969 (17.0)	202 (2.9)
SAH-no (%):						
very good	4110 (24.0)	5866 (35.2)	5200 (33.0)	7165 (35.3)	2790 (21.0)	209 (3.0)
good	8597 (50.3)	7096 (42.6)	6477 (41.1)	6661 (32.9)	7200 (54.2)	1170 (16.8)
average	3624 (21.2)	2686 (16.1)	2967 (18.8)	4965 (24.5)	2806 (21.1)	4365 (62.7)
bad	645 (3.8)	766 (4.6)	848 (5.4)	1254 (6.2)	418 (3.2)	1096 (15.7)
very bad	125 (0.7)	262 (1.6)	268 (1.7)	232 (1.1)	67 (0.5)	126 (1.8)
SAH-no (%):						
bad/very bad	770 (4.5)	1028 (6.2)	1486 (7.1)	1486 (7.3)	485 (3.7)	1222 (17.5)
Sex:*						
Men	343 (4.2)	444 (5.4)	520 (7.4)	751 (8.0)	212 (3.3)	551 (16.3)
Women	427 (4.8)	584 (6.9)	596 (6.8)	735 (6.8)	273 (4.0)	671 (18.7)
	p=0.035	p<0.0005	p=0.160	p=0.001	p=0.033	p=0.008
Education rank:$						
1	75 (1.5)	85 (2.8)	123 (3.1)	157 (4.1)	43 (1.2)	119 (12.4)
2	139 (2.8)	456 (5.1)	203 (3.7)	710 (6.2)	40 (1.6)	349 (11.7)
3	168 (4.9)	68 (6.8)	79 (9.1)	161 (8.1)	147 (3.1)	705 (25.4)
4	348 (11.0)	405 (12.3)	650 (14.6)	431 (15.7)	246 (11.2)	41 (20.3)
	p<0.0005	p<0.0005	p<0.0005	p<0.0005	p<0.0005	p<0.0005

* Chi-squared hypothesis test used to calculate p value
$ Chi-Squared test for trend used to calculate p value

Table 1 (cont): Characteristics of Western European study datasets

Characteristic	Netherlands	Ireland	Italy	Norway	Portugal	Sweden
Number	15,803	15,051	118,245	6,623	40,917	11,484
Age (years):						
range	16-85	16-100	16-105	16-102	16-103	16-84
Mean (sd)	46.5 (17.7)	43.8 (18.5)	47.1 (18.8)	46.1 (17.7)	48.1 (19.3)	46.3 (18.2)
Gender (men):						
no. (%)	7670 (48.5)	7455 (49.5)	56951 (48.2)	3306 (49.9)	19336 (47.3)	5587 (48.9)
Education rank-no. (%):						
1	3599 (22.9)	2148 (14.3)	7579 (6.4)	1718 (26.0)	3574 (8.7)	3135 (27.3)
2	5921 (37.7)	4470 (29.8)	35605 (30.1)	3746 (56.7)	4479 (11.0)	5310 (46.3)
3	3823 (24.4)	3574 (23.8)	35149 (29.7)	1149 (17.4)	4255 (10.4)	1323 (11.5)
4	2345 (15.0)	4819 (32.1)	39912 (33.8)	----	28579 (69.9)	1705 (14.9)
SAH-no (%):						
very good	2513 (18.9)	6896 (45.9)	14536 (12.3)	2216 (33.5)	622 (2.7)	4037 (35.2)
good	3546 (26.7)	5322 (35.4)	50010 (42.3)	3141 (47.5)	6652 (28.4)	4540 (39.6)
average	5668 (42.6)	2320 (15.5)	43733 (37.0)	860 (13.0)	10085 (43.0)	2160 (18.8)
bad	1349 (10.1)	373 (2.5)	8008 (6.8)	338 (5.1)	4816 (20.6)	576 (5.0)
very bad	224 (1.7)	109 (0.7)	1958 (1.7)	63 (1.0)	1263 (5.4)	165 (1.4)
SAH-no (%):						
bad/very bad	1573 (11.8)	482 (3.2)	9966 (8.4)	401 (6.1)	6079 (25.9)	741 (6.5)
Sex:*						
Men	636 (10.0)	241 (3.2)	3857 (6.8)	157 (4.8)	1747 (20.1)	315 (5.6)
Women	937 (13.5)	241 (3.2)	6109 (10.0)	244 (7.4)	4332 (29.4)	426 (7.2)
	p<0.0005	p=0.835	p<0.0005	p<0.0005	p<0.0005	p=0.001
Education						
rank:$	224 (7.0)	24 (1.1)	181 (2.4)	41 (2.4)	70 (3.8)	108 (3.4)
1	493 (9.7)	60 (1.3)	943 (2.7)	205 (5.5)	63 (3.3)	343 (6.5)
2	394 (12.3)	53 (1.5)	1494 (4.3)	155 (13.5)	175 (8.0)	67 (5.1)
3	444 (25.8)	341 (7.1)	7348 (18.4)	----	5771 (33.0)	222 (13.1)
4	p<0.0005	p<0.0005	p<0.0005	p<0.0005	p<0.0005	p<0.0005

* Chi-squared hypothesis test used to calculate p value

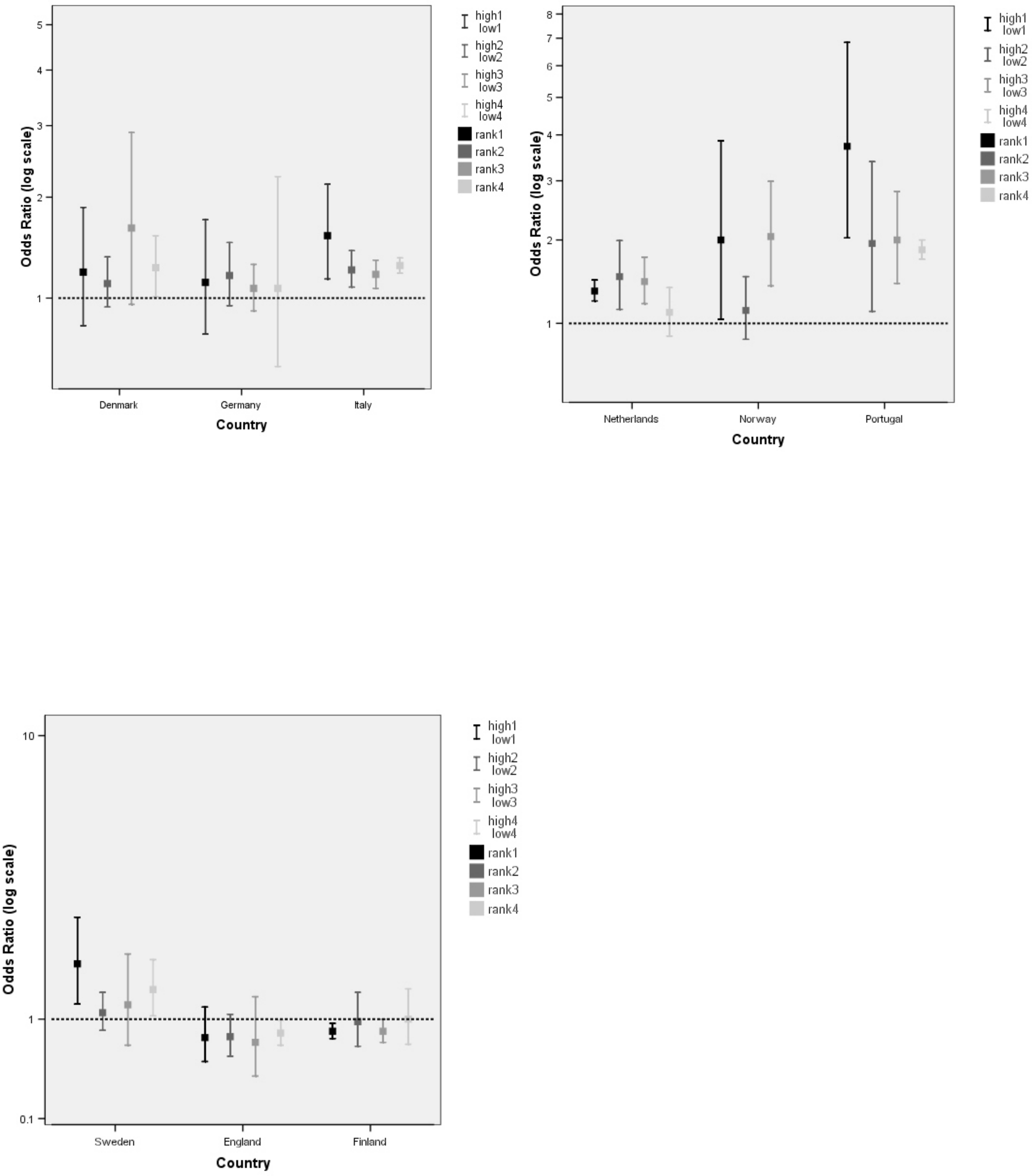
$ Chi-Squared test for trend used to calculate p value

Table 2: Association of sex with SAH (stratified by educational rank)*

	Total		Educational rank							
			1		2		3		4	
	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI
Belgium	1.09	0.94,1.27	1.21	0.76,1.92	1.44	1.02,2.02	0.89	0.65,1.21	0.99	0.80,1.25
Denmark	1.23	1.08,1.39	1.22	0.79,1.88	1.12	0.93,1.36	1.65	0.95,2.89	1.26	1.01,1.57
England	0.88	0.78,0.99	0.79	0.55,1.15	0.80	0.60,1.06	0.74	0.42,1.29	0.84	0.71,0.99
Finland	0.85	0.77,0.95	0.86	0.78,0.95	0.97	0.70,1.35	0.86	0.74,1.00	1.00	0.72,1.40
France	1.15	0.95,1.38	0.82	0.44,1.51	1.43	0.74,2.76	1.11	0.80,1.55	1.09	0.83,1.44
Germany	1.13	1.00,1.29	1.13	0.73,1.74	1.19	0.94,1.50	1.08	0.90,1.29	1.08	0.52,2.26
Netherlands	1.44	1.29,1.60	1.34	1.23,1.47	1.51	1.14,1.99	1.45	1.20,1.76	1.11	0.88,1.38
Ireland	0.93	0.77,1.12	0.81	0.36,1.84	1.22	0.71,2.07	1.06	0.61,1.84	0.90	0.72,1.13
Italy	1.33	1.27,1.39	1.57	1.16,2.16	1.24	1.09,1.42	1.20	1.08,1.33	1.28	1.21,1.35
Norway	1.51	1.23,1.87	2.00	1.04,3.86	1.13	0.85,1.51	2.05	1.40,2.99	--	----
Portugal	2.01	1.87,2.15	3.73	2.03,6.84	1.95	1.12,3.39	2.00	1.43.2.80	1.86	1.73,2.00
Sweden	1.23	1.06,1.44	1.79	1.19,2.69	1.08	0.87,1.35	1.18	0.71,1.96	1.39	1.04,1.86

* Odds ratios represent female:male SAH

Figure 1: Association of sex with SAH (stratified by educational rank)*



Chapter 14

Class related health inequalities are not larger in the East: a comparison of 4 European regions using the new European Socio-Economic Classification

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Abstract

Objectives
Little is yet known about health inequalities in the East compared to West. The overall aim was to determine whether people in the East had larger health inequalities compared to three West European regions (North, Central and the South).

Methods
The data source is the first (2002) and second (2004) wave of the European Social Survey, from which we analysed 63 754 individuals from 23 countries. The two health outcome variables were self-reported limiting longstanding illness and fair/poor general health. Occupational class was defined according to the European Socio-economic Classification (ESeC). For four regions, we assessed the magnitude of absolute and relative inequalities according to nine occupational classes for men and women separately.

Results
For both sexes and within all European regions, the four most advantaged classes are the higher and lower professionals, self-employed and higher service workers, as they reported fewer cases of ill-health compared to other occupational classes. In contrary, lower technical and routine workers held the poorest health in this study. Farmers reported most cases of ill-health. Although the overall prevalence of ill-health is consistently highest in East, there is no evidence for the hypothesis that East European countries have larger absolute or relative health inequalities than other European regions Income is an important explanatory factor of class related health inequalities in all regions, but the direct effect of education is even more important, in particular among women. Income and education did not explain more, nor less, of the class related health inequalities in the East compared to the other regions.

Conclusions
We found no evidence for the hypothesis that East European countries have larger class related health inequalities than other European regions. The link between class and people’s educational attainment seems to play the key role in explaining occupational health inequalities in the East as well as in the West.

Introduction

Substantial differences in life expectancy have between reported between the eastern and western European populations since the end of the communist era [1-4], but little is yet known about health *inequalities* in the East compared to West. The few studies available for Eastern Europe have only looked at inequalities in relationship to educational level [5-8]. These studies suggest that inequalities in *mortality* are probably larger in the East compared to the Western European countries, but there is no evidence so far suggesting larger inequalities in *morbidity* in the East, as the few available studies did not systematically compare the East and the West [9-11]. It is thus uncertain whether health inequalities are larger in East, but due to the little evidence available, we fair that they might be, at least for mortality.

It is important to examine whether health inequalities are larger in East, because it could suggest that the former communist countries still have to cope with the legacy of the former communist era, which was a failure in both socio-economic and epidemiological terms. This might imply that Eastern European welfare states are not buffering sufficiently against social health inequalities through the health promoting mechanisms of education and income. It would therefore be important to assess the contribution of education and income to social health inequalities in the East and the West.

The overall aim of the present paper is therefore to expand the above-mentioned work by looking at class related health inequalities in self-assessed health within 6 East European countries, by applying the new ESeC scheme on the European Social Survey. Class is regarded as a good predictor of health in both West and East European countries [12]. With the new European Socioeconomic Classification (ESeC), problems of comparability have now been addressed to a much large extent than in any previous social class scheme. We aim to examine the magnitude of absolute and relative health outcomes in the East with regard to nine occupational classes for men and women separately, which in turn are to be compared with inequalities observed in 3 West European sub regions (North, Central and South), covering 17 European countries.

The analysis involves three steps. First we will describe class patterns in nine occupational groups in the East and the West. West European regions are to be further classified into three sub-regions, being the North, Central and South. Secondly, we aim to compare the magnitude of health inequalities in the East with those observed in the West, both in absolute and relative terms. The third intention is to investigate whether the contributions of education and income to class related health inequalities in the East differ from those in the West.

Data and Methods

This study was conducted as part of the European Union funded ‘Tackling Health Inequalities in Europe (Eurothine)’ project. [13]. The data source is made up of two independent waves of the European Social Survey (merged files from 2002 and 2004), from which we analysed 63 754 individuals (aged 25 or higher) from 23 countries (Table 1). The two health outcome variables were self-reported limiting longstanding illness and fair/poor general health. Occupational class was defined according to the European Socio-economic Classification (ESeC), which is a further development of the widely applied EGP classification [14]. The ESeC classification classifies people according to their positions within labour markets and production units, with special attention to their employment relations. The ESeC is designed to facilitate international overviews and cross-national comparisons across the EU. In order to improve population coverage, those who are not currently in paid employment are allocated to an ESeC class on the basis of their last main paid job. Most analyses distinguish all 9 available classes, while a summary measure comparing classes 1 and 2 with the classes 8 to 9 was constructed for some analyses.

The distribution of respondents in 9 occupational classes per gender and region is presented in Table 2. This table shows that the populations in the East have similar class distributions as the other regions, with one main exception. The percentage of lower technical and routine workers is much larger in the East than elsewhere except for South European women. In the South, the percentage of self-employed and farmers is much larger, and the percentage of higher and lower professional workers is much lower than elsewhere

Education was measures as years of full-time education completed, while income was based on household income. In the ESS the respondents were shown a card, on which 12 weekly, monthly and annual wage intervals were given, each marked with a letter. The respondents were then asked: ‘Using this card, if you add up the income from all sources, which letter describes your household’s total net income? From this variable, we constructed a scaled variable based on the median (average of lower and upper limit) value of these intervals, which in turn was recoded into a weekly equivalent income variable, using the OECD-modified scale. This scale assigns a value 1 to the household head, 0.5 to each additional adult member and 0.3 to each child [15]. The variable was recoded into country specific tertiles, which also included a group of non-responders classified separately. We also tested whether this rather broad categorisation could underestimate the contribution of income in explaining health related class inequalities in the East. We tested this by applying income quintiles instead of tertiles, but this strategy gave similar results as those presented in Table 3.

Prevalence rates and absolute differences were calculated using direct age-standardisation. Relative health inequalities were calculated applying a series of logistic regression analysis. Table 2 was based on logistic regression analysis, in which class was introduced with 8 categorical independent variables (using higher professionals as the reference category), controlled for age, with health variables as the dependent variable. The results shown in Table 3 were based on the summary measure of class. In the basic model (model 1), class was introduced as an independent variable, controlled for age. In the second and third model, education and income was added to the model respectively, while the fourth model included all three measures of socio-economic position.

The independent contribution of education to class related health inequalities was calculated by the percentage reduction of the odds ratios of occupational class attributable to the inclusion of education (model 2) to the model already containing income tertiles (model 3). The independent contribution of income was calculated in the same manner, replacing education with income. The overlapping contribution of income and education was then calculated by subtracting of the independent contribution of education (model 2) with the total (independent and indirect) contribution of income. These calculations may be studied more in detail in Table 3.

Results

The lines, which represent each of the four regions, demonstrate an increasing picture from the left to the right. This indicates that higher occupational classes are also associated with higher prevalence rates of ill-health, as compared to the lower classes. More accurately, we observed that the absolute difference of the prevalence rates was about 10% between the four highest occupational classes compared to the four lowest throughout the regions. This shows that the absolute differences of ill-health are not larger in the East compared to the Western regions.

Figure 2 shows again that the East European region hold an average position compared to the other regions with regard to the relative differences, as there are no larger relative inequalities in the East compared to the other regions. Relatively high prevalences of ill-health are found among farmers in the East (2 < OR < 3) and among farmer women in the North (OR = 6,5) , but we should be careful in drawing too much attention to this finding, as the number of respondents is relatively few in this class, and especially in the North. With only two minor exceptions, in the East, no health differences are observed between the four higher occupational classes, while they are large between the reference group and the five lower occupational classes. In the other regions, on the other hand, health inequalities are generally present also among the most advantaged occupational classes.

Table 3, first column, shows the overall magnitude of relative class differences in health by means of a summary measure, which compares classes 1+2 vs. 8+9. In these terms, the East European region seemed to hold an average position compared to the other regions, both with regard to limiting longstanding illness and fair/poor general health. For example, for men in the East, the odds ratio of limiting longstanding illness is 1.65 compared to 1.85_{North}, 1.82_{Central} and 1.80_{South} in the other regions, while the odds ratio of poor/fair general health for women in the East is 2.10 as against 2.22_{North}, 2.25_{Central} and 2.15_{South} in the remaining regions. This international pattern did not substantially change after controlling for education (second model), income (third model) and both education and income (fourth model).

Figure 3 quantifies the contribution of education and income to the health disparities by occupational class position. The figure also presents the indirect contribution of income. This figure shows that income and education did not explain more, nor less, of the class related health inequalities in the East than in the other regions. 60 to 80 percent of class related health inequalities could be attributed to class variations in educational and income level in the East. This is approximately the same amount as in the North, while even less (only 50%) could be explained in Central-West, mainly due to the low proportion explained by educational attainment. In contrary, we could explain even more of class inequalities in the South compared to the East. With the exception of men's limiting longstanding illness in Central-West, education explained more of the health variation than does income in all regions. Generally, income (direct or indirect) seems to be more important for men as compared to women, while education is more important for women as compared to men.

Discussion

Summary of findings

Summing up the results, this study has firstly shown that there is no evidence for the hypothesis that East European countries have larger absolute or relative health inequalities than other European regions. Secondly, for both sexes and within all European regions, the four most advantaged classes are the higher and lower professionals, self-employed and higher service workers, as they reported fewer cases of ill-health compared to other occupational classes. In contrary, lower technical and routine workers held the poorest health in this study. Farmers reported by far most cases of ill-health, but the number of respondents is relatively few in this class. Finally, the contribution of education to class related health inequalities was large, while we found an important but smaller contribution of income. Education and income did not explain more, nor less, of the class related health inequalities in the East than in the West.

Evaluation of data problems

Some possible limitations of the study that could influence the observed East-West patterns should be addressed more in detail. The first limitation concerns the missing information on occupational class for South European women (27,6 percent). The question is whether they have the same level of health as compared to the occupational class to which they are assigned to. We could verify that this is not likely to have affected our results substantially, as our income data showed that these women do not report systematically different health status, as compared to other women (with known occupation) within the same income tertiles (not presented in tables). South European women whose occupation was known reported better health than the women who did not report an occupation. The difference were 7,6 % versus 8,1 % for fair/poor general health and limiting longstanding illness respectively. The exclusion of these women is only likely to have affected our results, if the non-responders are clustered into few occupational groups. Secondly, cultural and psychosocial perceptions of health are sensitive to cultural and other factors, which may be especially relevant to countries in transition. Although a growing number of studies have shown that this measure of self assessed health is strongly correlated with more objective measures such as mortality [16, 17] and that there is a substantial difference in mortality between eastern and western Europe [18], we should not exclude the possibility of a substantial, additional effect of cultural differences. The most important issue in this regard is whether such differences vary according to class, and whether these class variations are larger in some countries than in others. However, despite such possible variations it is remarkable that the observed class inequalities are so much similar across all countries.

Third, the analysis might be sensitive to the chosen cut-off point of self assessed general. We therefore evaluated whether the results for the Eastern region would be sensitive to using the measure “less than fair health” instead of the most commonly applied measure “less than good health”. This test (not shown in tables) demonstrated that the odds ratios based on model 1 (class + age) increased within all regions, except among men in Northern European countries, which also include United Kingdom and Ireland. Generally, this increase was largest for Central-Western men and South European women (about 30%), and smallest for the East European populations (6% among women and 16% for men). However, the observed pattern between the regions did not change. Thus, also with this lower cut-off point; inequalities in health do not appear to be larger in the East as compared to the other regions. They are of similar size, except for clearly larger inequalities among men in Central West and women in South. With one main exception, the proportion of class differences explained by income and education did not change considerably in the four regions. This exception was the Northern region, where the educational contribution decreased among men (10%) and women (16%), while the income contribution increased among men (18%).

Key findings and their implications

Our study does not support the hypothesis that East European countries have larger class related health inequalities than other European regions. This finding does not correspond with previous studies of mortality. In a recent review of previous studies on inequalities in Eastern Europe, Mackenbach et al. [19] suggest that during the late 1980s, inequalities in mortality in Eastern Europe were at least large, and probably much larger than in Western Europe. Valkonen et al. [4] reported larger educational health inequalities in the East (Czech Republic and Estonia) compared to the West (Norway and Italy) among women, while the educational differences among men were reported larger than in the East [4]. They also reported large and widening mortality gaps in Hungary compared to Western countries (Belgium, Austria, and England & Wales). Another study of Leinsalu et al. [5] explored a tremendous rise of the mortality gap in Estonia, while Shkolnikov et al. [8] reported a reduction of educational mortality differences in the Czech Republic (and Finland) and a striking widening increase in Estonia and Russia.

The only previous study, which is comparable to ours because of its focus on morbidity instead of mortality, is the one of Knesebeck et al. [11]. Although they did not explicitly compare morbidity differences in the East with those in the West, they analysed both West and East European countries. They applied the same health indicators and the same cut-off points from the ESS as the present study, but used educational level as the indicator of socioeconomic position. From their tables, it seems that inequalities are generally large in the East. They stated that the inequalities are relatively large in Hungary, Poland and Portugal and small in Austria, Norway, Sweden, and the United Kingdom. This is not in accordance with our findings. The first possible reason for the diverging results is due to sample differences. Knesebeck et al. [11] only used the first wave of the ESS, which provided the study with half of the cases and fewer countries (Slovakia and Estonia were not included). Secondly, it might also be due to the fact that education is a stronger predictor for health in East, as compared to occupational class.

This comparison to previous studies raises the key question *why* inequalities are larger in the East with regard to mortality but not for morbidity. The answer is related to factors that could have affected the lower classes in the East more than in the West with regard to mortality, but not for self-assessed health. The explanations of earlier mortality in the East might involve social, economical, political and cultural structures, from which we suggest five possible sources. First, these explanations have focused on *behavioural patterns*, such as the heavy smoking [20] and drinking [21] and secondly; *psychosocial factors* [22-24]. West European countries generally report a higher level of life-control than the Eastern countries, which also involves the freedom of taking decisions at work [10]. Third, *material deprivation* in the East has been reported to constitute a powerful predictor of health status in the East, which might be derived from the consequences of the economic reforms after the collapse of communism [25]. Fourth, the high mortality inequalities in the East may also be related to *social stagnation* [24] and *social disintegration* [12]. The totalitarian power that dominated the East before 1989 undermined civic the society, which in turn might have had negative health effects for its population [24]. Finally, some researchers have questioned whether the quality of the *medical care* may have contributed to the East-West divergence of mortality [24, 25].

All five sources of explanations may potentially affect inequalities in morbidity as much as mortality in the East. Although we are not able to rank their importance, we may discuss how they could matter. For example, *mortality selection* might be a contributor in this respect [19]. When mortality at younger ages is high, as in the East European countries, it might affect the frail people first, leaving a more selected and more robust population that survives up to higher ages. This could be a reason why inequalities in mortality are larger in the East, while inequalities in morbidity are of similar magnitude as those in the West. Behavioural patterns, psychosocial factors and material deprivation might be key elements here. The latter is supported by our own data, as Figure 3 clearly shows that income distribution does not explain more of the class related (self-assessed) health differences between the two regions. The proportion explained by income in the East lie between 20 and 30 percent, which even less than in the North European countries. Social stagnation and disintegration may have contributed to relatively high health inequalities with regard to mortality, but not necessarily with respect to morbidity. This may be illustrated by Helson's adaptation level theory [26]. According to this view, the adaptation level of a person at any given instant will be constantly changing as new stimulus objects are experienced. Following this perspective, when people from the East belonging to lower classes were asked to judge their level of health, their judgement would be based on an adaptation level influenced by the negative experiences (social stagnation and social disintegration) of the communist regimes. This would lead to lower expectations to health and not necessarily poorer reporting of health compared to the West. The same may be the case with regard to medical care. According to the WHO, the East European countries spend less than Western European countries on health per capita, after controlling for differences in purchasing power [18]. When medical care is poor, people will also have a lower reference point. As a consequence of this, one might argue that people with low SES do not expect better health from the health care system in the East, relatively to for example people in the North.

We should also keep in mind that the former communist countries emphasised an egalitarian class ideology in the past, which might be still persistent in the occupational structure, but it is difficult to disentangle whether the observed inequalities are due to the historical background or whether it is due to the Eastern countries performing well. Our results suggest that educational attainment explains the largest part of the class related health inequalities in the East, as well as in the West and among women in particular. Thus, the most promising step to reduce class related health inequalities in European populations would be to lower the effect education has on ill-health.

Conclusion

We found no evidence for the hypothesis that East European countries have larger class related health inequalities than other European regions. The variation of people's educational attainment seems to play the key role in explaining occupational health inequalities in the East as well as in the West, and in particular among women. Thus, reducing the effect of education on poor health could prove to reduce class related health inequalities in the East, but not to a greater extent than in other European regions.

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Table 1. Country statistics

		2002				2004			
Region	Country	Response rate (%)	Included in the analysis Men	Women	Total	Response rate (%)	Included in the analysis Men	Women	Total
East	Czech Republic	43.3	996	1165	2161	55.3	577	554	1131
	Estonia					79.1	643	981	1624
	Hungary	69.9	508	726	1234	65.4	660	691	1351
	Poland	73.2	635	660	1295	73.7	776	796	1572
	Slovakia					64.2	526	520	1046
	Slovenia	70.5	443	475	918	69.7	553	587	1140
West (North)	Denmark	67.7	609	642	1251	64.3	658	617	1275
	Finland	73.2	803	901	1704	70.7	797	846	1643
	Norway	65.0	779	731	1510	66.2	962	811	1773
	Sweden	69.5	831	817	1648	65.9	863	828	1691
	Ireland	64.5	730	910	1640	59.7	708	760	1468
	United Kingdom	55.5	753	772	1525	54.6	839	881	1720
West (Central)	Austria	60.4	676	836	1512	62.4	831	894	1725
	Belgium	59.2	715	670	1385	61.2	750	620	1370
	France	43.1	705	736	1441	43.6	543	581	1124
	Germany	55.7	1071	1180	2251	51.0	1161	1228	2389
	Luxembourg	43.9	678	546	1224	50.1	496	497	993
	Netherlands	67.9	701	889	1590	65.1	911	1053	1964
	Switzerland	33.5	833	941	1774	48.6	821	836	1657
West (South)	Greece	80.0	900	867	1767	78.8	921	850	1771
	Italy	43.7	437	396	833				
	Portugal	68.8	639	763	1402	71.2	533	604	1137
	Spain	53.2	604	462	1066	59.7	565	494	1059

Table 2
The distribution of respondents in 9 occupational classes per gender and region (N = 63754)

Sex	Region	Higher prof.	Lower prof.	Service	Self empl.	Farmers etc.	Supervisors	Sales	Lower tech.	Routine	N	Missing
Men	East	10.1 %	14.7 %	3.2 %	8.6 %	3.1 %	12.3 %	5.1 %	21.2 %	21.6 %	6316	5.1 %
	North	17.2 %	19.6 %	3.7 %	10.4 %	3.8 %	13.3 %	4.1 %	12.5 %	15.3 %	9333	1.3 %
	Central	17.4 %	23.2 %	6.0 %	8.0 %	2.4 %	14.5 %	4.6 %	12.1 %	11.8 %	10892	2.7 %
	South	9.5 %	11.8 %	4.7 %	17.8 %	9.5 %	10.2 %	5.2 %	15.0 %	16.2 %	4600	4.2 %
Women	East	7.2 %	22.9 %	15.4 %	5.5 %	2.3 %	6.0 %	15.4 %	5.8 %	19.6 %	7155	8.3 %
	North	7.9 %	25.2 %	14.7 %	4.5 %	0.9 %	7.3 %	19.9 %	2.9 %	16.7 %	9516	4.8 %
	Central	7.6 %	26.0 %	19.4 %	4.9 %	0.9 %	6.1 %	15.2 %	3.8 %	16.1 %	11507	9.0 %
	South	4.6 %	12.6 %	10.1 %	11.2 %	8.2 %	4.3 %	11.9 %	8.5 %	28.5 %	4436	27.6 %

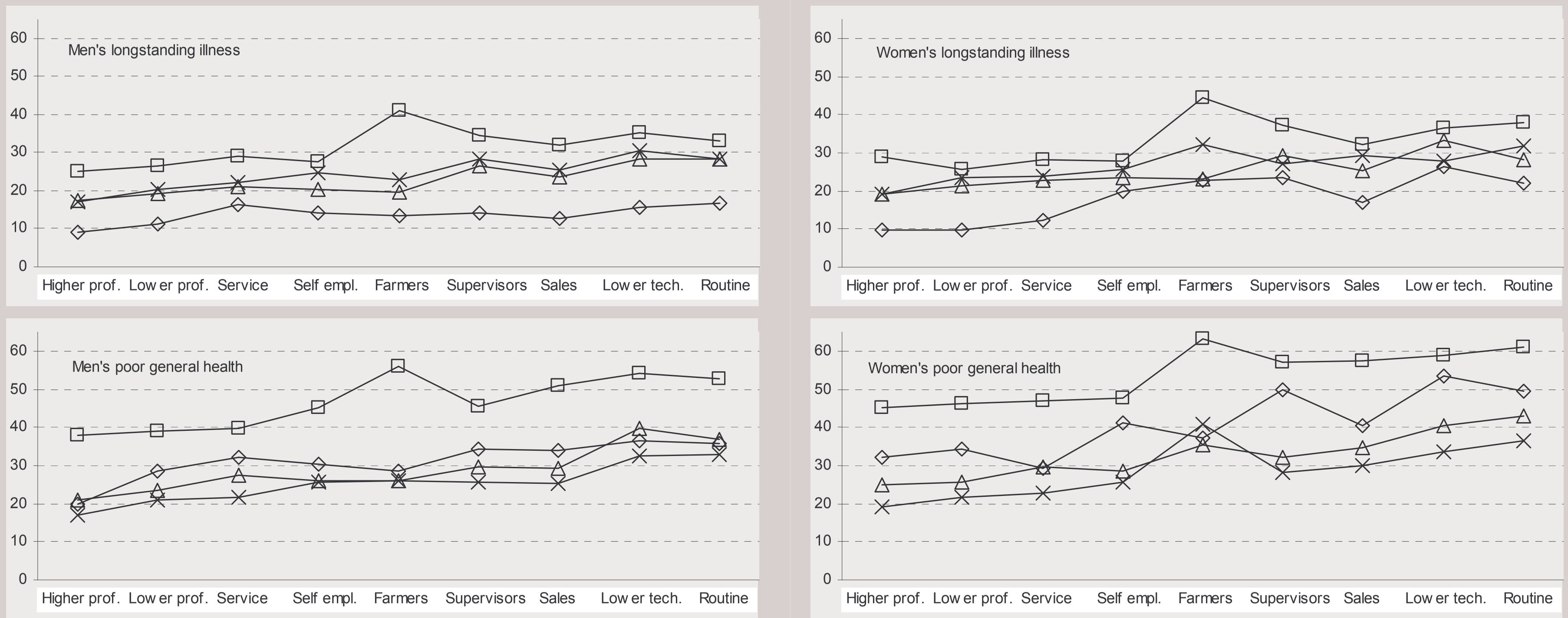

Figure 1[a]

Age-adjusted prevalence rates (Y-axis) of limiting longstanding illness (above) and fair/poor general health (below) in 9 occupational classes (X-axis) for men and women

[a] East = □ North = x Central = Δ South = ◊

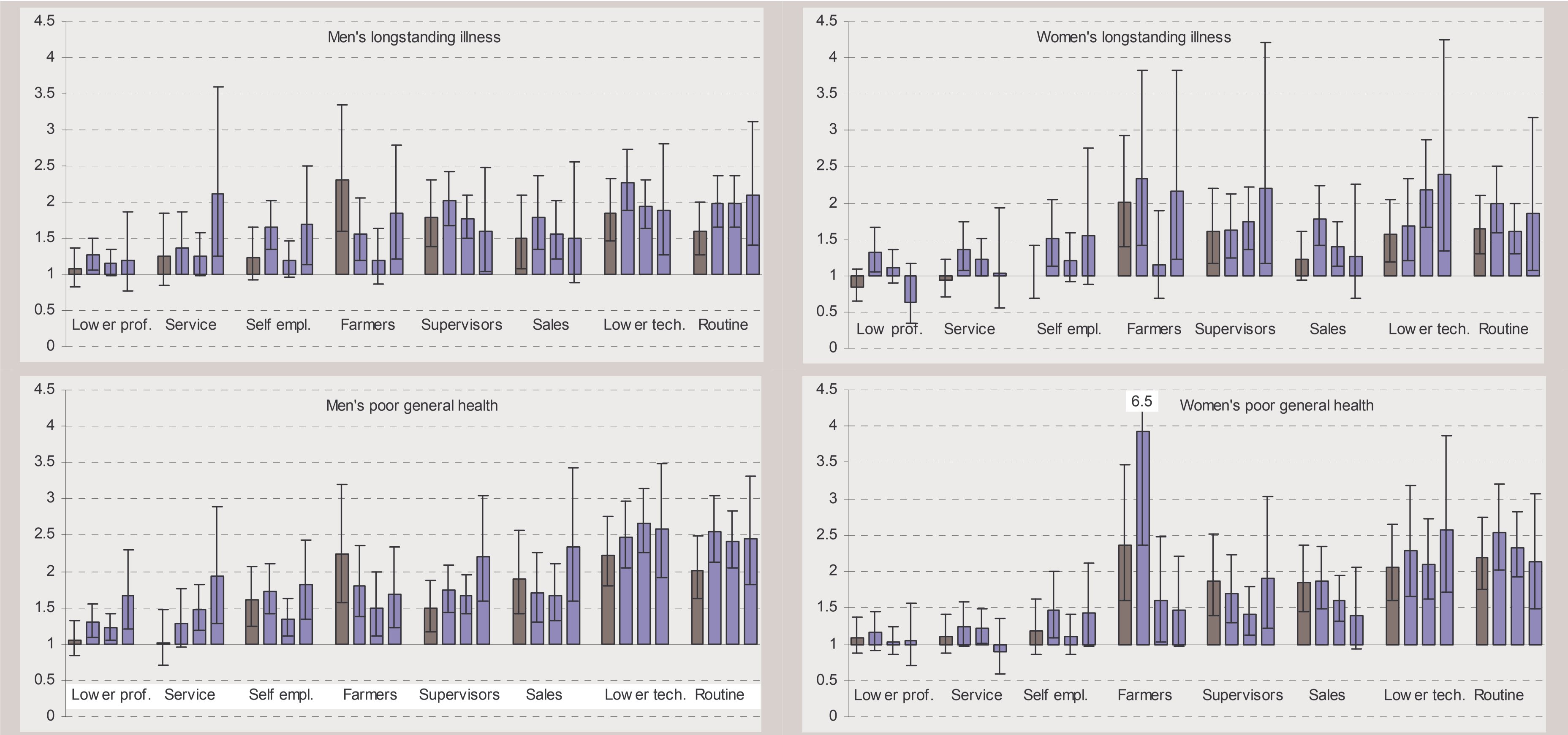

Figure 2
Odds ratios (95 % CI) for reporting limiting longstanding illness and poor health among men and women in 9 occupational classes within the European regions East, North, Central and South (subsequently from the left to the right bars)

Table 3 Class related health inequalities after control for education and income among four European regions

Health outcome	Sex	Region	Odds ratio comparing class 8-9 to class 1-2 (95% CI) Model 1: Age + Low class	Model 2: Age + Low class + Education	Model3: Age + Low class + Income	Model4: Age + Low class + Education + Income
Limiting longstanding illness	Men	East	**1.65 (1.42 – 1.92)**	**1.29 (1.06 – 1.56)**	**1.44 (1.23 – 1.69)**	1.17 (0.96 – 1.42)
		North	**1.85 (1.64 – 2.10)**	**1.44 (1.24 – 1.68)**	**1.55 (1.36 – 1.78)**	**1.28 (1.09 – 1.50)**
		Central	**1.82 (1.62 – 2.05)**	**1.73 (1.51 – 1.99)**	**1.58 (1.39 – 1.80)**	**1.53 (1.33 – 1.77)**
		South	**1.80 (1.39 – 2.33)**	1.25 (0.88 – 1.76)	**1.50 (1.13 – 1.98)**	1.14 (0.80 – 1.63)
	Women	East	**1.85 (1.61 – 2.13)**	**1.40 (1.17 – 1.67)**	**1.70 (1.47 – 1.96)**	**1.33 (1.11 – 1.59)**
		North	**1.56 (1.36 – 1.79)**	1.18 (0.99 – 1.39)	**1.38 (1.19 – 1.60)**	**1.11 (0.94 – 1.32)**
		Central	**1.60 (1.38 – 1.78)**	**1.43 (1.23 – 1.66)**	**1.46 (1.28 – 1.68)**	**1.35 (1.16 – 1.58)**
		South	**2.82 (2.08 – 3.83)**	**1.72 (1.15 – 2.58)**	**2.49 (1.81 – 3.43)**	**1.60 (1.06 – 2.42)**
Fair/poor general health	Men	East	**2.06 (1.79 – 2.37)**	**1.54 (1.29 – 1.84)**	**1.78 (1.54 – 2.07)**	**1.39 (1.16 – 1.67)**
		North	**2.17 (1.92 – 2.45)**	**1.61 (1.39 – 1.87)**	**1.82 (1.59 – 2.07)**	**1.43 (1.23 – 1.67)**
		Central	**2.26 (2.02 – 2.52)**	**1.84 (1.62 – 1.09)**	**2.02 (1.79 – 2.28)**	**1.70 (1.49 – 1.94)**
		South	**1.88 (1.54 – 2.29)**	0.99 (0.77 – 1.30)	**1.56 (1.26 – 1.92)**	0.92 (0.70 – 1.20)
	Women	East	**2.10 (1.76 – 2.30)**	**1.29 (1.09 – 1.53)**	**1.83 (1.59 – 2.11)**	**1.22 (1.03 – 1.45)**
		North	**2.22 (1.94 – 2.55)**	**1.61 (1.36 – 1.90)**	**1.90 (1.64 – 2.21)**	**1.47 (1.24 – 1.75)**
		Central	**2.25 (2.00 – 2.53)**	**1.76 (1.53 – 2.01)**	**2.04 (1.80 – 2.31)**	**1.63 (1.42 – 1.88)**
		South	**2.15 (1.76 – 2.63)**	0.91 (0.68 – 1.21)	**1.93 (1.56 – 2.38)**	0.86 (0.64 – 1.15)

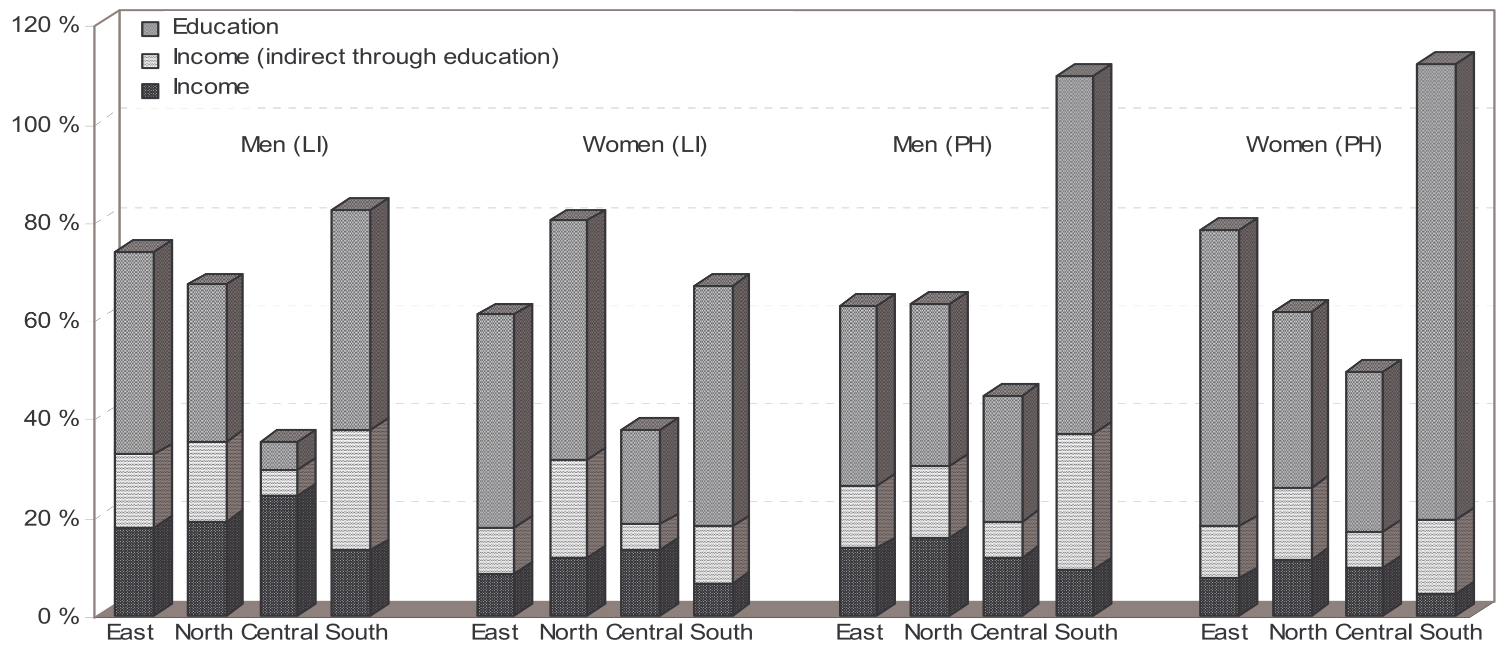

Figure 3[a]
The independent contribution of education, income and their joint effect (income through education) in class related health inequalities for men and women in East, North, Central and South Europe.

[a] These calculations are based on the three sets of regression models from Table 3.
A: The *independent* contribution (%) of education in class related health inequalities: [100*(Model 1 – Model 4) / (Model 1 – 1)] – [100*(Model 1 – Model 3) / (Model 1 – 1)]
B: The *independent* contribution (%) of income in class related health inequalities: [100*(Model 1 – Model 4) / (Model 1 – 1)] – [100*(Model 1 – Model 2) / (Model 1 – 1)]
C: The *indirect* contribution (%) of income through education: [100*(Model 1 – Model 2) / (Model 1 – 1)] – A

Chapter 15

The impact of local policies on socioeconomic inequalities in health: an Italian case study

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Abstract

Background

Priority choice and impact evaluation of European Union policies do not usually take into account the potential reduction of health heterogeneity among areas.
Italian regional distribution of self reported health status is characterized by a North-South gradient, mainly due to compositional differences in individual socioeconomic conditions.
The present study aimed at: 1) defining potential pathways that may explain the regional heterogeneity in health and modelling health as a function of individual and contextual factors; 2) focusing on macro-level distal dimensions that may exacerbate social inequalities in health in the Italian Southern regions and smooth social inequalities in the health of Northern populations and evaluating the predictive power of each dimension involved in this process; 3) focusing on some individual proximal determinants of health, by evaluating geographical heterogeneity of inequalities in unhealthy behaviours related to socioeconomic conditions.

Method

Gender specific multilevel models on individual subjective health, as a function of socioeconomic conditions (education, occupation, family type and housing conditions) and contextual features (municipality demographic size and altitude, geographical latitude), were built with data from the 2000 National Health Interview Survey. Regional indicators measuring Economy, Labour, Welfare and Social Cohesion were introduced within the models to statistically explain regional heterogeneity of health inequalities by education. Multilevel models on smoking habits and ponderal characteristics were built, as a function of socioeconomic conditions and contextual features.

Results

Being less educated leads to poorer health in residents in some Southern regions than in the North. Regional differences in welfare and the economic development appears to provide a statistical explanation for the heterogeneity in physical health inequalities by education; labour market opportunities strongly predicted mental health. A smaller contribution to the explanation of health inequalities by education was provided by social cohesion. A strong relationships between smoking (among men) and being overweight (in both genders) and individual socioeconomic conditions was also found, similarly for all Italian regions.

Conclusions

Italian geographical divide in health is explained by both compositional socioeconomic conditions, affecting lifestyle inequalities, and regional differences in social health inequalities. This contextual effect could be related to the way the social and economic context provides and distribute resources within the regions and in the way the welfare and the communities are able to focus their interventions and services in presence of larger needs.

Introduction

Geographical heterogeneity of health is a phenomenon observed everywhere and at every level. Many European countries are characterized by a regular health gradient across geographical latitude, usually resembling the gradient in economic development of different regions within the same country. European Union (EU) Structural Funds have been introduced: i) to assist regions in which development is lagging behind and those undergoing economic conversion or experiencing structural difficulties; ii) to provide assistance under the European employment strategy; iii) to help in both the development and the structural adjustment of rural areas (1, 2). Policies financed through EU Structural Funds aim at reducing disparities in development among geographical regions and at promoting economic and social cohesion in the European Union. In Italy the areas involved in the EU Structural Funds are the six Southern Regions, characterized by less favourable economy and labour. But both the priority choice and the impact evaluation of these policies do not usually take into account the potential reduction of health heterogeneity among areas, primarily due to the lack of epidemiologic evidence about the relationship between the geographical variation in health and the economic and social targets of these policies.

Indeed the geographical distribution of self-reported health indicators across Italian regions is characterized by a North-South gradient, with better conditions in the Northern regions for both males and females (3). In the last decades even life expectancy has improved faster in the North compared to the South, despite the persistent Southern protection against the cancer risk (4).

Variation in health among regions is closely related to differences in the composition of these areas in terms of individual characteristics, which consist of specific exposure to behaviours and risk factors including or influenced by individual socioeconomic conditions, such as education, occupation or income. Recent studies also suggest that regional heterogeneity in health cannot be completely explained by compositional characteristics, hypothesizing that the physical and socio-economic characteristics of the area itself could independently affect the health of the resident population (5, 6, 7). The results from a previous study suggest that the Italian North-South gradient in health, at least for self-reported health, can be mainly affected by macro-area compositional differences in individual education, with a negligible overall influence of contextual socioeconomic deprivation. However, being less educated leads to poorer health in some regions (mainly the South) than in others (mainly the Northeast) (3).

Following upon these results, the present study aimed at

1. defining potential pathways that may explain the regional heterogeneity in health, with specification of distal important dimensions in the context of Italian local social sub-systems and political competences, that may be relevant for an equity-oriented health impact assessment of the EU Structural Funds;
2. focusing on macro-level distal dimensions that may exacerbate social inequalities in health in the Italian Southern regions and smooth social inequalities in the health of Northern populations; evaluating the predictive power of each dimension

involved in this process, in terms of the corresponding explained proportion of regional heterogeneity in health inequalities by education;
3. focusing on some individual proximal determinants of health, by evaluating geographical heterogeneity of inequalities in unhealthy behaviours related to socioeconomic conditions.

Methods

The first objective of this study was pursued through the development of a conceptual framework representing potential pathways, from distal macro-level dimensions to individual proximal determinants, which may explain the observed regional heterogeneity in health status.

The second objective began with modelling differences in subjective health differences among Italian regions, taking into account the impact of compositional and contextual features on these variations. This analysis was performed with data from the National Health Interview Survey, carried out during the year 2000; a representative sub-sample of the Italian population aged between 18 and 80 years living in household (53,752 men and 56,765 women) was selected. Individual socioeconomic conditions were classified according to educational level (degree, diploma, lower secondary, primary or less), occupational status and position (unemployed, housewives, manuals, non-manuals), family type and housing conditions. For these last two information, age-specific classifications were defined, to take into account the differential predictive power of attributes when age increases. Family type for people aged less than 65 years distinguished between couples with children, lone parents, and others; and housing conditions were classified as absence of indoor toilet or small house with 1 toilet, as opposed to all the other types. For older people, family type was classified as lone person, couple, and all other types; and housing conditions distinguished between rented house and all other types. We also took into account municipality indicators, such as a composite classification of demographic size and altitude (metropolitan area, 2,000 or less inhabitants/lowland, 2,000 or less inhabitants/mountain, 2,001-10,000 inhabitants/lowland, 2,001-10,000 inhabitants/mountain, 10,001-50,000 inhabitants, over 50,000 inhabitants) and the geographical latitude (North, Centre, South, Isles). With regard to health outcome measures, we took into account the total physical and mental component summary scores computed on the SF12 Health Survey. We analysed these summary scores as a function of compositional (age, education, occupational status and position, family type and housing conditions) and contextual variables (demographic size and altitude, geographical latitude).

We used linear multilevel models stratified by gender, specifically taking into account the three-level data hierarchy, with individuals nested within municipality and municipalities nested within regions. We included random effects around the intercepts and tested regional variance on the effects of socioeconomic conditions, allowing for the evaluation of regional modification on the influence of individual socioeconomic circumstances on health.

The subsequent part of the analysis focused on the observed regional heterogeneity of health status between the least and most educated people. Each macro-level distal dimension involved in the conceptual framework of health inequalities (i.e. Economy, Labour, Welfare, Social Cohesion) was operationalised into a set of regional indicators, collected from routine statistics published by the Italian Institute of Statistics around the year 2000. Each regional indicator considered was chosen to represent the "volume" of resources provided by Economy, Labour, Welfare and Social Cohesion (and the related policies) or the "quality" of these same resources, i.e. the buffering capacity of policy on the basis of individual needs (i.e. their ability to meet individual needs). For the Economy dimension, the set of indicators included *per capita income*, *Gross Domestic Product (GDP) per occupied resident*, Gini *income concentration index ("volume"* in the sense of wealth produced and distributed*),* and *proportion of the occupied population within the research and development sectors ("quality"* in the sense of productivity and innovation*)*. The indicators for the Labour dimension were *total unemployment rates* and *long-term unemployment rates ("volume"* of occupation*)*, *proportion of non-regular work units, proportion of the occupied population with temporary jobs and rate of first employment within three years among university graduates* ("*quality"* of occupation"). The Welfare indicators included *public expenditure for education* and *public expenditure for health ("volume"* of funding*)*, *school drop out*, *pre-school child care* and *prompt access to breast cancer screening ("quality"* of services); and for Social Cohesion, we took into account *electoral compliance ("volume"* of participation), *participation in association meetings* and the *violent crime rate ("quality"* of the relationships). The interaction between each regional indicator and the primary education dummy variable was included in the multilevel model, and its significance was tested using an approximate Wald test (8). In the presence of a significant interaction term, the reduction of the regional variance in the health score difference by education, before and after the inclusion of interaction, was computed.

The third part of the analysis was performed on the above mentioned sub-sample of the National Health Interview individual database. Individuals were classified according to their smoking habits (current smoker, non-smoker, former smoker) and according to ponderal characteristics (overweight BMI≥25, normal weight BMI<25), that represent the two most relevant proximal determinants of health and of health inequalities. Similar to the analyses addressing the second objective of the study, the risk of being a smoker and the risk of being overweight were modelled as functions of compositional (age, education, occupational status and position, family type and housing conditions) and contextual variables (demographic size and altitude, geographical latitude). We used logistic multilevel models stratified by gender, with individuals nested within municipality and municipalities nested within regions. We included random effects around the intercepts and tested regional variance on the effect of socioeconomic conditions, allowing for the evaluation of regional modification on the influence of individual socioeconomic circumstances on the probability of being a smoker and on the probability of being overweight. Statistical analyses were performed using the SAS System (9) and MLwiN (10) software packages.

Results

Figure 1 shows standardised regional mean scores of physical component summary of SF12, collected through the National health Interview Survey among people aged from 18 to 80 years. The geographical distribution of subjective physical health is characterized by a clear North-South gradient, with higher mean scores (better self-perceived conditions) among residents in the Northern regions, for both males and females. Figure 2 shows the theoretical pathways underlining inequalities in health. The left side of the figure illustrates macro-level distal policy dimensions; the interaction between national, regional or local policies and characteristics of historical social sub-systems is intended to directly influence the availability and the distribution of socioeconomic resources and also their capacity to buffer needs, acting at both the individual and contextual level. The remaining right side of the conceptual scheme represents known proximal mediating mechanisms influencing health differences.

Table 1 shows the results of gender-specific models for the physical component score on the SF12 questionnaire. The models revealed a strong association between the SF12 score and individual educational level, with a four and five point decrease in the mean score respectively, for men and women with primary education compared to university graduates. Unemployment was also associated with a lower mean health score, twofold among men compared to women; housewives had also slightly poorer health compared to non-manual occupied women. Compared to the respective reference groups, women of all other family types and both genders with unfavourable housing conditions showed poorer health. However, young lone parent males or elderly men living alone seemed to report better subjective health. A small decrease in health score was found among people residing in less-populated lowland areas; men living in cities with 50,000 or more inhabitants showed a borderline higher score. No differences were found for latitude; however, women living in the isles had a significantly lower SF12 physical component mean score compared to Northern females. For both genders, significant regional random variation around the effect of primary education was found.

Models for the SF12 mental component summary (table 2) confirmed the strong influence of individual education. Poorer psychological health was also reported by unemployed people, particularly among men, compared to non-manual workers. A significantly lower psychological score was found for people with all family types and all housing conditions compared to the respective reference groups. A higher mean score was found for men living in mountain municipalities with less than 2,000 inhabitants. No differences were found for latitude; however, men living in the isles showed a significantly better mental health. Significant regional random variation around the effect of primary education was found for both genders, also for mental health.

The plot in figure 3 shows region-specific mean departures from the model coefficients comparing physical component summary scores between primary educated and university graduates; labels identify regions where the confidence interval for this departure does not include the null value, i.e. region-specific coefficients significantly higher or lower than the mean. The plots highlight that the poorest health profile associated with lower education is shared by people living in specific Southern regions; the reverse was found for residents in specific Northern regions, where health differences between people with the lowest and highest educational levels were significantly smoothed. The same was found for the significant regional heterogeneity in the mental component mean scores between people with primary school and degree (data not shown).

For each macro-level distal dimension included in the conceptual framework for health inequalities, figure 4 shows regional indicators significantly modifying health of lower educated people and providing the largest reduction in regional heterogeneity of health inequalities between the most and least educated people. Among men, the Welfare regional indicator *prompt access to breast screening* produced the largest reduction in regional heterogeneity of physical health inequalities by education, followed by the Economy dimension, measured by *per capita income*; however, the Labour market *rate of first employment within 3 years, among graduated people*, was also highly predictive of regional variation of health inequalities by education; Labour dimension expressed by the *total unemployment rate* seems to provide the highest contribution for the reduction of mental health inequalities, followed by *per capita income*. Social cohesion made the smallest contribution, although it was not negligible in explaining the variation in mental health inequalities by education. With regard to women, the largest contribution toward explaining physical health inequalities was provided by *per capita income*, followed by Welfare (*prompt access to breast cancer screening*) and Labour (*total unemployment rate*); Social Cohesion made the smallest contribution. Labour market made the largest contribution in the reduction of mental health inequalities by education, and the smallest was provided by *prompt access to breast cancer screening*.

The model for smoking behaviours highlights that for males, the odds of smoking increases as education decreases, even if not regularly (table 3); it also shows higher odds of being a smoker for unemployed and manual workers, compared to non-manual workers, and a significantly higher risk among people with poorer housing conditions. A higher risk of smoking was also observed for males in Central regions. Slightly different results were observed for females: women with primary education had a significantly lower risk of smoking; lone parents, women with poor housing conditions and manual workers had a higher odds of reporting smoking behaviour; living in Southern or Island regions was associated with significantly lower odds of being smoker.

The odds of being overweight (BMI≥25) among men also increased as education decreased (table 4); the odds were higher among unemployed, residents in small mountain municipalities and in Southern regions; men with poor housing conditions or in lone-parent families had significantly lower odds of reporting high BMI. Finally, all poorer socioeconomic conditions with the exception of lone-parent families were associated with increased odds of being overweight among females, particularly for education. Living in municipalities with more than 50,000 inhabitants appeared to protect for being overweight; higher BMI was observed for residents in Southern regions.

No significant regional random variation was observed for the effect of socioeconomic conditions on smoking or being overweight.

Discussion

The present study aimed at deeply investigating the results of a previous study carried out by the same group (3), based on modelling individual health data from the same national survey. In the present study, we enriched the set of covariates to predict geographical variation in health, with particular attention to individual socioeconomic determinants, whose distribution among individuals in the survey explained most of the North-South health divide in Italy. This study confirmed that physical and mental health differences by education are higher in some Southern regions, while health inequalities are smoothed for residents in some Northern regions. The present study also focused on the geographical variation in proximal determinants of health, such as smoking and ponderal characteristics, revealing strong relationships between smoking (among men) and being overweight (in both genders) and individual socioeconomic conditions, and similarly for all Italian regions. A geographical heterogeneity of inequalities by different age-groups has not been evaluated, and could not be totally excluded at least for smoking among younger women. Among macro-level distal features potentially affecting health inequalities by education and their regional variations, differences in welfare and the economic development of regions appears to provide a statistical explanation for the heterogeneity in physical health inequalities; labour market opportunities strongly predicted mental health. Social cohesion seems to make a smaller contribution to the explanation of health inequalities by education, probably due to the stronger role of individual social capital on health compared to the collective dimension that we measured.

Each regional indicator considered was chosen to represent the “volume” of resources distributed by Economy, Labour, Welfare and Social Cohesion (and the related policies) or their “quality”, their ability to meet individual needs. This distinction reflects the A. Sen theory on inequality, strictly connected with the concept of free access to material and symbolic resources which people consider as wellness condition for life. According to Sen, societies have to offer not only generic quantity of resources to population but, for example, work and life conditions satisfying what people consider as a “good work” and a “good life”, in our case represented by the "quality" dimension (11). Bearing in mind the distinction between these two roles, we observe that within the dimensions of Economy and Labour, the significant and larger contribution is made by the “volume” indicators, whereas the “quality” component of Welfare and Social Cohesion are mostly contributing to the explanation of heterogeneity of health inequalities.

Despite the wealth of information provided by the National Survey and its use for modelling health and behaviours or risk factors, as well as the numerous regional indicators used to provide insights into macro-level mechanisms, the cross-sectional design of this study is its main weakness, which makes it difficult to infer causal relationships actually acting over time. Moreover, our choice of specific regional indicators to represent the macro-level distal determinants of health was based on the availability of data, although they are adopted in official national plans and surveys as descriptors of the socioeconomic political characteristics of the system (2,12). Finally, our analysis could not evaluate the predictive ability of various macro dimensions simultaneously; reciprocal confounding, therefore, could not be excluded from their evaluation.

Models of individual health and behaviours actually confirm the well-known role of socioeconomic determinants (13,14). Their contribution in influencing health inequalities is rich of other important empirical examples, more focused on national level variations (15,16,17,18,18), where the corresponding heterogeneity in demographic structure, socioeconomic systems and policies can provide a wide range of interpretation keys. According to the frame of Figure 2, the main results of the study seem to attribute a big responsibility of the North-South health divide to the compositional effect (more social disadvantages distributed among Southern residents) (Pathway 1). At the same time a substantial contribution to this divide is made by the interaction of some characteristics of the Southern context on the size of individual effect of social inequalities in health (Pathway 2). This contextual responsibility of the South in modifying the effect of low education on health is related to the amount of resources that economy and labour produce and distribute across the regions, and to the quality of welfare and solidarity provided by the institutions and the community in order to moderate the impact of poor and unequal distribution of resources (pathway 3). Moreover the geographical variations favouring the North in some proximal determinants (such as overweight in both genders) (20) is explained mostly by the individual social characteristics, similarly with what observed for physical and mental health (Pathway 4), while no geographical modification of social inequalities in these lifestyles is evident. Similar results have been obtained in an unpublished analysis of the geographical and social distribution of a composite indicator of health services utilization by the individuals of the same survey, that demonstrated that health care utilization was strongly influenced by the individual social position as indicator of health need, without any significant contextual effect (pathway 5). It could be indirectly inferred that the Italian geographical divide in health is explained by both compositional and contextual effect in social health inequalities, and that the compositional effect may be explained by the lifestyle inequalities (and not by the compositional effect of health care utilization that goes in the direction of protecting health), while the explanation of the contextual effect should be searched in other mechanisms. These alternative mechanisms could be found in the way the social and economic context provides and distribute resources within the regions and in the way the welfare and the communities are able to focus their interventions and services in presence of larger needs.

According to this interpretation health disparities may suggest new clues for planning and evaluating the policies of investments in the EU Structural Funds in the poorer regions. In the case of Italy, there are four democratically elected levels of government: the National Parliament, 20 Regional Councils, 103 Provincial and 8,100 Municipal Councils. The National Parliament and Regional Councils approve legislation, and decide on revenue and expenditure. Regional authorities also manage health services through Local Health Units. Provincial Councils have specific duties respecting the environment, territorial infrastructures, poverty and labour. Municipal Councils have a high degree of autonomy and administer local matters such as pre-schools, school buildings, care of elderly people, roads, water, waste and energy. All of these institutions together with the social institutions (corporate and unions) are involved in the decisions about such investments. Given the geographical variation in health and its relationship with compositional and contextual inequalities, and the responsibility of socio-economic policies in buffering such inequalities, at least the compositional effect should be considered as a critical point for any priority setting in the investments of EU Structural Funds for economy, labour, welfare and social cohesion.

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Tables and figures

Figure 1. SF12 physical component summary. Quintiles of regional standardised scores (ref. Italian population Jan 2000); people aged 18-80yrs

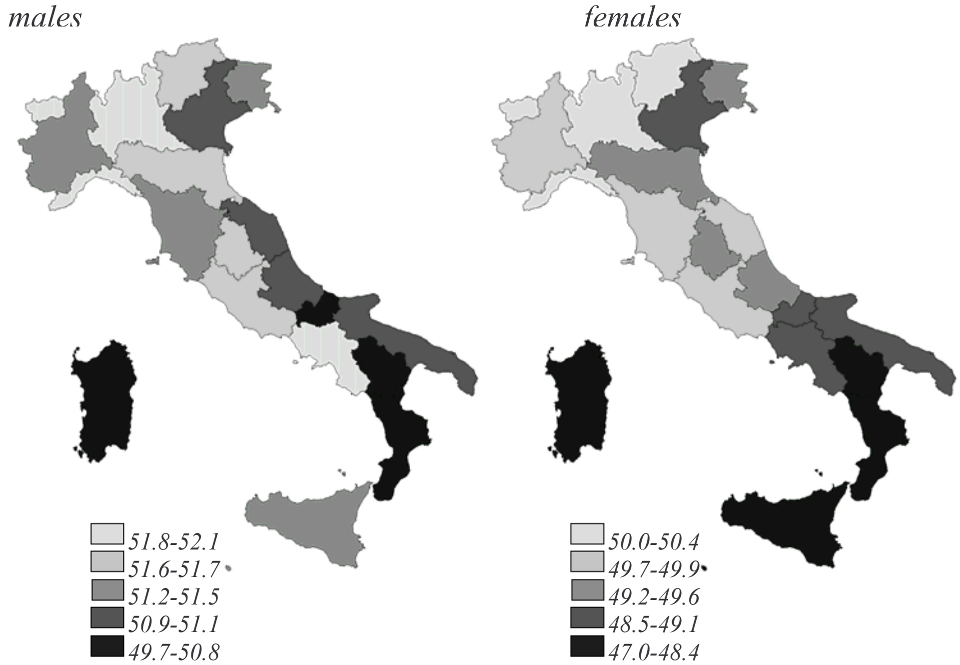


Figure 2. Conceptual framework of health inequalities

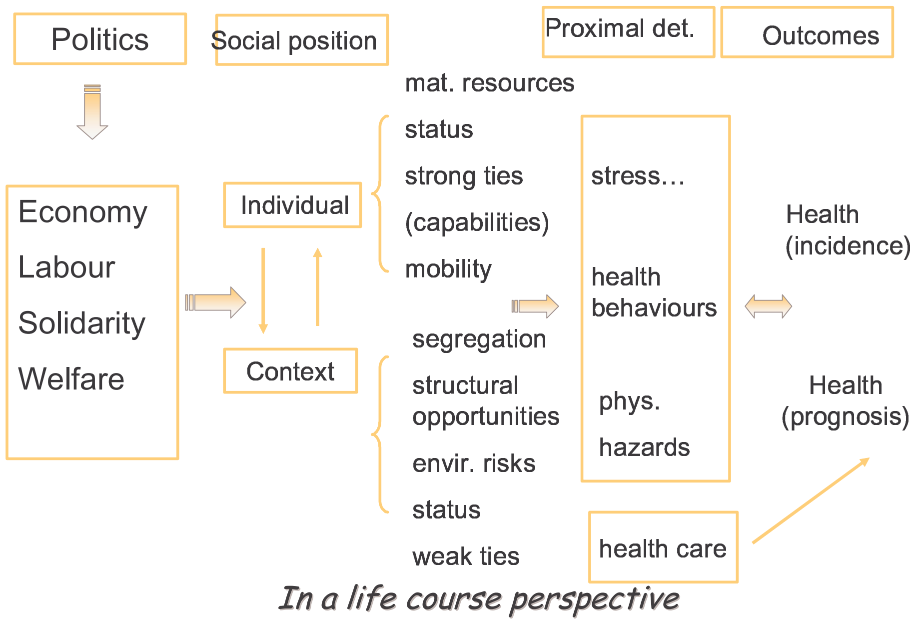


Table 1. SF12-Physical component summary. Linear regression coefficients and 95% CI from multilevel models*, people aged 18-80yrs

		Men		Women	
		Coeff.	95%CI	Coeff.	95%CI
Education (ref.degree)	diploma	-0.9	(-1.2;-0.6)	-0.7	(-1.0;4)
	lower secondary	-1.5	(-1.8;-1.2)	-1.6	(-1.9;-1.3)
	primary	-3.9	(-4.4;-3.3)	-4.9	(-5.6;-4.2)
Occupational status and position (ref. non manual)	unemployed	-2.4	(-2.6;-2.2)	-1.2	(-1.4;-1.0)
	housewives			-0.3	(-0.5;-0.1)
	manual	-0.1	(-0.2;0.1)	0.0	(-0.3;0.2)
Family type (ref. couples with children/other)	lone parents./alone	0.3	(0.1;0.5)	-0.3	(-0.5;-0.1)
	other/couples	-0.3	(-0.5;-0.2)	-0.9	(-1.1;-0.8)
House conditions (ref. other/ownership)	no toilet or small with one toilet/rented	-0.4	(-0.5;-0.2)	-0.4	(-0.6;-0.2)
Demographic size and altitude (ref. 10,001-5,0000 inhab)	metropolitan area	0.3	(0.0;0.7)	-0.1	(-0.6;0.3)
	<=2,000 inhab. lowland	-0.5	(-0.8;-0.1)	-0.6	(-1.0;-0.1)
	<=2,000 inhab.mountain	-0.2	(-0.5;0.1)	0.0	(-0.3;0.4)
	2,001-10,000 inhab. lowland	-0.1	(-0.5;0.2)	-0.2	(-0.5;0.2)
	2,001-10,000 inhab. mountain	0.0	(-0.4;0.3)	-0.1	(-0.4;0.3)
	>50,000 inhab.	0.3	(0.0;0.7)	0.1	(-0.3;0.5)
Geographical area (ref. north)	centre	-0.1	(-0.6;0.3)	0.1	(-0.3;0.6)
	south	-0.3	(-0.6;0.1)	-0.1	(-0.5;0.2)
	isles	-0.3	(-0.8;0.3)	-0.6	(-1.1;-0.1)

**including also age*

Table 2. SF12-Mental component summary. Linear regression coefficients and 95% CI from multilevel models*, people aged 18-80yrs

		Men			Women		
		Coeff.	95%CI		Coeff.	95%CI	
Education (ref.degree)	diploma	-0.5	(-0.8;	-0.2)	-0.4	(-0.8;	-0.1)
	lower secondary	-0.6	(-0.9;	-0.3)	-0.7	(-1.0;	-0.3)
	primary	-1.7	(-2.3;	-1.1)	-2.2	(-2.8;	-1.6)
Occupational status and position (ref. non manual)	unemployed	-1.3	(-1.5;	-1.1)	-0.4	(-0.6;	-0.1)
	housewives				0.1	(-0.1;	0.4)
	manual	0.7	(0.5;	0.9)	1.0	(0.7;	1.3)
Family type	lone parents./alone	-1.0	(-1.3;	-0.7)	-1.6	(-1.9;	-1.3)
(ref. couples with children/other)	other/couples	-0.2	(-0.3;	-0.1)	-0.3	(-0.5;	-0.1)
House conditions (ref. other/ownership)	no toilet or small with one toilet/rented	-0.8	(-1.0;	-0.6)	-0.8	(-1.0;	-0.6)
Demographic size and altitude (ref. 10,001-5,0000 inhab)	metropolitan area	-0.1	(-0.6;	0.5)	-0.4	(-1.1;	0.3)
	<=2,000 inhab. lowland	-0.1	(-0.6;	0.4)	-0.6	(-1.3;	0.1)
	<=2,000 inhab.mountain	0.6	(0.2;	1.1)	0.3	(-0.2;	0.8)
	2,001-10,000 inhab. lowland	-0.1	(-0.5;	0.4)	-0.1	(-0.7;	0.4)
	2,001-10,000 inhab. mountain	0.3	(-0.2;	0.7)	0.2	(-0.3;	0.8)
	>50,000 inhab.	-0.1	(-0.6;	0.4)	0.1	(-0.6;	0.8)
Geographical area (ref. north)	centre	0.1	(-0.5;	0.6)	-0.3	(-1.2;	0.6)
	south	0.1	(-0.4;	0.6)	0.0	(-0.8;	0.8)
	isles	0.8	(0.1;	1.5)	0.4	(-0.7;	1.5)

**including also age*

Table 3. Smoker vs. non smoker or former smoker. ORs and 95% CI from from logistic regression multilevel models*, people aged 18-80yrs

		Men			Women		
		ORs	95%CI		ORs	95%CI	
Education (ref.degree)	diploma	1.05	(1.03;	1.07)	1.01	(0.99;	1.02)
	lower secondary	1.12	(1.10;	1.14)	1.00	(0.99;	1.02)
	primary	1.10	(1.08;	1.12)	0.86	(0.85;	0.88)
Occupational status and position (ref. non manual)	unemployed	1.05	(1.04;	1.07)	1.00	(0.99;	1.01)
	housewives				0.98	(0.97;	1.00)
	manual	1.06	(1.05;	1.07)	1.05	(1.04;	1.07)
Family type (ref. couples with children/other)	lone parents./alone	0.99	(0.97;	1.00)	1.04	(1.03;	1.05)
	other/couples	1.01	(1.00;	1.02)	1.01	(1.00;	1.02)
House conditions (ref. other/ownership)	no toilet or small with one toilet/rented	1.03	(1.02;	1.05)	1.03	(1.02;	1.04)
Demographic size and altitude (ref. 10,001-5,0000 inhab)	metropolitan area	1.01	(0.99;	1.04)	1.01	(0.99;	1.03)
	<=2,000 inhab. lowland	1.01	(0.98;	1.04)	0.97	(0.95;	1.00)
	<=2,000 inhab.mountain	0.98	(0.96;	1.00)	0.97	(0.95;	0.99)
	2,001-10,000 inhab. lowland	1.00	(0.98;	1.02)	0.98	(0.96;	1.00)
	2,001-10,000 inhab. mountain	1.00	(0.98;	1.02)	0.98	(0.96;	1.00)
	>50,000 inhab.	0.99	(0.97;	1.02)	1.00	(0.98;	1.02)
Geographical area (ref. north)	centre	1.03	(1.01;	1.05)	1.00	(0.98;	1.03)
	south	1.00	(0.98;	1.02)	0.89	(0.87;	0.91)
	isles	1.01	(0.98;	1.04)	0.93	(0.90;	0.96)

**including also age*

Table 4. Overweight vs. normal weight. ORs and 95% CI from from logistic regression multilevel models*, people aged 18-80yrs

		Men		Women	
		ORs	**95%CI**	**ORs**	**95%CI**
Education (ref.degree)	diploma	1.06	(1.04; 1.08)	1.05	(1.03; 1.07)
	lower secondary	1.11	(1.09; 1.13)	1.12	(1.10; 1.14)
	primary	1.16	(1.14; 1.18)	1.35	(1.33; 1.37)
Occupational status and position (ref. non manual)	unemployed	1.02	(1.01; 1.03)	1.04	(1.03; 1.06)
	housewives			1.06	(1.05; 1.07)
	manual	1.00	(0.99; 1.02)	1.02	(1.00; 1.03)
Family type (ref. couples with children/other)	lone parents./alone	0.96	(0.94; 0.97)	1.00	(0.99; 1.01)
	other/couples	1.00	(0.99; 1.01)	1.02	(1.01; 1.03)
House conditions (ref. other/ownership)	no toilet or small with one toilet/rented	0.98	(0.97; 0.99)	1.01	(1.00; 1.02)
Demographic size and altitude (ref. 10,001-5,0000 inhab)	metropolitan area	1.00	(0.98; 1.02)	0.99	(0.97; 1.01)
	<=2,000 inhab. lowland	1.02	(1.00; 1.04)	1.01	(0.99; 1.03)
	<=2,000 inhab.mountain	1.03	(1.01; 1.04)	1.00	(0.99; 1.02)
	2,001-10,000 inhab. lowland	1.02	(1.00; 1.04)	1.00	(0.98; 1.02)
	2,001-10,000 inhab. mountain	1.02	(1.00; 1.03)	1.00	(0.99; 1.02)
	>50,000 inhab.	0.98	(0.96; 1.00)	0.98	(0.96; 0.99)
Geographical area (ref. north)	centre	1.03	(0.99; 1.07)	1.03	(1.00; 1.06)
	south	1.07	(1.04; 1.11)	1.09	(1.06; 1.12)
	isles	1.04	(0.99; 1.09)	1.03	(0.99; 1.07)

**including also age*

Figure 3. Regional significant residuals of SF12-physical component summary differences: primary education vs. degree

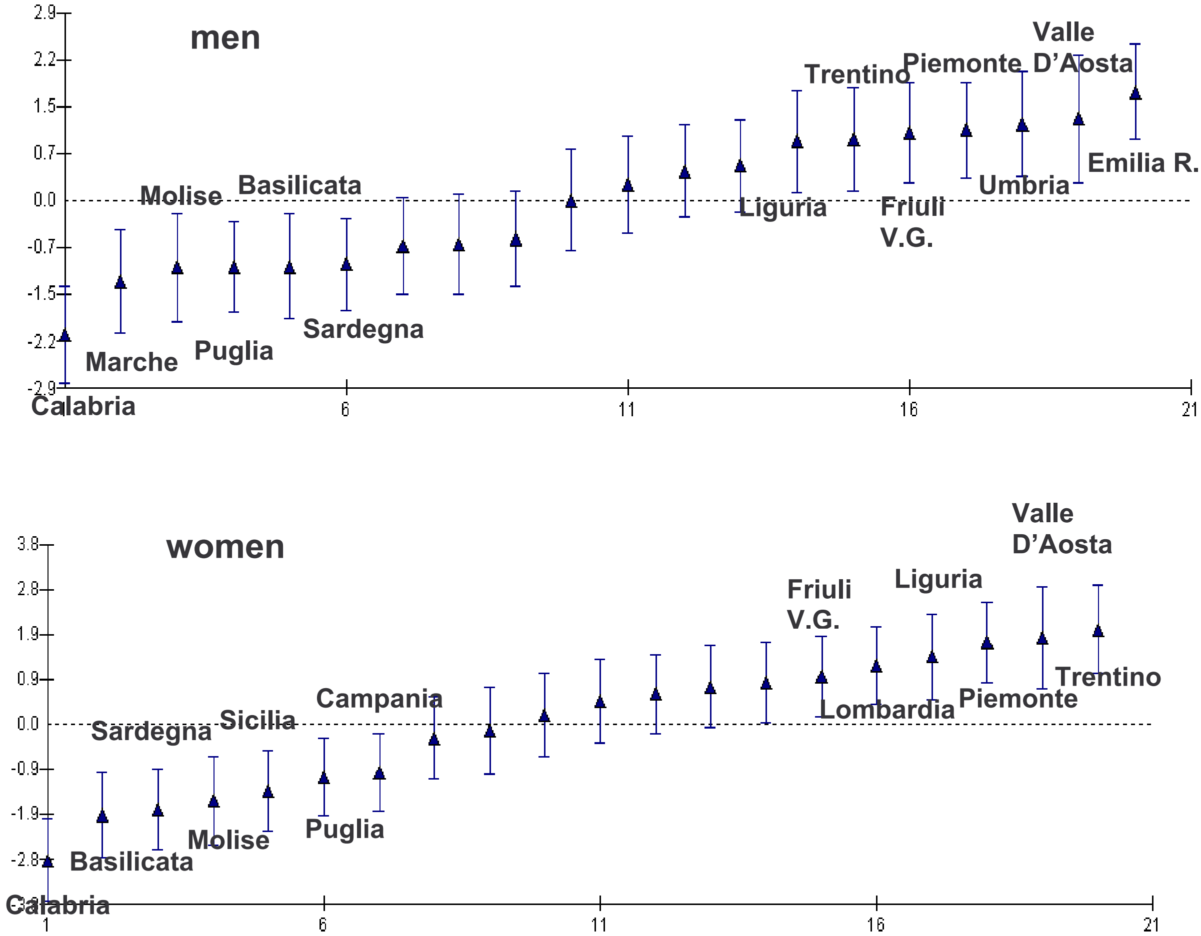
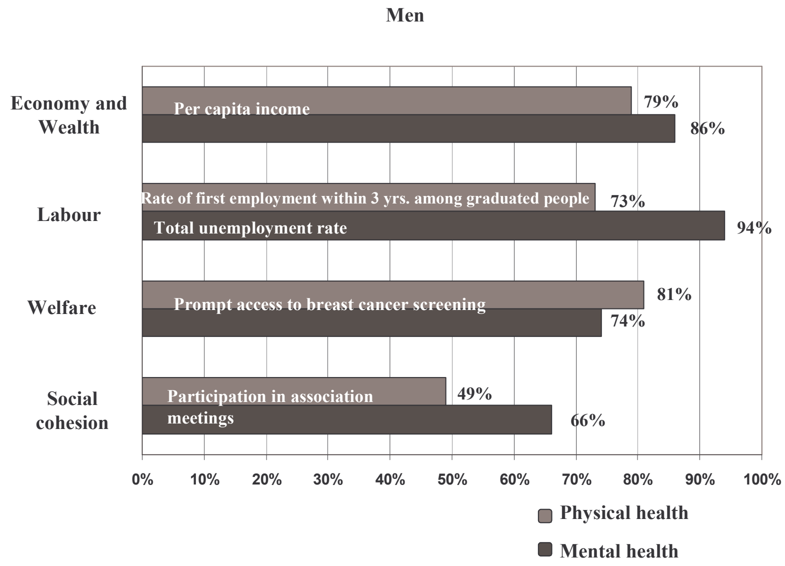
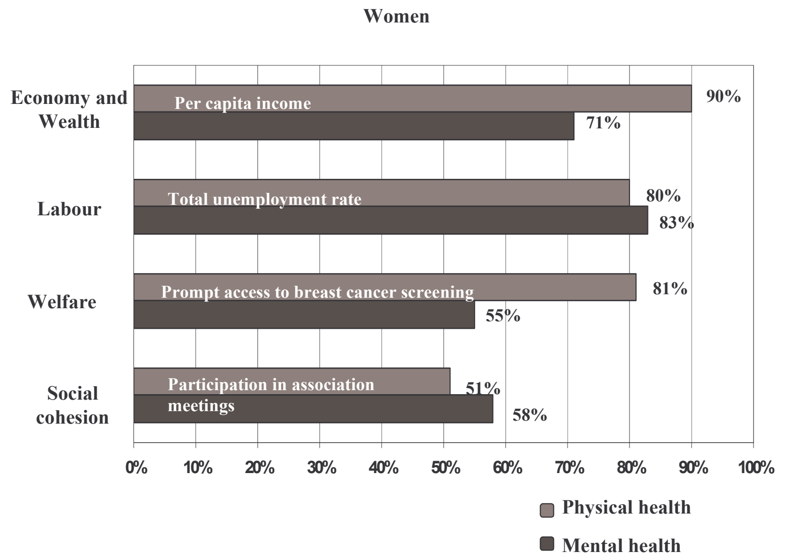


Figure 4. Significant regional indicators with the largest reduction of regional heterogeneity in health inequalities between most and least educated people, and corresponding reduction (%)





Chapter 16

Inequalities between lone and couple mothers in different welfare states – Italy, Sweden and Britain

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Abstract

Background

Welfare state arrangements and social policies are important determinants of health and health inequalities and vary between different countries. Using a framework to study the pathways from social context to health outcomes we analyse the distinctive features of lone motherhood in Italy, Sweden and the UK and how these may be traced back to existing traditions, politics and policies.

Method

Comparable national household surveys with cross-sectional data for mothers aged 16-59 and relevant social policies from Italy, Sweden and the UK were analysed regarding: a) entry in lone motherhood; b) the degree of exposure to health risks; and c) to what extent exposure to health risks translate into poorer health and how this relates back to the policy context of each country.

Results

Prevalence rates and age and socio-economic composition of lone mothers differed notably between the countries. Lone mothers were less likely to be employed than couple mothers except in Italy. Lone mothers report worse health (with a clear socio-economic gradient), more smoking and higher indications of material disadvantage than couple mothers in all three countries. However, absolute levels varied considerably which may reflect differences in traditions, politics and policies.

Conclusions

The differences revealed in our analyses partly reflect the differing welfare state arrangements and social policies of the three countries. This type of cross-country comparison may contribute to understanding the pathways by which health inequalities are generated and of entry points for both targeted and population-wide policy interventions.

Introduction

Welfare state arrangements and social policy are important determinants of health and of inequalities in health (1,2). Arrangements differ widely between countries, and certain typologies of welfare states have been proposed, such as that of Esping-Andersen (3) which groups the welfare systems of capitalist countries into liberal, corporatist and social-democratic ‘ideal type’ welfare regimes. This typology has been further refined in relation to gender aspects (4).

In many societies lone mothers are recognised as a potentially vulnerable group, whose living conditions are particularly sensitive to the setup of social policies, and who therefore may be among the first to be affected by any changes in welfare and employment policies. Previous studies comparing Britain and Sweden have shown a large variation in living conditions among lone mothers between the two countries, which in turn may lead to differences in health status (5).

As part of the Eurothine project, this study focuses on welfare state arrangements and social policy, living conditions and health among lone and couple mothers in Britain, Italy and Sweden. The welfare systems in these countries have been selected as representative of Esping-Anderson’s three types of welfare regime: Italy as an example of a “Corporatist” regime; Sweden as a “Social-democratic” type; and Britain as a “Liberal” regime. They have been studied with regard to distinctive features of lone motherhood in each country, and how these features might be traced back to, and related to, existing traditions, politics and policies forming the social context of each country.

Conceptual framework

Social context in this study is seen as the product of social structure, relevant economic and social policies, culture, traditions etc, and the interaction between these factors. The social context could be seen as the policy environment in which the life course trajectory or life chances of an individual or a certain social group is formed. Figure 1 depicts a framework by Diderichsen et al (6) to study the pathways from social context to health outcomes and the policy entry points along the way.

Pathways leading to ill health may be seen from the position of the individual or of the society. The setup of society affects the likelihood of an individual attaining a specific social position (arrow I in Figure 1, social stratification). For the individual, certain social positions are associated with an increased probability of exposures detrimental to health (arrow II in Figure 1, differential exposure). Lifestyles and health behaviours are not merely a choice of the individual but also a consequence of social position. For example, low education or unemployment is often associated with health risks such as bad housing, poverty and negative health behaviours such as smoking or a sedentary lifestyle. Arrow III in Figure 1 (differential vulnerability) indicates that whether an exposure leads to ill health or not is in part dependent on the presence of other risk factors. For instance, unemployment may not be as detrimental to health for individuals with good social networks, who can receive economic, emotional and instrumental support. Lone mothers, however, are often exposed to several health risks, and these may further interact to produce higher susceptibility to ill health of a certain exposure. The framework in Figure 1 also indicates that the social and economic consequences of disease or injury may differ between different groups (arrow IV in Figure 1), for instance between lone and couple mothers. Such a differential may also have a further impact on social stratification. Social consequences of disease or injury are however not a focus of the present study.

The social and policy context shapes the pathways from social position to ill health at several entry points (A, B, C, and D), thereby potentially influencing living conditions and ultimately the health of the population. Using the above framework, this paper compares the situation of lone and couple mothers in Italy, Sweden and Britain as derived from household survey data. These will be framed within the differing social contexts and policy environments of the three countries. This will then allow analysis and discussion of the extent to which specific policies influence prevalence and differentials in risk conditions and health outcomes for lone and couple mothers in these countries.

Data and methods

National household interview surveys with cross-sectional data from Italy, Sweden and Britain were used for the empirical analyses of health and living conditions. The Italian study (from 1999/2000) had 21,133 couple mothers and 1,911 lone mothers, the Swedish study (from 1999/2000/2001) included 2,302 couple and 453 lone mothers. The British study (2000/2001) included 2,034 couple and 652 lone mothers. The age range of mothers was 16-59 years.

A mother is defined as someone who lives with at least one of her children aged under 18 years. A couple mother is a mother who is either married or cohabiting and lives with her partner. A lone mother may or may not be living with other adults in the household but does not live with a partner. Definitions of socio-economic group were those used for the Eurothine project. Low income was defined using different indicators. In the Italian data there was no information on income. In Sweden low income was defined as household income (excluding transfers) on a level below social assistance threshold. In Britain the indicator of low income was earning less than 50 per cent of the median income. As a result, the overall level of low income in Sweden in this study will be somewhat overestimated in relation to official statistics. Recent estimates from 2005 (7) indicate that the poverty rate (<50% of median income) among lone mothers was 12 per cent compared to 5 per cent among couple mothers. Unemployment was defined according to the ILO definition (unemployment is a count of jobless people who want to work, are available to work, and are actively seeking employment).

Self-rated health and limiting longstanding illness (not available for Italy) were used as health outcome measures. Direct age-standardised rates of less than good health and limiting longstanding illness were calculated using the World Health Organisation's European Standard population (8). Confidence intervals around the European Standardised Rates (ESRs) were calculated according to the methods of Rothman and Greenland (9).

Results

Do lone mothers have worse health than couple mothers in all three countries?

When applying the framework, the first point to establish is whether lone mothers are disadvantaged in health terms in all three countries. Table 1 demonstrates that this was the case. Lone mothers had worse self-rated general health than couple mothers in all three countries, in relation to each of the age-groups and in the age-standardised rates. The prevalence of limiting long-standing illness (not available for Italy) was also higher among lone than couple mothers in both Britain and Sweden (Table 1). In interpreting this table, it should be noted that it is not advisable to compare the absolute rates of self-rated health across the countries, because the survey responses may be influenced by the different wording of the questions. Comparing the absolute rates for different groups within each country, however, is valid, as is comparing relative differences. Bearing in mind these caveats, Table 1 shows that the gap in health between lone and couple mothers was smaller in Italy than in Sweden and Britain, in both absolute and relative terms. The absolute differences in limiting long standing illness between lone and couple mothers were larger in Sweden than in Britain, but relative differences were similar for this health measure.

Given that there are clear inequalities in health status between lone and couple mothers in the three countries, and differences between the countries, how could these be explained and what part do the different welfare systems play in the process?

The role of compositional factors and social position

Lone mothers may differ from couple mothers in their demographic and social characteristics, and the extent of variation may differ between countries, influenced, in part, by the process of social stratification and the social welfare context (Mechanism I and policy entry point A in Figure 1). A range of policies, for example, may affect the age distribution or overall prevalence of lone motherhood in a country. Liberal divorce laws may increase the overall prevalence of lone motherhood, whilst the availability and quality of sex education and contraceptive services may help make the route into lone motherhood less common among young women. Abortion and adoption laws also affect the number of pregnancies brought to term and whether the children continue to live with a lone parent.

There were four striking differences between the countries in relation to the number and characteristics of lone mothers (Table 2). First, the likelihood of being a lone mother differed considerably between the countries, with Italy having the lowest prevalence (8.3 % of all mothers), Sweden twice that prevalence (16.4 %) and Britain (24.3 %) - almost three times greater prevalence of lone mothers than in Italy. Whilst the prevalence of lone motherhood in Italy had more than doubled from 3.2 per cent in the mid-1990s (10), rates in Sweden had barely changed (from 16.0 % in the mid-1990s), and for Britain there had been a steady increase - up from 20.9 percent in the mid-1990s (Whitehead et al 2000).

The increase in lone motherhood in both Sweden and Britain has been attributed in part to the decline in stigma attached to divorce and unmarried motherhood (11,12), accompanied by major relaxations in the divorce laws in the 1920s in Sweden and in the late 1960s in Britain. In Sweden, a package of policies introduced as early as the 1940s to improve the financial situation of families with children (in part in response to concerns about a falling birth rate), together with improvements in housing and access to services for all mothers, helped women with children gain autonomy. In Britain, a dramatic campaign to deal with a great problem of homelessness in the mid-1970s led to a major change in housing legislation that enabled mothers who lived with other family members to set up their own households (13).

Second, widowhood was a surprisingly common route into lone motherhood in Italy (36.2% of lone mothers are widows), whereas in Sweden and Britain it was rare, with only 1% and 3% respectively of lone mothers categorised as widows. In contrast, the most common routes into lone motherhood in Britain and Sweden were divorce (47.7% and 27.6% respectively) and being single/never married (44.1% and 50.8% respectively).

The relatively high rate of widowhood among Italian lone mothers is partially explained by demographic and cultural factors. Trifiletti et al (14) point out that Italy is experiencing the same fall in the proportion of widows and increase in separated and divorced mothers of dependent children that have been seen in other countries. They also note that many aspects of family formation in Italy, including lone motherhood, are being shifted to later phases of the life course by factors such as the falling birth-rate and increasing age of mothers having their first child. These factors along with a tendency to avoid or postpone divorce in marriages with children, along with longer divorce proceedings, provides some explanation of the older median age of Italian mothers, both lone and couple, compared to those in Sweden and Britain.

Third, the age distribution of lone mothers differed markedly at both ends of the age range. Italian lone mothers were older on average than their couple mother counterparts (47 years lone versus 42 years couple) and much older than lone mothers in Sweden and Britain (39 lone versus 38 couple and 33 lone versus 36 couple respectively). On the other hand, the prevalence of young lone mothers was significantly higher in Britain. Almost a quarter (23.5 per cent) of lone mothers in Britain and 14 % of couple mothers were aged 16-24 years, compared to 3.1 per cent and 2 per cent in Sweden and 0.8 and 1.3 per cent in Italy respectively.

Why should Britain have such a high proportion of young mothers, and especially young lone mothers, compared with Italy and Sweden? That is a question that has been taxing British policy analysts, as the UK has the highest rates of teenage pregnancy in Western Europe. Teenage mothers in particular are seen to have very disadvantaged trajectories throughout their lives and the UK Government maintains that 'teenage pregnancy is often a cause and a consequence of social exclusion' (15). There is, however, clear social patterning to teenage pregnancy. Young girls and women from the lowest social class are ten times more likely to become teenage mothers than those from highest social class (16), and those in the poorest areas of England have teenage conception and birth rates up to six times higher than the most affluent areas (15). The high proportion of young lone mothers has been recognised and been the focus of a number of policy initiatives in the UK. However, policy analysis suggests that some of UK policies to reduce the prevalence of teenage motherhood may be misguided as they focus largely on employment as a route out of poverty and hence a deterrent to early motherhood, and fail to recognise how identity and belonging can be achieved by young working class women through full-time motherhood (17,18). Similarly, the key reason given by lone parents for not participating in a major UK welfare-to-work programme for lone parents was that 'caring for their child(ren) was of paramount importance … and was often viewed as a full-time job which took priority over all other factors' (19).

Fourth, as an indicator of relative social positions in society, the occupational class of lone and couple mothers showed marked differences between the mothers in each country and between the countries (Table 2). In Italy, there were relatively few mothers, whether lone or couple, in the higher non-manual classes (6.9% and 5.5% respectively). A greater proportion of lone than couple mothers were found in the lower non-manual and manual classes, while the reverse was found for the never worked/inactive category (36.3 % lone versus 48.5% couple). It was striking, however, that the greatest proportions of both lone and couple mothers were found in the never worked/inactive category in Italy. The reverse was found for Sweden and Britain, with the smallest proportions of mothers (lone and couple) in the never worked/inactive category, though more lone than couple mothers fell into this category within each country. Sweden differed in other respects too, with lone mothers much more evenly distributed among the classes, with a sizeable proportion (28.7%) in the higher non-manual group. Mothers in general were in a better social position in Sweden than their counterparts in Italy and Britain. It was still the case, however, than Swedish lone mothers were not as advantaged as couple mothers overall – 40.1% of Swedish couple mothers were in the higher non-manual group compared with 28.7% of lone mothers. Britain demonstrated a third pattern, with most mothers, whether lone or couple, concentrated in the lower-non-manual and manual classes, and relatively few in either the higher non-manual or inactive categories. Like Sweden, however, the overall occupational class distribution of British lone mothers was less favourable than for couple mothers: lower proportions of lone than couple mothers in the two non-manual classes and greater proportions in the manual class.

Taken as a whole, these findings point to different pathways into lone motherhood in the three countries, and to different social positions for lone compared to couple mothers, which again varied across the countries.

The question arises of whether differences between lone and couple mothers in the social positions they occupy account for the observed differences in health status shown in Table 1. This question was explored further in Table 3, which shows age standardised rates of less than good health by occupational class and parental status. Considering the vertical relationships first, there was a clear social gradient in the percentage ill, with increasing prevalence moving from higher non-manual to manual classes, in all three countries and for lone and couple mothers alike, with the exception of a higher prevalence among higher than lower non-manual couple mothers in Sweden. This gives some indication that the more disadvantaged social position of lone compared with couple mothers in the three countries may be playing a role in the observed inequalities in health between lone and couple mothers. The horizontal relationships, however, reveal a more complex picture. In all but one case, prevalence rates of less than good health were higher for lone mothers than couple mothers within each occupational class, indicating that there was a health disadvantage of being a lone mother over and above that associated with their particular occupation class, in all three countries.

The exception is interesting and relates to Italian lone mothers in the higher non-manual occupational class. In this one case, lone mothers had lower rates of less than good health than couple mothers (Table 3, columns 1 and 2). This may indicate that for the (relatively few) mothers in Italy in the most advantaged social position, their privileged circumstances may overcome the health disadvantage associated with being a lone mother. Repeating the analysis in relation to limiting longstanding illness revealed a similar marked social gradient in illness and similar relationships between lone and couple mothers in each occupational class in both Sweden and Britain, again with the exception of Swedish higher non-manual couple mothers (data for Italy not available).

The role of differential exposure to health risks

A second mechanism bringing about the observed inequalities in health between lone and couple mothers may be differences in exposure of the two groups of mothers to health risks (Mechanism II and entry point B in Figure 1). By virtue of being sole providers, for example, lone mothers may run the risk of poverty. Various social and labour market policies may aim at decreasing this risk either directly through social assistance benefits, universal child allowances, and child maintenance advances for lone parents, or indirectly by providing subsidised child care and thereby facilitating employment. Flexible employment options for parents, such as the proposed ‘parent-worker’ model in Sweden (20), which includes a generous, paid parental leave and subsidized institutions for childcare, provides parents (both couple and lone) with more flexibility to negotiate the work/family balance. Other policies in terms of labour market legislation and social insurance systems may affect lone mothers differently from couple mothers.

When women become lone mothers, therefore, an important question is the extent to which the social welfare system protects them from exposure to such health risks, and whether different types of system are more or less effective in this respect. From Table 4, it is clear that exposure to poverty and joblessness differs markedly between lone and couple mothers and between the three countries.

Markers of income or wealth indicate that lone mothers were worse off financially in all three countries. A higher proportion of lone than couple mothers had low incomes in both Britain and Sweden (Italian data not available). The poverty rate among lone and couple mothers was much higher in Britain, however, with 50 per cent of lone mothers classed as poor, compared to 19 per cent among couple mothers. In Sweden, the corresponding poverty rates were 16 per cent and nearly 10 per cent respectively. Another marker of low-income - the proportion living in rented accommodation rather than owning their own home - was much higher among lone mothers in all three countries.

In relation to employment, however, Italian lone mothers were more likely than their couple-mother counterparts to be employed (nearly 58 % compared to 44% of couple mothers) and less likely to be unemployed (Table 4). The Italian pattern contrasted with both Britain and Sweden, where lone mothers had lower chances of employment and higher rates of unemployment than couple mothers. The Italian pattern is similar to the situation in Sweden in the early 1990s, when the employment rates were at around the same level for both lone and couple mothers (between 70-80%). At the same time, the employment rate in Britain was about 40% among lone and 60% among couple mothers; in Italy it was about 42% among lone and 67% per cent among couple mothers (21, 14).

However, comparing the countries, the overall level of employment among mothers was highest in Sweden, where 77 % of lone mothers and 84 % of couple mothers were employed. In Britain, half of lone mothers and 69% of couple mothers were employed. Italy had the lowest level of employment among mothers: 58% for lone and 44% for couple mothers. The high level of participation on the labour market in Sweden in part reflects the greater availability and use of child day care compared to Britain and Italy. However, in comparison to previous studies, the employment rates among Swedish lone mothers were lower in 1999-2001 than previously, and have fallen below the rates among couple mothers. Following a number of policy initiatives in Britain, including greater availability of child care, tax credits for child care and the working poor, and other welfare reforms, employment rates among lone mothers have increased substantially, resulting in declining rates of poverty among lone mothers and among children in general (22). Maternity leave policies have improved both in Britain and in Sweden, although British maternity leave remains at half the level of Sweden. Child care in Italy is scarce and expensive for children under three, but for 3-6 year olds child care is provided universally at only the costs of meals resulting in 90 per cent of children being enrolled.

A significant proportion of Italian lone mothers were living with another person in the household. According to other sources, the other person was likely to be another family member who could also look after children (23). The higher employment rate among Italian lone mothers compared to couple mothers may therefore be explained by more family care provided by married women with children on one hand and by the fact that lone mothers need an adequate income on the other hand. Lone mothers in Italy work longer hours compared to partnered ones (the weekly average hours are, respectively, 44 and 41). These differences are also linked to the higher rate of part-time work among couple mothers (29.3% compared to 21.8% of lone mothers) because lone mothers cannot afford the change from full to part time jobs (24).

In all countries, lone mothers have a higher prevalence of smoking than couple mothers, albeit at different levels in the different countries. The UK has the highest prevalence of smoking for both groups, with almost half of all lone mothers smoking daily, compared to only a quarter of couple mothers. In Sweden, whilst overall prevalence is lower, more than twice as many lone mothers smoke daily than couple mothers (Table 4). This differential exposure to smoking may partly reflect a coping behaviour among lone mothers, in response to stress (25). Although not beneficial to health, smoking may provide an instant relief to stress.

The extent to which the differing welfare systems protect mothers from poverty and non-employed in 2000/2001 is explored in Table 5 for Sweden and Britain (data for

Italy not available). Being employed greatly reduces the risk of poverty in both countries and for both lone and couple mothers, most strikingly so for lone mothers in Britain, where the poverty rate reduces from 50% to 19% among working lone mothers. Conversely, not being in employment greatly increases the risk of poverty, again, strikingly so among British lone mothers. These data are in line with the thrust of British policy in recent years, which has clearly focused on getting parents, especially lone parents, into work to reduce poverty, and many related initiatives have been to facilitate this, as mentioned above. They also illustrate, however, the severe problem of poverty for lone mothers who do not work, and the deficiencies in the British social welfare system, which fails to protect a high proportion of them. The Swedish welfare system fares better in protecting a higher proportion of lone and couple mothers from poverty when employed and when not working. The poverty rate of 36% among lone mothers who do not work and 23% among their couple mother counterparts, however, is an indication that the Swedish system is falling short of full protection. However, the Swedish poverty indicator employed in the present study (income below the norm for social assistance) yields a higher prevalence rate of poverty than that officially reported, which should be kept in mind. The official poverty rate (<50% of median income) in 2005 was 12% among lone and 5% among couple mothers. Other studies have shown that the economic situation of Swedish lone mothers has deteriorated in recent years, partly owing to the higher non-employment rates during the 1990s but partly also due to policy changes in the wake of the economic recession which seem to have differentially affected lone mothers adversely. Comparing the situation of Swedish lone mothers over time, for example, a greater proportion were non-employed and had financial difficulties in the 1990s than in the 1980s (26).

The role of differential vulnerability

A further potential mechanism operating to generate the health inequalities between lone and couple mothers is greater vulnerability to the health damage caused by risk factors such as joblessness and poverty (Mechanism III and entry point C in Figure 1). This was explored tentatively in Tables 6 and 7, with the data available to us. In Italy, there was only a small difference in rates of less than good health between employed and not employed for lone and couple mothers, and the rate difference was actually bigger for the couple mothers (rate difference for lone mothers = 0.4; for couple mothers= 3.4) (Table 6). There was therefore no indication of greater vulnerability of lone mothers in Italy to the health effects of joblessness; if anything, it was the couple mothers who were more vulnerable. This contrasted with the pattern found in both Sweden and Britain, where the differences in rates of less than good health between employed and not employed lone mothers were substantially higher than among couple mothers (rate difference = 25.3 for lone versus 17.8 for couple mothers in Sweden and 17.3 for lone versus 12.1 for couple mothers in Britain). These findings indicate that lone mothers in both Sweden and Britain may be more vulnerable than couple mothers to the health damage of joblessness. When health was measured by limiting longstanding illness on the other hand, there was no sign of greater vulnerability of Swedish lone mothers, as the rate differences were of similar magnitude for both lone and couple mothers. There was still a larger rate difference for British lone mothers compared with couple mothers, though, in line with the findings from the self-rated general health measure (data on limiting longstanding illness for Italy not available). Of further note are the very high rates of ill health among lone and couple Swedish mothers who were not working, higher than our studies of the 1990s (5). One tentative conclusion is that health selection into and out of the labour market has become more prominent than before in Sweden, and may be related to a harsher employment policy climate.

In relation to poverty, there was no indication of greater vulnerability of lone mothers from the findings presented in Table 7. The rate differences for self-rated general health and limiting longstanding illness were only marginally larger for lone compared with couple mothers, and indeed when self-rated general health was used as a measure, couple mothers had a marginally higher rate difference than lone mothers.

Discussion

Our analyses reveal considerable differences in the prevalence of lone motherhood, the demographic and socio-economic composition and economic conditions of lone mothers in the different countries. These differences partly reflect the different traditions, culture and types of welfare systems prevailing in the countries. Lone motherhood is a dynamic phenomenon, as indicated by the increasing prevalence rates in Italy and Britain. This also shows to some extent in the demographic and socio-economic composition of lone mothers in the different countries. There may be very different reasons for becoming a lone mother, and the social and economic circumstances and trajectories of lone mothers vary correspondingly. Lone motherhood is common in all socio-economic groups in Sweden, which suggests that being a lone mother is less class-related in Sweden than in the other countries. A large proportion of Swedish couple and lone mothers are in the higher non-manual group. This and the higher employment rate among women overall may be a result of longstanding general policies regarding gender and social equality in Sweden. In Britain on the other hand, a smaller proportion of all women are in the higher non-manual group, but the proportion of higher non-manual lone mothers is even smaller. This may reflect a disadvantaged position on the labour market of British mothers overall, and particularly of lone mothers. Lower rates of employment among British mothers may partly be a result of the lack of affordable child day care (27, 28). The high proportion of young lone mothers in Britain also has a socio-economic gradient. The increase in Italian lone motherhood is quite recent and may be an aspect of emancipation, as it mostly involves employed women across all social classes. Contrary to Sweden and Britain, a sizeable proportion of both lone and couple mothers in Italy were inactive or have never worked. Another important aspect, not investigated in the present study, is the duration of lone motherhood. Other studies have suggested considerable variation in the duration of lone motherhood. In the mid 1990s lone motherhood was considered to a greater extent to be persistent in Italy and Britain, while it to a greater extent was temporary in Sweden. A greater proportion of lone mothers were never or short term poor in Italy and Sweden compared to Britain, where a greater proportion were often or persistently poor. (10)

Lone mothers report worse health than couple mothers in all three countries. The magnitude of the difference varies, but this was a general finding. The results regarding self-rated health and limiting longstanding illness (not available for Italy) sometimes showed different results, particularly in the rate differences between employed and not employed mothers. This suggests that the choice of health outcome measure may be important for the interpretation of results. In the case of Britain and Sweden, ill health was more concentrated among mothers who were not employed and who were poor. This may be due to health selection into and out of the labour market, or to the detrimental effects to health of being poor or not employed. This was not as evident in Italy, which again may reflect the different age and socio-economic composition of lone mothers in Italy.

Among lone and couple mothers there was also a socio-economic gradient in health, in all countries. Analysing socio-economic differences among lone mothers is complicated by the fact that a sizeable proportion of lone mothers, particularly in Italy, are classified as “never worked/inactive including students”. The socio-economic differentials in health found in the present study among Swedish lone and couple mothers were not entirely along the expected gradient, particularly among couple mothers where higher non-manual mothers had worse health than lower non-manual mothers.

Other factors relating to differential exposure which may contribute to explain the health disadvantage among lone mothers is the higher smoking prevalence compared to couple mothers, found in all countries.

The health disadvantage of Italian lone mothers was smaller than in Sweden and Britain. This may partly be due to the particular demographic and socio-economic composition of lone mothers in Italy. In Sweden and Britain the differences between lone and couple mothers were more pronounced. Our previous studies suggested that the relative health disadvantage of lone compared to couple mothers was similar in Britain and Sweden, but that the factors explaining the health disadvantage differed between the countries (5). While joblessness and poverty explained about half of the disadvantage of British lone mothers, the corresponding explanatory power of these factors was only 3-13 per cent. Our conclusion from the previous study was that other factors determine the health disadvantage of Swedish lone mothers. One tentative suggestion was time poverty, resulting from the higher employment rate among Swedish lone mothers, which might make it difficult to combine full time work and parental duties. However, this was not possible to study with the available data. Given the lower rates of joblessness and poverty among lone mothers in Sweden compared to Britain, it is unlikely that these factors explain the health disadvantage of Swedish lone mothers.

The living conditions of lone mothers may also change over time, as policies change. This is reflected, for example, in the increasing proportion of working lone mothers in Britain, and the increasing rates of non-employment and financial difficulties among Swedish lone mothers during the 1980s and 1990s. Yet, the basic welfare state structure in Sweden, with good access to subsidised child day care still enables high employment rates among women in general, but among lone mothers in particular, as reflected in the fact that lone and couple mothers in Sweden in spite of the decrease in employment rates during the 1990s still had higher employment rates than lone and couple mothers in Italy and Britain. Access to affordable child day care seems to be one important aspect in which the different examples of welfare systems vary.

British government policy initiatives over the last decade seem to have been partially successful in increasing rates of employment and lowering poverty rates among lone mothers. In Italy there have been no direct policy changes influencing lone mothers and their living conditions and health. Given the increase in the prevalence of lone motherhood in Italy, now seems to be the time to consider such policies, keeping in mind that the heterogeneity of the group would necessitate different policies to meet different needs.

Cross-country comparison of living conditions and health of a specific group like lone mothers may contribute to the understanding of pathways by which health inequalities are generated, and of entry points for possible policy interventions in different social contexts. In this respect, not only specific, targeted policies may be important, but also universal and general policies which apply to the whole population and shape the general social and political context of the society in which people live their lives.

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Tables and figures

Table 1. Percentages of lone and couple mothers aged 16-59 years reporting less than good health in Italy (1999/2000), Sweden (1999/2000/2001) and Britain (2000/2001), and rates of limiting longstanding illness in Sweden and Britain. Age standardised rates with 95 per cent confidence intervals (CI).

	Italy		Sweden		Britain	
	Lone *(n=l911)*	**Couple** *(n=21133)*	**Lone** *(n=453)*	**Couple** *(n=2302)*	**Lone** *(n=652)*	**Couple** *(n=2034)*
	%	**%**	**%**	**%**	**%**	**%**
Less than good health						
Crude prevalence rate	48.9	41.0	31.6	16.6	42.8	29.9
Age-specific rate						
16-24	33.0	20.3	35.7 *(5/14)**	15.2 *(7/46)**	32.2	28.0
25-34	31.5	27.1	28.3	14.1	44.8	30.3
35-44	36.7	35.3	29.2	16.3	42.9	28.3
45-59	58.3	54.4	38.5	20.8	57.8	35.2
Age standardised rate (95% CI)	41.7 (39.6-43.8)	36.2 (35.0-37.5)	33.5 (26.5-40.4)	17.0 (14.2 -19.7)	44.8 (40.2-49.4)	29.4 (27.1-31.8)
Limiting long-standing illness						
Crude prevalence rate	*n/a*	*n/a*	26.7	16.4	16.9	11.3
Age-specific rate						
16-24	*n/a*	*n/a*	21.4 *(3/14)**	13.0 *(6/46)**	32.2	28.0
25-34	*n/a*	*n/a*	25.8	14.5	15.5	11.4
35-44	*n/a*	*n/a*	21.8	16.1	18.7	10.5
45-59	*n/a*	*n/a*	36.8	20.0	29.6	16.5
Age standardised rate (95% CI)	*n/a*	*n/a*	27.4 (21.3-33.6)	16.3 (13.7-18.9)	19.5 (15.6-23.4)	12.0 (10.3-13.7)

* Actual numbers indicated because of small n aged 16-24 years

Table 2. Characteristics of lone and couple mothers aged 16-59 years in Italy (1999/2000), Sweden (1999/2000/2001) and Britain (2000/2001).

	Italy		**Sweden**		**Britain**	
	Lone ***(n=l911)***	**Couple** ***(n=21133)***	**Lone** ***(n=453)***	**Couple** ***(n=2302)***	**Lone** ***(n=652)***	**Couple** ***(n=2034)***
Lone mothers as % of all mothers	8.3		16.4		24.3	
% of lone mothers who are widows	36.2	n/a	1.3	-	2.8	-
Single/never married	10.2	1.0	42.8	-	50.8	-
Divorced (%)	17.9	0.4	47.7	-	27.6	-
Separated (%)	35.8	0.4	8.2	-	18.9	-
Married (%)	-	98.1	-	68.1	-	76.4
Cohabiting (%)	-	0	-	30.7	-	23.6
Median age (years)	47	42	39	38	33	36
% aged 16-24	0.8	1.3	3.1	2.0	23.5	14.0
% aged 45-59	59.1	39.9	21.7	25.8	11.0	14.3
% higher non-manual	6.9	5.5	28.7	40.1	7.4	12.5
% lower non-manual	32.3	28.8	17.4	15.0	40.5	46.7
% manual	24.6	17.2	40.2	38.0	36.0	28.7
% never worked/inactive (including students)	36.3	48.5	13.7	6.9	16.1	12.1

Table 3. Age standardised prevalence rates of less than good self-rated health with 95% CI by socioeconomic group for mothers aged 16-59 years in Italy (1999/2000), Sweden (1999/2000/2001) and Britain (2000/2001), and age standardised rates of limiting longstanding illness in Sweden and Britain.

	Italy		Sweden		Britain	
Prevalence rate (%)	**Lone** ***(n=l911)***	**Couple** ***(n=21133)***	**Lone** ***(n=453)***	**Couple** ***(n=2302)***	**Lone** ***(n=652)***	**Couple** ***(n=2034)***
Less than good health						
Among higher non-manual	21.0 (15.5-26.4)	28.1 (25.2-31.0)	19.1 (13.6-24.5)	14.5 (5.5-23.6)	38.7 (18.7-58.7)	19.3 (14.5-24.0)
Among lower non-manual	38.3 (35.7-41.0)	34.7 (33.5-36.0)	28.7 (20.1-37.2)	11.3 (8.0-14.7)	42.8 (35.4-50.2)	29.9 (25.9-33.9)
Among manual	46.4 (40.3-52.5)	42.6 (41.5-43.7)	40.6 (31.1-50.1)	21.6 (17.5-25.6)	55.0 (47.7-62.2)	34.6 (29.8-39.4)
Among inactive	44.2 (40.4-48.1)	38.2 (37.4-39.1)	33.1 (18.2-48.0)	20.0 (9.6-30.5)	35.4 (15.8-55.1)	34.6 (21.5-47.7)
Limiting longstanding illness						
Among higher non-manual	n/a	n/a	21.0 (15.4-26.5)	14.8 (5.7-23.8)	11.4 (15.1-21.3)	9.2 (5.6-12.9)
Among lower non-manual	n/a	n/a	19.2 (12.0-26.3)	11.1 (7.8-14.4)	15.6 (10.3-21.0)	10.5 (7.9-13.1)
Among manual	n/a	n/a	33.3 (23.9-42.7)	20.5 (16.4-24.5)	25.3 (18.0-32.6)	15.1 (11.5-18.6)
Among inactive	n/a	n/a	32.4 (18.7-46.0)	23.9 (13.0-34.8)	31.6 (14.6-48.6)	13.3 (2.5-24.1)

Table 4: Exposure to low-income, joblessness and smoking among lone and couple mothers aged 16-59 years in Italy (1999/2000), Sweden (1999/2000/2001) and Britain (2000/2001).

	Italy		Sweden		Britain	
Prevalence rate (%)	**Lone** ***(n=l911)***	**Couple** ***(n=21133)***	**Lone** ***(n=453)***	**Couple** ***(n=2302)***	**Lone** ***(n=652)***	**Couple** ***(n=2034)***
Employed	57.8	44.3	77.0	84.0	50.4	69.4
Unemployed (ILO definition)	7.2	8.5	10.8	7.3	7.9	2.1
Not seeking work/keeping house	35.0	41.0	13.9	11.3	41.6	28.1
Renting accommodation	34.2	19.1	65.1	21.6	65.2	21.0
Low income*	n/a	n/a	16.1	9.9	50.3	19.1
Smoking daily	34.3	23.3	37.4	18.1	48.0	24.8

* Sweden: household income (excluding transfers) on level below social assistance threshold.
Britain: <50% of median income.

Table 5: Proportion employed and proportion poor among all and among employed and not employed mothers aged 16-59 years in Italy (1999/2000), Sweden (1999/2000/2001) and Britain (2000/2001).

	Italy		Sweden		Britain	
Prevalence rate (%)	**Lone** ***(n=l911)***	**Couple** ***(n=21133)***	**Lone** ***(n=453)***	**Couple** ***(n=2302)***	**Lone** ***(n=652)***	**Couple** ***(n=2034)***
Employed	57.8	44.3	77.0	84.0	50.4	69.4
Poor among all	n/a	n/a	16.1	9.9	50.3	19.1
Poor of employed	n/a	n/a	9.9	7.4	19.3	11.8
Poor of not employed	n/a	n/a	36.3	23.2	80.1	35.8

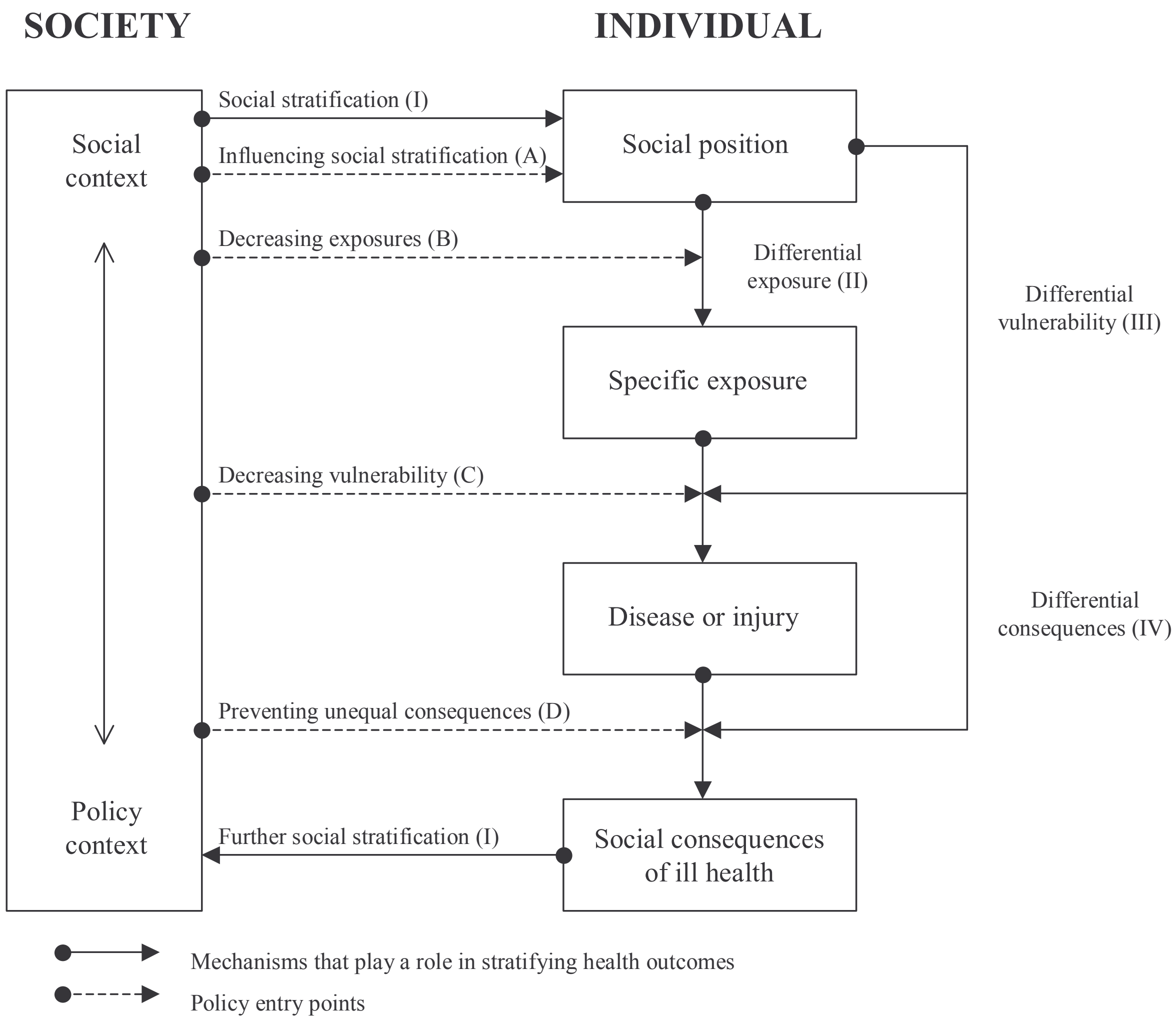
Table 6: Age standardised prevalence rates of less than good self-rated health with 95% for employed and not employed mothers aged 16-59 years in Italy (1999/2000), Sweden (1999/2000/2001) and Britain (2000/2001), and age standardised rates of limiting longstanding illness in Sweden and Britain.

	Italy		Sweden		Britain	
Prevalence rate (%)	**Lone** ***(n=l911)***	**Couple** ***(n=21133)***	**Lone** ***(n=453)***	**Couple** ***(n=2302)***	**Lone** ***(n=652)***	**Couple** ***(n=2034)***
Less than good health						
Among not employed	42.6 (39.9-45.4)	37.6 (35.9-39.3)	50.2 (38.0-62.3)	31.8 (25.7-37.9)	54.1 (47.1-61.1)	38.7 (33.9-43.5)
Among employed	42.2 (39.4-44.9)	34.2 (33.4-35.1)	24.9 (17.4-32.5)	14.0 (10.1-17.8)	36.8 (30.7-42.8)	26.6 (23.9-29.4)
Rate difference	0.4	3.4	25.3	17.8	17.3	12.1
Limiting longstanding illness						
Among not employed	n/a	n/a	46.6 (35.1-58.0)	30.6 (24.9-36.4)	32.2 (25.1-39.2)	23.1 (18.6-27.5)
Among employed	n/a	n/a	21.4 (14.0-28.8)	5.7 (2.9-8.5)	9.9 (5.8-14.0)	8.4 (6.7-10.1)
Rate difference	n/a	n/a	25.2	24.9	22.3	14.2

Table 7: Age standardised prevalence rates of less than good self-rated health and limiting longstanding illness with 95% CI for poor and not poor mothers aged 16-59 years in Sweden (1999/2000/2001) and Britain (2000/2001.

	Sweden		Britain	
Prevalence rate (%)	**Lone** ***(n=453)***	**Couple** ***(n=2302)***	**Lone** ***(n=652)***	**Couple** ***(n=2034)***
Less than good health				
Among poor	40.0 (25.9-54.1)	20.3 (12.3-28.3)	48.1 (40.8-55.5)	35.1 (29.0-41.2)
Among not poor	35.0 (26.2-43.7)	16.5 (13.5-19.5)	42.9 (36.4-49.3)	27.8 (25.0-30.6)
Rate difference	5.0	3.9	5.3	7.3
Limiting longstanding illness				
Among poor	28.0 (16.2-39.8)	14.9 (7.8-22.1)	23.9 (17.1-30.8)	16.5 (11.6-21.5)
Among not poor	29.8 (21.4-38.1)	16.1 (13.3-18.9)	16.3 (11.3-21.4)	11.2 (9.2-13.2)
Rate difference	-1.8	-1.3	7.6	5.3

Figure 1 Framework for studying the pathways from the social context to health outcomes and for introducing policy interventions.



Source: Diderichsen F, Evans T, & Whitehead M. The social basis of disparities in health. In: Evans T, Whitehead M, Diderichsen F, Bhuiya A, Wirth M (eds). Challenging inequities in health. From ethics to action. New York: Oxford University Press, 2001, pp 13-23.

Chapter 17

Lone mothers in Spain: policy context and individual outcomes in terms of health and health-related behaviours

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Abstract

Background

This paper analyses health and health-related behaviour inequalities among types of mothers by social class in Spain. The results are discussed in relation to the social policy context.

Methods

Data came from the *Encuesta Nacional de Salud* (Spanish National Health Survey, 2003). For the purposes of this study, a subsample of mothers aged 16-65 (n=2982) was selected. Lone mothers are defined as mothers of 18 or less year-old children not living with a partner. Lone mothers are split in two groups: those who are household heads and those who are not, and results are compared with those of mothers with a partner.

Results

Comparing health outcomes by types of mothers, lone mothers who are household heads were more likely to report sleeping 6 or less hours a day, whereas lone mothers non-household heads were more likely to report smoking and drinking to a risky level. There were no significant inequalities in the health indicators between the three groups taken as a whole. However, when interacting the analyses by type of motherhood and social class, manual class lone mothers household heads were those with the highest risk of having a poor self-assessed health, a limiting long-standing illness and of smoking compared to the non-manual class lone mothers household heads. Among mothers in the non manual class few inequalities appeared between mothers with or without partners, whereas for manual class mothers having or not a partner had a significant impact on health outcomes.

Conclusions

Lone mothers household heads belonging to the manual class are those with the worst health and health-related behaviours compared with the other groups of women analyzed. When studying health inequalities among types of mother, the socio-economic position of these women should be taken into account in the Spanish context.

Introduction

Lone mothers are considered as one of the most vulnerable and disadvantaged groups in many countries, a fact that has been documented to a great extent by research in a variety of countries like the United Kingdom, Sweden, Canada, Australia or New Zealand [1-10]. They have been found to have a poorer health status compared to mothers living in couples both in cross-sectional [1][3][10][11] and in longitudinal studies [2]; more anxiety and sleep problems [5], more self-reported mental health problems [4], depressive episodes [6][7][11], and poor health-related behaviours such as smoking [8][9][11]. Although the number of lone mothers has been increasing during the last decades in Spain, the theoretical, empirical and political interest in lone motherhood is still far from that of other countries.

The study *Social policies and the pathways to inequalities in health: a comparative analysis of lone mothers in Britain and Sweden* [12] establishes a significant antecedent for our approach. Starting with the consideration that lone mothers are a potentially vulnerable group, it hypothesizes that changes in welfare and employment policies have a direct impact on lone mothers, to the extent of being one of the first groups where the effect of these policies become visible. The analysis showed a large variation in living conditions among lone mothers between the two countries, and that this in turn could lead to differences in health status. On the other hand, however, the health of lone mothers compared to that of couple mothers was found to be poorer in Sweden as well as in Britain and the magnitude of the differential between lone and couple mothers was similar in both contexts.

In 2001, lone parent households in EU-15 represented 9% of all households with dependent children, ranging from 22% in Sweden and 17% in the United Kingdom to 4% in Italy, Portugal and Greece, and 3% in Spain (this data refers only to “single” lone parents, i.e. where one parent lives alone with his/her dependent child(ren)) [13]. Although the weight of the lone-parent family model in Spain is still far from the European average, it has risen to proportions never known before, roughly tripling in the last 20 years. Some of the explanations associated with this increase are the legalization of divorce, occurred in 1981; the greater independence of Spanish women due to their incorporation to the labour market [14] and the higher presence of single women with children [15][16].

As in most of the European countries, lone mothers constitute the majority of lone-parent households. Almost four out of five of the households composed by a parent with one or more children in Spain are headed by women [15][17]. In 2001, 79% of lone parents with children under 16 were mothers [18]. In Spain, however, lone mothers do not constitute a homogenous group affected by marginalization, discrimination and economic disadvantages. On the other hand, widows with children are the only category of lone mothers that, in the majority of the cases, receive governmental help and traditionally have been socially accepted and respected [15].

In parallel, and in contrast with countries like the United Kingdom or Sweden, research about lone motherhood in Spain is only descriptive and is very fragmented, a factor that goes together with a lack of public policies oriented towards this sector of the population. The focus on large families both in redistributive and research terms constitutes an important indicator of the lack of importance attributed to lone mothers and their situation in Spain. This paper aims to fill the gap in literature about lone mothers and their health and health-related behaviours compared to that of couple mothers. Following the line of the case studies carried out in the United Kingdom and Sweden [12], this study analyses the situation of lone mothers in Spain compared to that of couple mothers.

The basic assumption of the lone mother's case studies is that the social context and specific social, economic and labour market policies may have an important impact on the health status of some groups more than others, and therefore explain health inequalities. Due to the large differences between the Welfare State policies of the UK, Sweden and Spain, three different regimes all together [19][20][21] and the scarce research on health inequalities of mothers in Spain, it seemed very interesting to carry out a study exploring possible inequalities in this different context.

Social policy in Spain is decentralized and every level of governance has a role, from the central government to the 17 autonomous governments and also local councils. The 17 autonomous governments do not only have the authority to carry out policies, but also to legislate in this area. This gives, as a result, the possibility of finding a different policy in every region of Spain, even though some regional governments do not practice their powers in some areas. Secondly, it is well known that the Spanish Welfare State services and transfers are little developed. The expenditure on welfare policies is far behind the average levels of the EU-15 countries. According to Eurostat, in 2003 Spain spent 123.3 ppp's per inhabitant on family and children policies -one of the lowest of the EU-25- against the EU-15 average of 532.2 ppp's per inhabitant[1]. For example, the expenditure on child care was 3.4 ppp's per inhabitant against 58 ppp's in the EU-15. The results for Sweden were 210.2 ppp's per person and in the UK 49.3 ppp's. Regarding family or children allowances, the expenditure was 45.1 ppp's per inhabitant in Spain, compared to 211.7 ppp's in Sweden and 328.9 ppp's in the UK, whilst the average for the EU-15 was 308 ppp's.

In 2000, the right-wing party, *Partido Popular,* established a majority government, approving in the following year the *Plan Integral de Apoyo a la Familia* 2001-2004 (Integral Plan for the Family, 2001-2004). The policy for lone-parent families consisted in assisting these families when in social risk, throughout Social Services, NGO's or family solidarity. Although PP's family plan claimed that lone-parent families needed additional specific support as they have larger difficulties in combining labour and family lives and a higher risk of social exclusion, the measures implemented were mostly means-tested, and not a universal support for all lone parents. This differed, for instance, from the policy for large families (3 or more children), where specific transferences are provided to all these families. Examining policies which are expected to improve living conditions of lone parent families – family plans and programs, employment measures, public childcare, child allowances, social welfare and inclusion benefits and housing policy measures- few specific policies for lone parenthood appear, both at the State and regional level. Again, policies offer scarce coverage and generosity, being mainly means-tested and

[1] PPP's per inhabitant spent on family and children policies for other countries in 2003: Sweden = 754,5; UK = 454,2; Italy = 237,7. Source: Eurostat. Information available online, extracted April 2006 (http://epp.eurostat.ec.europa.eu)

oriented to low-income families, regardless of the family composition (except for large families).

For this case study, the conceptualization of social context and its effects on health used by Diderichsen et al. [22] was adopted, which understands social context as the product of social structure, relevant economic and social policies, culture, traditions etc, and the interaction between these factors. The social context could be seen as the policy environment in which the life course trajectory or life chances of an individual or a certain social group is formed. Figure 1, based on the framework used by Diderichsen et al., illustrates how the social context may operate in relation to causal pathways in the specific case of (lone)motherhood and health outcomes in Spain.

In the line of Diderichsen's theoretical framework, it is assumed that there are four possible entry points of policy which can configure and determine health outcomes of Spanish mothers. **Entry point A**: The underdeveloped welfare state influences social stratification, as it is insufficient to provide equal opportunities and conditions to all individuals. **Entry point B**: The lack of public resources to support mothers with children, and specifically lone mothers, affects women's possibilities or wish to become a lone mother, which will instead depend on their private resources. The same applies to becoming a lone mother who is a household head, or living in another supporter's household. (Lone mothers with less socio-economic resources live in another supporter's household more than lone mothers with more resources, who become household heads of an independent home). **Entry point C**: Once a lone or a couple mother, the underdeveloped public family support means a limited reduction of these mother's different vulnerabilities to health problems. The risks associated to bringing children up alone in contrast to sharing responsibilities with a partner are not sufficiently covered by the Spanish welfare state. Therefore, the ability to avoid these risks depends on ones own private resources, meaning that both lone and couple mothers can present good or bad health outcomes. **Entry point D**: The policy context can act to prevent further social stratification caused by the presence of health problems.

This paper investigates health inequalities between Spanish lone mothers and mothers with a couple, taking into consideration socio-economic factors. The main hypothesis of the research is that due to the underdevelopment policy support for all mothers, and for all mothers in particular, and the heterogeneity that characterizes lone mothers in Spain, there would not be important differences between the health of lone mothers compared to couple mothers as a whole due to the fact that lone parents are overrepresented in the high socio-economic positions, and therefore have more personal resources to support their children in default of public interventions. When controlling by socio-economic positions, it is expected to see stressed inequalities between lone mothers and mothers with a partner from lower socio-economic positions, and less or no differences between mothers from higher positions, as they have the same personal resources to protect themselves from health risks.

Data and methods

Data

Data are derived from the *Encuesta Nacional de Salud* (Spanish National Health Survey, 2003), a cross-sectional survey based on a representative sample of 22.000 households of the non-institutionalised population. The Spanish National Health Survey (NHS) provides information about people's self-assessed morbidity, the characteristics and use of health services and lifestyles, among other aspects. Multiphase stratified sampling independent in the 17 Autonomous Communities. For the purposes of this study a subsample of mothers aged 16-64 was selected (N=2982). Lone mothers are defined as mothers of 18 or less year-old children not living with a partner. Lone mothers are split in two groups: those who are household heads and those who are not[2].

Dependent variables

Health status
Self-assessed health
Self-perceived health status was elicited by asking the respondents to describe their general health as "very good", "good", "fair", "poor" or "very poor". The variable was dichotomised by combining the categories "fair", "poor" and "very poor" to indicate perceived health as below good. Self-perceived health is a broad indicator of health related well being and has also proved to be a good predictor of mortality [23][24].

Limiting long-standing illness
Was asked with the question "In the last 12 months, have you suffered an illness, disease or health problem that has limited your everyday activity for more than 10 days in a row?" With two categories, LLI is a functional measure of ill health, directing attention to the consequences of illness, i.e., whether reported illness restricts daily activities or not.

Chronic conditions
Were asked through the question "Has your doctor told you that you suffer in a chronic way from one of the following diseases or health problems at the moment?". The categories include the following chronic diseases: high blood pressure; high cholesterol; diabetes; asthma, chronic bronchitis or emphysema; diseases of the heart; stomach ulcers; allergy; depression; other mental diseases; migraine or headache; bad blood circulation; hernias; degenerative osteoarthritis and rheumatic problems; osteoporosis; problems of the menopause period (except osteoporosis); problems of the prostate. This variable was dichotomised as "suffering from none" versus "suffering from at least one" chronic condition.

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[2] Although the sample size of the group of lone mothers non-household heads is not large enough to make strong generalizations (N=51), this group was maintained in the statistical analyses as a separate category as it represents a characteristic situation of the Mediterranean context, that is, women who cannot afford to emancipate and live with their parents up to grown up age. And so, they are expected to present different, and perhaps better, health outcomes than lone mothers who are household heads, who do not have the same family support at home.

Health-related behaviours

Daily number of hours slept

This variable was created based on the following question “Could you indicate, approximately, how many hours a day do you sleep?”. It was dichotomized into “6 hours or less” and “More than 6 hours”.

Smoking behaviour

Was asked through the question “Could you tell me if you smoke at present?” with 4 possible answers “Yes, smokes daily”; “Smokes, but not daily”; “Doesn’t smoke at present but has smoked before”; “Doesn’t smoke and has never smoked habitually”. The original variable was dichotomized into “Smoker” (daily and not-daily smokers) and “Non-smoker” (contains Ex-smoker).

Alcohol consumption

Was asked with the question “How often and what kind of drinks containing alcohol do you consume at present?” with 6 categories of drinks[3] and 7 of frequencies[4]. To calculate the grams of alcohol level of consumption, moderate or risky, the five kinds of beverages are assigned the following alcohol grams in order to weight them: beer 9.6, wine 11.2, liquor 12.8 and whisky or cocktails 22.4 and the frequency and amount of consumption are taken into account. A dichotomic variable was constructed with the categories “Teetotallers and moderate drinkers” opposed to “Risky drinkers”.

Independent variables

Type of motherhood

A three category variable for mothers of 18 or less year-old children was used: couple mothers or mothers with a partner (CM) who were those mothers living with a partner (2502 cases); lone mothers who were household heads (LMH; 429 cases); and lone mothers non household heads (LMNH; 51 cases).

Educational attainment

This variable has the following categories: “No formal education”; “Primary education” (with primary studies or equivalent; 1st cycle of secondary studies; 2nd cycle of vocational training); “Secondary education” (2nd cycle of secondary studies; superior vocational training); and “University education” (1st cycle of University studies or equivalent; 2nd or 3rd cycle of University studies).

Employment status

[3] Glasses of wine, champagne or cava; beer or cider; sherry, vermouth or appetizers with alcohol; liquor (anisette, cognac, rum, gin, etc.); whisky; cocktails or mixed drinks.
[4] Daily; 4 to 6 days a week; 2 to 3 days a week; 1 day a week; 1 day every 2 weeks; 1 day a month; less than 1 day a month..

This variable is constructed based on the original question “With regards to economic activity, in which of the following situations did you find yourself last week?”, with 14 categories of answers. It has been recoded into a 6 category variable: working, unemployed, retired, studying, housewife and other situations.

Occupational social class

This variable has been constructed based on the original question “What is the occupation, profession or job that you hold or held in your last employment?”. The occupational social class, assigned according to the respondent’s current occupation, was measured with a widely used Spanish adaptation of the British Classification [25]. Because of the low number of individuals in some categories, the six original social classes were collapsed into two broad classes: I and II (non manual occupational classes), III and Iva-Ivb-V (manual occupational classes). When the women’s occupation wasn’t available, the household head’s category was taken into account[5] [26].

Equivalised monthly income intervals

The original question reads “What is the monthly amount of the household incomes adding every source (if there’s more than one source) subtracting tax deductions and social contributions and other equivalent payments? Indicate on which interval your incomes are placed, with 8 intervals of incomes. This variable has been standardised by household size, and the original 5 intervals were collapsed in the individual level due to the low number of cases in the highest incomes: less than 360€, 360-600€ and more than 600€.

Statistical analysis

Multiple logistic regression models were fitted in order to calculate adjusted odds ratios (aOR) and 95% confidence intervals (CI). Models were separated by the type of mother and occupational social class, adjusted for age and weighted. Evaluating the available socioeconomic variables, occupational social class was selected to perform our analysis for the following reasons. The difficulties in constructing a poverty rate based on the income intervals available in the dataset led to the decision to use another socio-economic variable. Working status was discarded, as it was expected that it would be misleading, due to the fact that Spanish lone mothers, in contrast to the Swedish and British cases, have higher occupation rates than mothers with a partner. Also, the ambivalence of the association between health outcomes and employment status, especially among women with higher family burdens, could lead to multiple and perhaps contradictory interpretations. Finally, in the Spanish context educational attainment is not a guarantee for achieving a good job position and corresponding income for women with children in Spain, being overqualification a serious problem of the labour force [27]. Therefore, occupational social class was expected to give a more realistic vision of the resources and social position of Spanish mothers. A correlation test between these socioeconomic variables was carried out, and being proved that occupational social class correlated to these variables in the expected way, the decision to use the dichotomized

[5] When considering social class, only 1.54% of women could not be classified.

occupational social class as the key socio-economic control variable in the analysis was taken.

Results

General description of the population

Table 1 shows the general description of the population under study. The sample is made up of 83.9% of mothers with a partner -CM from now on- (2502 cases), and 16.1% of lone mothers: 14.4% of whom are household heads –LMH from now on- (429 cases), and 1.7% non household heads –LMNH from now on- (51 cases). LMH are the oldest ones, with approximately 81% in the 35-64 age group, and LMNH are the youngest ones, with 61% in the 16-34 age group. Regarding socio-economic variables, LMNH are those with the lowest educational attainment (75% have primary or less education), followed by CM and LMH (66% and 52%, respectively). LMH have the highest percentage of University studies (30,7%). Whereas the majority of lone mothers work (67% LMH and 61% LMNH), half of the CM of the population under study are housewives and only 39% work. Most CM belong to the manual class (62%) and have an equivalized monthly income of 360-600€ (the middle category, 46%). More than half of LMH belong to the non-manual class (52%) while a lower amount than CM or LMNH are in the low income intervals. The great majority of LMNH belong to the manual class (72%) and have incomes below 360€ per month (the lowest category, 55%).

Whereas LMH present the worst health outcomes, LMNH have the worst health-related behaviours. Approximately 29% of LMH present a poor self-assessed health (followed by 26% of CM), 25% a limiting long-standing illness (followed by 22% of CM) and 41% chronic conditions (followed by 28% of CM). LMH are those who sleep less in the sample, too (9% sleep 6 or less hours a day, followed by 8% of LMNH), whereas LMNH are those who smoke and drink to a risky level the most (78% and 8%, respectively, followed by 42% and 7% of LMH, respectively).

Examining the risk of negative health outcomes and health-related behaviours associated with the type of motherhood and occupational social class

The analysis shows no significant differences in the prevalence of poor health outcomes between the type of mothers when examined as a whole. However, some differences emerge regarding their health-related behaviours. LMH are more likely to report sleeping 6 or less hours a day (aOR=1.45; 95% CI=1.00-2.10), and LMNH are more likely to report smoking and drinking to a risky level (aOR=5.20; 95% CI=2.65-10.23 and aOR=4.09; 95% CI=1.25-13.30, respectively) followed by LMH (aOR=1.45; 95% CI=1.17-1.79 and aOR=2.11; 95% CI=1.24-3.58, respectively) (Table 2, third column).

On the other hand, when considering all mothers in the sample by social class, prevalence of poor health outcomes and poor health-related behaviours are significantly higher among manual class mothers in two of the three health outcomes and two of the three health-related behaviours. Manual class mothers present a higher risk of poor self-assessed health (aOR=1.90; 95% CI=1.59-2.27), a limiting long-standing illness (aOR=1.30; 95% CI=1.08-1.56), sleeping 6 or less hours a day (aOR=2.56; 95% CI=1.80-3.63) and smoking (aOR=1.46; 95% CI=1.24-1.70) compared to non-manual class mothers. Manual class mothers, however, are less likely to present chronic conditions (aOR=0.72; 95% CI=0.61-0.84) and to drink to a risky level (aOR=0.54; 95% CI=0.35-0.85) compared to non-manual class mothers (Table 3, third column).

Much more differences emerge between mothers when interacting the type of motherhood with social class. Examining health inequalities between types of mother within each social class, manual class LMH present the highest risk of having a poor self-assessed health (aOR=1.58; 95% CI=1.16-2.15), a limiting long-standing illness (aOR=1.53; 95% CI=1.11-2.12) and of sleeping 6 or less hours a day (aOR=1.75; 95% CI=1.12-2.74) compared to manual class CM. Among non-manual class mothers, only the prevalence of smoking is significant and much higher among LMNH (aOR=8.42; 95% CI=2.37-29.83) compared to non-manual class CM (Table 2, first and second columns).

On the other hand, examining health inequalities between social classes within each type of mother, the higher prevalences of poor health outcomes and poor health-related behaviours among manual class LMH emerge more clearly. Manual class LMH present a higher risk of having a poor self-assessed health (aOR=3.57; 95% CI=2.26-5.63), a limiting long-standing illness (aOR=2.03; 95% CI=1.29-3.18), of sleeping 6 or less hours a day (aOR=3.17; 95% CI=1.51-6.64) and of smoking (aOR=1.66; 95% CI=1.12-2.46) compared to the non-manual class LMH. Also, manual class CM have a lower risk of having any chronic condition (aOR=0.71; 95% CI=0.60-0.85) and of drinking to a risky level (aOR=0.55; 95% CI=0.32-0.94) compared to non-manual class CM (Table 3, first and second columns).

Discussion

This study has analyzed health and health-related behaviours of lone mothers in Spain compared to these of mothers with a couple, filling a gap in the literature about this issue in the Spanish context. What is more, and in contrast with other studies carried out about lone mothers, in this paper two types of lone mothers have been considered: lone mothers who are household heads and lone mothers who are not household heads. This decision was taken in order to provide a more realistic view of the Spanish society, where familism can act as a buffer to poor health among lone mothers that live with their parents or other supporters.

Similar to the results found in other studies, lone mothers presented worse health-related behaviours than mothers with a partner [8][9][11]. Lone mothers who were household heads were more likely to report sleeping 6 or less hours a day, whereas lone mothers who were non-household heads were more likely to report smoking and drinking to a risky level. In the British and Swedish case studies [12], lone mothers had significantly poorer health than couple mothers for all the health indicators considered and these differences remained constant over the study period. Lone mothers presented between 61 and 74% greater risk of fair/poor health than couple mothers in Britain, and between 39 and 92% greater risk in Sweden. On the contrary, in the Spanish case this paper shows that there are not great differences in health outcomes between lone and couple mothers taken as a whole, due to the strong impact of social class, and the different socioeconomic features of each group of mothers.

Aware of the different social class structures of each type of mother in Spain, this study went a step further searching for health inequalities by interacting the type of motherhood with social class. This new approach allowed the detection of specific subgroups in a vulnerable situation regarding health and health-related behaviours. Manual class lone mothers who were household heads presented a higher risk of having a poor self-assessed health, a limiting long-standing illness and of smoking, compared to non-manual lone mothers who were non-household heads and also to manual class couple mothers. On the other hand, among non-manual class mothers, smoking was much higher among lone mothers who were not household heads compared to the non-manual couple mothers.

These findings can be explained through the theoretical framework guiding the study (Figure 1), in the sense that the specific policies available at each entry point, in combination with the different resources of Spanish mothers, can explain the health inequalities found in the study. The main health inequalities found and the relation with the Spanish policy context are the following:

Health Inequality 1: Small differences between all lone mothers and all mothers with a partner, although lone mothers are slightly worse off. This constituted one of the first findings in the preliminary analysis, and is reflected in the small differences between LMH and CM health outcomes. Policy is affecting through entry point B, determining an overrepresentation of lone mothers in the higher socio-economic positions. In fact, whereas of all manual occupational class mothers only 13.3% were lone mothers, 19.7% of non manual class mothers were raising their children alone.

The lack of policies supporting women with family responsibilities leads to a greater economic dependence on their partner. For example, the very limited social housing in Spain constitutes a barrier for women with less socio-economic resources to leave their partner, as possibilities of affording to acquire and run a separate household are few. Therefore, as women who are lone mothers come more from higher socio-economic positions than mothers with a partner, and as the policy context is failing to promote economic independence to women with less socio-economic resources, then health inequalities between all lone mothers and all mothers with a partner aren't as sharp as would be expected. The existing inequalities are explained by the limited coverage and generosity of supporting policies that do not reduce the differential risks of mothers with and without a partner (entry point C).

Health Inequality 2: Inequalities between LMH and LMNH are due in first place to the age distribution. Despite lower socio-economic positions of LMNH, their health is better due to the younger age, whereas their health-related behaviours are worse. LMH present worse outcomes due to the lack of public support reducing vulnerability (policy entry point C), and the higher risk as they are in charge of maintaining the household, whereas LMNH receive the support of other household members. The policy context also influences lone mothers' possibilities to constitute a separate household (policy entry point B); more lower socio-economic positioned mothers live at the home of another supporter as only mothers with more socio-economic resources can cover the risks of being a household head without a partner. Among manual class mothers, 2% are LMNH, compared to 1% of non manual class mothers.

Health Inequality 3 and 4: Large differences between lone mothers of different socio-economic positions (especially LMH), and large differences between mothers with a partner of different socio-economic positions. These inequalities are the two sides of the same coin: due to the insufficient family support policies for all mothers, the effect of ones socio-economic positions and resources is key to determine health inequalities, independently of the family model. Higher socio-economic families cover the needs associated with bringing up children with their own resources: higher incomes enable them to afford their own housing, goods and childcare, which then again favours the employment of mothers under less health risky conditions. Policy fails to reduce the risks for lone mothers with scarce resources who experience a precarious situation, overburdened with work and family responsibilities (entry point C), and therefore explains their bad health outcomes compared to non manual class LMH.

Health Inequalities 5 and 6: Large differences between lone and couple mothers of lower socio-economic positions, in contrast to **small or inexistent inequalities between lone and couple mothers with more socio-economic resources**. These inequalities became evident comparing health and health-related behaviour outcomes of different types of mothers within each social occupational class. In the non manual class, being a lone mother is only significantly associated with smoking, whereas being a lone mother in the manual class implies higher risks of poor outcomes in almost all the health and health-related variables. Policy is again affecting health outcomes through entry point C, as it is not reducing the risks that mothers without socio-economic resources suffer when they lack the support of a partner.

Redistributive and welfare policies such as income maintenance, education and training, social housing, promoting female employment and conciliation of labour and family lives, can help to reduce the unequal private resources each woman has, which then affect her maternity. Once a mother, supportive policies for mothers and children (child allowances, maternity leaves, affordable childcare, flexible time-tables, promotion of employment of mothers) can then influence the woman’s family model. The same policies can also help to reduce the vulnerability of each mother towards health risks, providing on the one hand economical aid and housing for unemployed mothers without resources (and in a medium term improve their opportunities to become self sufficient), and on the other, services and better labour conditions for working mothers. Then, they can develop support for mothers with health problems, such as home help, childcare, income support, or employment protection, avoiding further social consequences for these families.

In Sweden, socio-economic conditions such as joblessness and poverty did not explain health inequalities between lone and mothers with a partner [12]. This country has one of the highest social protection levels of the EU, with a well developed support system to all families. This reduces the impact of being unemployed or lacking income on health regardless of the family model and also without restricting the establishment of more plural family models in the society. Due to the underdevelopment of Spanish public policies oriented to this population in comparison to other countries such as Sweden and the United Kingdom, an effect of the policy context is that mothers with low socioeconomic resources are restrained when determining their family model. Under this circumstance, theories which relate lone motherhood and situations of poverty and social exclusion do not apply to the Spanish context; quite the opposite.

Therefore, rather than the family model per se, what seems to explain health inequalities between mothers in Spain is their socioeconomic position. Moreover, these inequalities are not only between lone mothers and mothers with a partner, which could be explained by the lack of a partner, but inside each category and related to their socio-economic condition. Specific groups of lone mothers are effectively presenting worse health and health-related behaviours outcomes. Remarkable differential prevalences of poor health conditions for manual occupational class lone mothers appear, which could lead to further social stratification, affecting the future opportunities and conditions of these mothers and their descendents. This evidence should serve as a warning of the risks these women are suffering, which recommends the promotion of public policies supporting lone mothers and preventing bad health among them, and also favouring socioeconomic opportunities. In such a context, supportive public policies would make it possible for ones' socioeconomic position and private resources not to be key in determining health conditions.

One of the limitations of this study is based in its cross-sectional design, which prevents us from determining the causal direction. As a consequence, a selection bias may exist, that is, the selection of mothers in a socio-economic position because of their health. To unravel the impact of social selection, longitudinal data would be needed in order to measure both the independent and dependent variables over time. In a context where this kind of data is scarce, other approaches can be useful to perform a deep analysis discovering specific risks and needs. In this line, the results found in this study have an intrinsic value despite their cross-sectional nature, showing the importance of considering socio-economic positions. In order to have a full view of health inequalities among mothers in Spain or other contexts where the Welfare State is underdeveloped in general or specifically regarding family support, considering socio-economic resources in research is a key factor.

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Figure 1. Explaining Health Inequalities of Lone Mothers and Mothers with a partner in Spain.

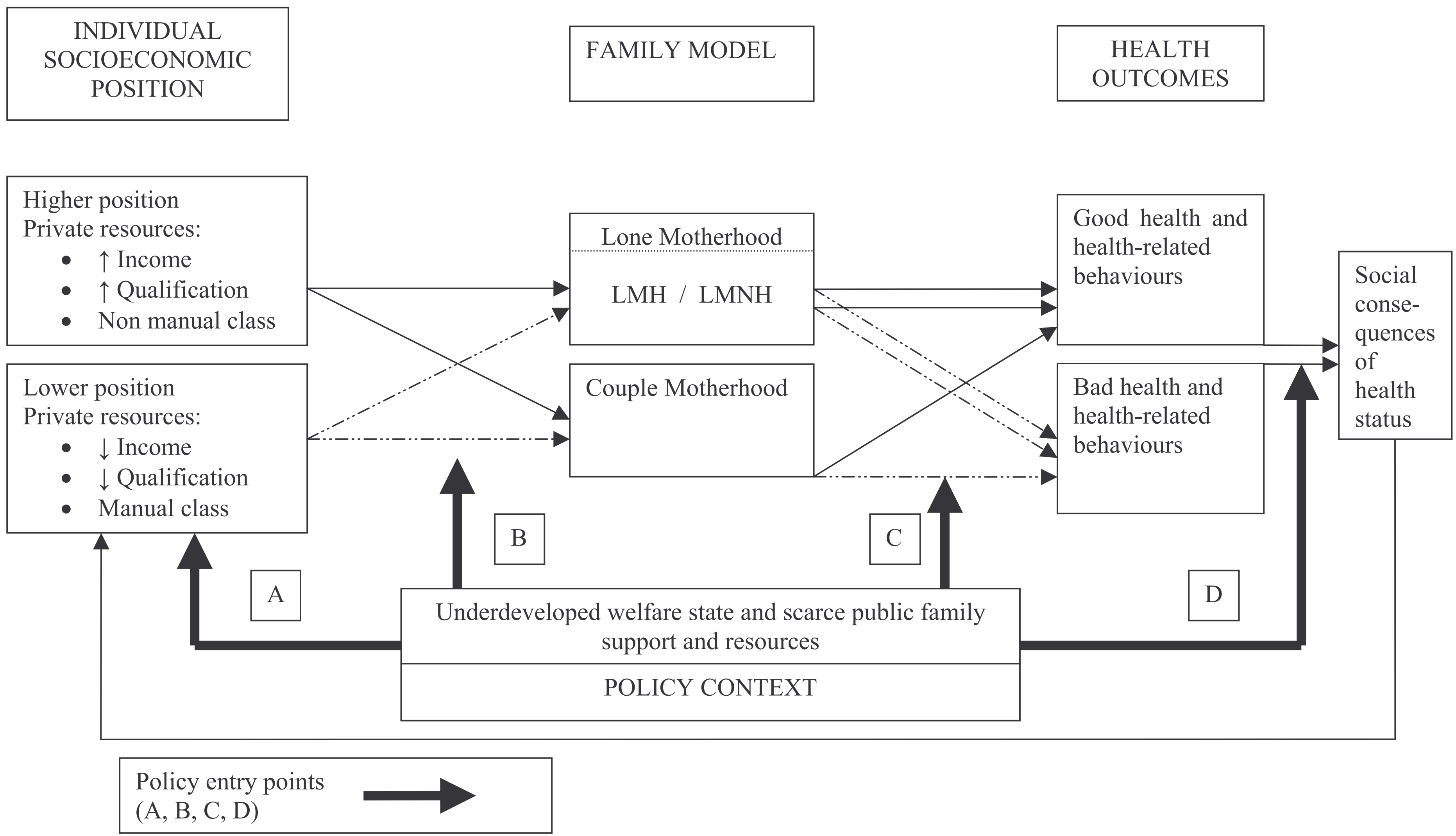

Table 1. General description of the population (in percentages) by type of mother. Weighted results. Spanish National Health Survey, 2003.

	Mothers with a partner (n = 2502)	*Lone mothers household heads (n = 429)*	*Lone mothers non-household heads (n= 51)*	p-values
Age groups				<0.001
• 16-34	28.1	19.4	60.8	
• 35-64	71.9	80.6	39.2	
Educational attainment				<0.001
• Without studies	6.4	5.8	5.7	
• Primary	59.2	46.1	69.2	
• Secondary	18.4	17.2	17.3	
• University	15.9	30.7	7.7	
Employment status				<0.001
• Working	39.4	67.9	60.8	
• Unemployed	8.9	10.9	21.5	
• Retired	0.8	7.2	0.0	
• Studying	0.3	1.6	5.9	
• Housewife	50.0	11.4	11.7	
• Others	0.5	0.7	0.0	
Occupational social class				<0.001
• Non-manual	37.9	52.2	27.5	
• Manual	62.1	47.8	72.5	
Equivalised monthly income in intervals				<0.001
• Less than 360€	34.9	26.4	54.9	
• 360-600€	46.3	52.3	31.4	
• More than 600€	18.8	21.2	13.7	
Poor self-assessed health	26.4	28.7	15.7	0.140
Limiting long-standing illness	21.8	25.4	11.7	0.027
Chronic conditions	37.8	40.8	25.5	0.109
Sleeping 6 or less hours	6.0	9.1	7.8	0.073
Smoking	35.4	42.6	78.4	0.697
Drinking to a risky level	3.4	7.2	7.9	0.028

Table 2. Health inequalities between types of mother within each social class. Prevalence rates, odds ratios (OR) and 95% confidence intervals (CI) comparing health outcomes of lone mothers to mothers with a partner (16-64) by occupational social class, adjusted by age. Weighted results. Spanish National Health Survey, 2003.

	Non-manuals (n=1176)		*Manuals* (n=1786)		*All classes* (n=2982)	
	%	aOR (95% CI)	%	aOR (95% CI)	%	aOR (95% CI)
Poor self-assessed health						
• Mothers with a partner (ref.)	20.9	1	29.5	1	26.4	1
• Lone mothers household heads	17.2	0.74 (0.50-1.09)	42.3	1.58 (1.16-2.15)**	28.7	1.04 (0.82-1.31)
• Lone mothers non-household heads	0.6	0.03 (0.00-16.14)	20.3	0.91 (0.40-2.08)	15.7	0.67 (0.30-1.48)
Limiting long-standing illness						
• Mothers with a partner (ref.)	20.2	1	22.6	1	21.8	1
• Lone mothers household heads	19.1	0.91 (0.63-1.33)	32.5	1.53 (1.11-2.12)**	25.4	1.15 (0.91-1.47)
• Lone mothers non-household heads	0.0	0.00 (0.00-893.8)	17.0	0.91 (0.38-2.20)	11.7	0.61 (0.26-1.44)
Chronic conditions						
• Mothers with a partner (ref.)	34.1	1	39.9	1	37.8	1
• Lone mothers household heads	37.7	0.91 (0.66-1.25)	44.1	0.97 (0.71-1.32)	40.8	0.98 (0.79-1.22)
• Lone mothers non-household heads	19.0	1.81 (0.46-7.11)	28.6	0.95 (0.45-2.01)	25.5	1.09 (0.57-2.09)
Sleeping 6 or less hours						
• Mothers with a partner (ref.)	3.2	1	7.8	1	6.0	1
• Lone mothers household heads	4.8	1.47 (0.71-3.01)	14.0	1.75 (1.12-2.74)*	9.1	1.45 (1.00-2.10)*
• Lone mothers non-household heads	11.9	4.63 (0.87-24.46)	5.9	1.09 (0.27-4.42)	7.8	1.72 (0.59-4.99)
Smoking						
• Mothers with a partner (ref.)	29.5	1	39.2	1	35.4	1
• Lone mothers household heads	37.3	1.42 (1.04-1.93)*	49.4	1.73 (1.27-2.34)***	42.6	1.45 (1.17-1.79)**
• Lone mothers non-household heads	77.9	8.42 (2.37-29.83)**	78.2	3.85 (1.73-8.58)**	78.4	5.20 (2.65-10.23)***
Drinking to a risky level						
• Mothers with a partner (ref.)	4.8	1	2.6	1	3.4	1
• Lone mothers household heads	9.5	2.00 (0.99-4.05)	5.8	2.09 (0.93-4.67)	7.2	2.11 (1.24-3.58)**
• Lone mothers non-household heads	16.9	4.80 (0.86-26.83)	6.1	3.92 (0.75-20.54)	7.9	4.09 (1.25-13.30)*

* p<0.05; ** p<0.01; ***p<0.001

Table 3. Health inequalities between social classes within each type of mother. Prevalence rates, odds ratios (OR) and 95% confidence intervals (CI) comparing health outcomes of lone mothers to mothers with a partner (16-64) by occupational social class, adjusted by age. Weighted results. Spanish National Health Survey, 2003.

	Couple mothers (n=2502)		*Lone mothers household heads* (n=429)		*Lone mothers non-household heads* (n=51)		*All mothers* (n=2982)	
	%	aOR (95% CI)	%	aOR (95% CI)	%	aOR (95% CI)	%	aOR (95% CI)
Poor self-assessed health								
• Non-manual (ref.)	20.9	1	17.2	1	0.6	1	20.0	1
• Manual	29.5	1.68 (1.38-2.04)***	42.3	3.57 (2.26-5.63)***	20.3	33.48 (0.04-24511,4)	30.8	1.90 (1.59-2.27)***
Limiting long-standing illness								
• Non manual (ref.)	20.2	1	19.1	1	0.0	1	19.7	1
• Manual	22.6	1.19 (0.98-1.46)	32.5	2.03 (1.29-3.18)**	17.0	4202.5 (0.00-152400)	23.6	1.30 (1.08-1.56)**
Chronic conditions								
• Non manual (ref.)	34.1	1	37.7	1	19.0	1	34.6	1
• Manual	39.9	0.71 (0.60-0.85)***	44.1	0.77 (0.51-1.15)	28.6	0.35 (0.06-2.02)	40.1	0.72 (0.61-0.84)***
Sleeping 6 or less hours								
• Non manual (ref.)	3.2	1	4.8	1	11.9	1	3.6	1
• Manual	7.8	2.64 (1.75-3.97)***	14.0	3.17 (1.51-6.64)**	5.9	1.51 (0.09-23.17)	8.4	2.56 (1.80-3.63)***
Smoking								
• Non manual (ref.)	29.5	1	37.3	1	77.9	1	31.5	1
• Manual	39.2	1.48 (1.24-1.76)***	49.4	1.66 (1.12-2.46)*	78.2	1.18 (0.24-5.71)	41.1	1.46 (1.24-1.70)***
Drinking to a risky level								
• Non manual (ref.)	4.8	1	9.5	1	16.9	1	3.6	1
• Manual	2.6	0.55 (0.32-0.94)*	5.8	0.61 (0.24-1.57)	6.1	1.22 (0.06-22.54)	2.2	0.54 (0.35-0.85)**

* p<0.05; ** p<0.01; ***p<0.001

Part IV

Health related behaviours: smoking

Chapter 18

Identification of socio-economic groups at increased risk of smoking in European countries: looking beyond educational level

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Abstract

Background

Educational level is most often used to identify social groups with increased prevalence of smoking. Other indicators of socioeconomic position (SEP) might however be equally or even more discriminatory. This study examines to what extent smoking behaviour is related to other socioeconomic indicators in addition to educational level.

Methods

Data were derived from the European Household Panel. We selected data for 45 765 respondents aged 25-60 years from 9 European countries. The association between six different SEP indicators and smoking prevalence was examined using Prevalence Rate Ratios (RR) estimated through log linear regression analyses.

Results

In univariate analyses, most selected SEP indicators were associated with smoking. In multivariate analyses, educational level, occupational class, accumulated wealth (measured by household assets) and housing tenure retained independent effects on smoking (RR's about 1.20). The effects observed for activity status and household income were small and insignificant in nearly all populations. In northern Europe, educational level had the greatest predictive value in the younger age groups; occupational class and housing tenure predicted most of smoking prevalence in the older age groups. The results showed a less pronounced and more varied pattern in southern Europe.

Conclusions

Our results indicate that smoking prevalence is not only related to educational level but also to occupational class and measures of accumulated wealth (other than income). These measures should be used in addition to educational level to identify groups at increased risk of smoking.

Introduction

Due to higher initiation rates and lower cessation rates, smoking prevalence is higher among lower socioeconomic groups compared to higher socioeconomic groups in most European countries. Lower socioeconomic groups do also smoke more cigarettes per day on average and are more susceptible to nicotine addiction. The inequalities in smoking are somewhat more pronounced in northern Europe than in southern Europe, as a consequence of a more advanced evolvement of the smoking epidemic in northern European countries. [1, 2] To tackle the inequalities in smoking prevalence, interventions and policies should be targeted at groups with an increased risk of high smoking prevalence. Identification of risk groups is therefore important for effective interventions and policies.

Educational level is most often used to distinguish between socioeconomic groups. Recently we reviewed 70 studies in the field of socioeconomic inequalities in smoking and 58 of these studies used educational level as the socioeconomic indicator. Socioeconomic position (SEP) however, is not determined by educational level only. Different socioeconomic indicators reflect one’s position in the socioeconomic hierarchy, but have specific characteristics that may relate to different pathways through which SEP influences smoking, and are therefore not interchangeable when studying socioeconomic inequalities in health. [3] Educational level for example reflects knowledge and cognitive skills, while occupational class determines most of all someone’s working circumstances and social environment during working hours. Income, accumulated wealth and housing tenure are indicators of financial and material situation. One may question whether educational level is the SEP indicator most strongly related to smoking or whether other indicators are as important as educational level to identify groups at risk.

Several studies found that educational level showed the largest differences in smoking prevalence compared to other SEP indicators including income and occupational class. [1, 4-9] Other studies found also strong associations between smoking and occupational class, accumulated wealth and housing tenure. [10-13] A study performed by Laaksonen [14] not only found that smoking was associated with other SEP indicators than educational level, but also found that housing tenure and economic satisfaction showed the largest differences in smoking in multivariate analyses. It is uncertain though, whether these results of this Finnish study can be generalized to other countries. The smoking epidemic evolved differently in European countries, and different socio-economic indicators might be associated with smoking inequalities at the different stages of the epidemic. Furthermore, countries differ in terms of social stratification and smoking-related factors (e.g. attitudes towards smoking by women, tobacco control policies). Results from a country-specific study might therefore not be applicable to other countries.

The aim of this study was to examine to what extent smoking behaviour is related to other socioeconomic indicators than educational level. We analysed a pooled population of nine countries using data from the European Community Household Panel (ECHP). Because of the large sample size (N=45 765) we were able to look at differences between sexes, regions and age groups in the impact of the different SEP indicators on smoking. Educational level, for example, might possibly be the most important indicator of SEP among young adults. Accumulated wealth, on the other hand, is likely to be more important among adults aged 40-60 years.

In this study we addressed the following research questions: 1) Does smoking prevalence differ substantially between groups distinguished by educational level, activity status, occupational class, household income, accumulated wealth and housing tenure?; 2) Do these associations persist in multivariate analyses, i.e. after control for other socioeconomic indicators?; And 3) how large is the predictive value of other SEP indicators over and above educational level in the relationship to smoking?

Methods

Study population

Data from the ECHP, an annual longitudinal social survey designed for the member states of the European Union, were studied. The survey used a uniform random sampling design, targeting the national household population of countries, using common blueprint questionnaires. The data collection was carried out in most countries by paper-and-pencil interviewing, but in Portugal and Greece by computer-assisted personal interviewing. The ECHP is further discussed in an extensive descriptive article of the design and procedures. [15]

We used data from the fifth wave of the survey, which was the first wave that included data on smoking, conducted in 1998. Nine countries included information on smoking and were included in this study. Because the smoking epidemic is more advanced in northern than in southern European countries resulting in different patterns in socioeconomic inequalities in smoking, we distinguished in the analyses between these two geographical regions. Finland, Denmark, Ireland, Belgium and Austria were defined as northern European countries, whereas Spain, Portugal, Italy and Greece were classified as southern European countries. Data from 45 765 respondents, aged 25-60 years, were included in the analyses. There were 22 528 (49,2%) males and 23 237 (50,8%) females, with more respondents from southern European countries (65%) than from the northern European countries (35%). The response percentages at the start of the survey (wave 1) differed from 91% in Italy to 56% in Ireland. Also the attrition over the follow-up periods (from wave 1 until wave 5) largely differed between countries. Especially Ireland (36%), Denmark (29%), Austria (26%) and Spain (23%) had high attrition percentages. The ECHP deals with non-response and attrition by providing weights for the respondents. Non-response and attrition in the ECHP data set is discussed more in detail elsewhere. [1, 15, 16]

Measures

Smoking status was self-reported using the question ‘Do you smoke or did you ever smoke?’ with the response categories of 1) *smoke daily*, 2*) smoke occasionally*, 3) *do not smoke, but used to smoke*, 4) *do not smoke, used to smoke occasionally* and 5) *never smoked*. Respondents were categorized as either ‘current daily smoker’ or ‘non-smoker’. Occasional smokers were classified as ‘non-smoker’, because important differences in both health consequences and in social gradients exist between occasional smokers and daily smokers. [17]. Furthermore, the number of occasional smokers was very small in our sample and did not have a large effect on our results (results not shown).

Table 1 shows the socioeconomic indicators and their distribution in the study sample by age, sex and region. Socioeconomic position was measured by six indicators: educational level, activity status, occupational class, household income, accumulated wealth and housing tenure.

Educational level represents the highest level of completed education of the respondent. The level of education was initially classified according to national categories, which were subsequently reclassified into three levels of education (1 = low, 2 = middle, 3 = high), approximately corresponding with the following levels of the International Standard Classification of Education (ISCED): low: ISCED 0–2 (pre-primary, primary, and lower secondary education), middle: ISCED 3 (upper secondary education), and high: ISCED 4–6 (post-secondary education).

Activity status defines whether a respondent was at the time of the survey economically active or inactive (e.g. unemployed, work disabled, housewife, pensioner).

Using a prototype of the new European Socioeconomic Classification (ESEC), we assigned respondents to one of the nine occupational classes. Occupational class was based on the occupation of the household member with the ‘dominant’ ESEC class. In selecting the dominant class, class 1 was considered to be dominant over class 2, 2 over 5, 5 over 4, 4 over 3, 3 over 6, 6 over 7, 7 over 8 and 8 over 9. [18] ESEC class is determined using information on economic activity status, status in employment (employee, self-employed, supervisor yes/no, establishment size) and occupational title (2-digit code of the International Standard Classification of Occupations). More information about the conceptual framework and derivation of the ESEC classification system can be found elsewhere. [18]

Household equivalent income was computed as the net monthly household income divided by the square root of the household size (number of persons living in a household). The study sample was divided into quintiles based on their household equivalent income.

The measure accumulated wealth derived from 13 items of living conditions of the household from the Current Life-Style Deprivation index (CLSD).[19] Five items (car, colour TV, video recorder, micro-wave, dishwasher, telephone) took the form of ‘possessed/availed of’. Only if absence was stated to be due to lack of resources, it was scored as positive on the deprivation scale. Six items took the form of one yes/no question ‘can you just check whether your household can afford these if you want them’ (e.g. keeping home warm, new clothes, eating meat/fish every second day). One item related to debts. The CLSD index is the addition of these 13 items. In the index, each item is weighted by the proportion of households possessing that item in each country. Thus, not being able to afford a car, for example, will contribute more to the deprivation index in a society where most people own a car than in a society wherein hardly anybody can afford a car.

The last socioeconomic indicator, housing tenure, was divided into two categories: owner-occupiers and tenants.

Statistical analyses

First, age-standardized smoking prevalence rates were calculated according to each socioeconomic indicator. The direct method of age standardization was used with the European standard population of 1995 as the standard population structure.

In the next step, using regression analysis, we examined the associations of the different SEP indicators with smoking status. Prevalence rate ratios (RR) and their 95% confidence intervals (C.I.) were estimated with log linear regression with binominal error.[20, 21] For each indicator, rate ratios were calculated in both univariate and multivariate analyses. In univariate analyses the association between smoking prevalence and one single SEP indicator was assessed. In the multivariate analyses, the six indicators were simultaneously included in the model with smoking status as the dependent variable. Previous studies on international patterns of smoking found strong and significant interactions by country, sex and age. [1, 2, 22, 23] These interactions were also observed in our data. Therefore, all analyses were adjusted for the interactions terms of age*sex, age*country and sex*country.

To study the additional predictive value of each socioeconomic indicator in addition to educational level, we performed logistic regression analysis. We constructed a multivariate model wherein we first controlled for age and educational level. With the stepwise method we included the other SEP indicators one after another. The order in which the indicators were added to the model was based on the order in which SEP indicators are shaped during lifetime: first educational level, then activity status, occupational class, income, and finally accumulated wealth and housing tenure. The Nagelkerke R-square was used to assess the percent variance explained by the independent variables.

All analyses were performed separately for men and women, the two geographical regions and two age groups. We limited our analyses to the adult population aged 25-39 yrs and 40-60 yrs. We made this distinction because we hypothesized, following the life-course perspective, that the predictive value of socio-economic indicators would change with increasing age. Educational level might be most strongly associated with smoking among the younger adults (25-39 yrs), whereas accumulated wealth might become more important in relation to smoking when people get older.

Results

Table 2 reports higher smoking rates among the lower socioeconomic groups in comparison with the higher socioeconomic group, for all SEP indicators and in each subpopulation. Only among women aged 40-60 years in southern Europe a different pattern was found, where older women in the highest socioeconomic group smoked more than those in the lowest socioeconomic group.

In univariate analyses all socioeconomic indicators, except activity status, were significantly associated with current smoking (table 3). Educational level, occupational class and accumulated wealth showed the largest differences in smoking prevalence (RR=1.38; RR=1.34; RR=1.29). In multivariate analyses, the associations of activity status (RR=0.95) and income (RR=0.95) with smoking substantially attenuated. Occupational class, housing tenure and accumulated wealth retained significant associations with smoking, although the differences between the highest and the lowest category also attenuated for these indicators. Accumulated wealth showed the largest differences between higher and lower socioeconomic position in the multivariate analyses (RR=1.26).

For northern Europe, the association of the different socioeconomic indicators with smoking was consistent for both men and women and for both age groups (table 4). In the univariate analyses, all indicators had significant associations with smoking. In the multivariate analyses, activity status did no longer show differences in smoking among women. Neither did income show differences for older men (i.e. 40-60 years) and for women in both age groups. Educational level showed the largest differences in smoking in multivariate analyses in the youngest (i.e. 25-39 years) age group (RRmale=1.46, RRfemale=1.92). In the older age group occupational class displayed the largest inequalities in smoking in men (RR=1.43) and housing tenure in women (RR=1.57).

The results for southern Europe were less pronounced and differed by sex and age. (See table 4) Young men in southern European countries showed a similar pattern as in northern Europe; educational level was the indicator revealing the largest differences in smoking prevalence in both univariate and multivariate analyses (RRuni=1.57, RRmulti=1.24). In multivariate analyses, accumulated wealth showed equally large difference in smoking (RRmulti=1.24). For older men only accumulated wealth (RR=1.22) and housing tenure (R=1.09) remained significant in multivariate analyses. For young women educational level (RR=0.86) and occupational class (RR=1.19) showed both significant associations in multivariate analyses, but in opposite directions. The results for older aged women in southern Europe showed a reversed pattern for all indicators except housing tenure. In multivariate analyses only educational level, income and housing tenure retained significant effects in opposite directions (RR=0.67; RR=0.81; RR=1.16).

The bars in figure 1a represent the individual-level variance in smoking explained by SEP indicators. In northern Europe occupational class had, besides educational level, a substantial additional predictive value in all subgroups. Housing tenure and accumulated wealth also contributed to the prediction of individual-level socioeconomic variation in smoking in northern Europe. Income and activity status however did not make substantial contributions. Educational level explained most of the variance in smoking prevalence in the younger populations, whereas occupational class and housing tenure explained most of the variance in the older age group.

In southern Europe (see figure 1b), the socioeconomic indicators explained less of the variance in smoking than in northern Europe, especially among older men and younger women. Educational level explained most of the socioeconomic variance in smoking among young men and older women in southern Europe. Accumulated wealth explained most of the socioeconomic variance in smoking among older aged men, as did occupational class among young women. Remarkably, educational level had no substantial additional predictive value in these populations.

Discussion

Summary

In multivariate analyses educational level, occupational class, housing tenure and accumulated wealth retained significant associations with smoking in most subgroups. Income and activity status were not independently related to smoking. In northern Europe educational level had the greatest predictive value in the younger populations, while occupational class and housing tenure were the strongest predictors in the older age groups. The results showed a less pronounced and more varied pattern in southern Europe. Educational level was important in the association with smoking for younger men and women in the older age group. Among older men, accumulated wealth predicted most of the SEP variance in smoking, as did occupational class among young women.

Evaluation of data

It should be noted that the non-response and attrition percentages were relatively high in some countries. Non-response and attrition could have biased our study results if one of the socioeconomic groups would be underrepresented. However, Eurostat concluded in two evaluation studies that the effects of non-response on the cross-sectional representativeness of the initial wave of the ECHP were small.[15] Watson showed that attrition was only weakly correlated with educational level in the ECHP data. [16] Several other studies concluded that even when non-response is related to socio-economic status, the association between smoking and socio-economic status did not greatly differ among non-respondents compared to respondents. [24, 25] Furthermore, non-response and attrition could only explain our results if the non-response and attrition percentages would largely differ among groups identified by different SEP indicators (e.g. high non-response among low income groups, but not among low educational groups). Although we do not consider it likely that non-response and attrition would be very differently related to the different SEP indicators, we cannot exclude the possibility that non-response bias is somewhat larger in relationship to education than to, say, income.

Another remark that should be made relates to the measurement of occupational class. In the ECHP data, only 200 occupations were distinguished. This may have led to less clear distinctions between the different occupational classes and to misclassification in a large number of cases. As a consequence, smoking differences between nearby occupational classes might have been underestimated. However, this misclassification would probably not greatly affect the difference between the highest versus the lowest occupational classes. In addition, this problem cannot explain our key result of occupational class as being an important, independent predictor of smoking.

The inactive group of the variable activity status is heterogeneous. We recognise that large variations in smoking prevalence might perhaps have been observed between specific groups of economically inactive people. At the same time, we wish to stress that with the variable activity status we aimed to simply distinguish between those who were active on the labour market and those who were not. We did not intend to use activity status as a proxy measure of poverty, because other variables were available to measure poverty more directly.

Unfortunately, our data did not include information on socio-economic position in early life. Other studies indicate that smoking is also related to socioeconomic position in early life, although the associations are generally weaker than the associations of smoking with adult socioeconomic position. [7, 26, 27]

Comparison with other studies

Our results are consistent with findings of some other studies on the association of different SEP indicators with smoking behaviour. Most studies also emphasized the relevance of other SEP indicators than only educational level in the relation of SEP with smoking. [10, 14, 28, 29] An Australian study also found that all SEP indicators (educational level, occupational class, housing tenure and socioeconomic disadvantage), except income were significantly associated with smoking. [28] A previous international overview of smoking inequalities of Huisman, wherein educational level and income were compared, concluded that both income and educational level were related with smoking, with educational level having the strongest association. [1] However, the association of smoking with income in our study disappeared when indicators as occupational class and accumulated wealth were included in the model.

Explanations

Occupational class has been found in this study to be an important measure of SEP in relation to smoking behaviour. For men in the age of 40-60 years in northern Europe it even is the indicator showing the largest differences between socioeconomic classes in multivariate analyses. Occupational class as defined in the ESEC may indicate differences between workers in working environment and social relationships at work. Studies show that social factors are important in relation to smoking and particular in relation to smoking cessation, because of its effect on attitudes, social norm and social support. [30-32] Negative working circumstances such as stress, physical job strain and less perceived influence on work – hallmarks of lower occupations – have been shown to impede successful cessation. [33]

Accumulated wealth and housing tenure are important predictors of the relationship between SEP and smoking in our study, especially among the older age group. Accumulated wealth not only reflects the current material situation, but also the financial situation over the previous years. Housing tenure is also an indicator of cumulative prosperity [14], but might as well reflect neighbourhood influences on smoking; tenants more often live in poor housing circumstances and deprived neighbourhoods than do ‘owners’. [34] It has been suggested that smoking is a way of coping with deprived living circumstances and (financial) stress. [29, 35, 36]

We found that income itself is not an independent predictor of socioeconomic variance in smoking. We observed income-related differences in smoking prevalence in univariate analyses, but these became insignificant when adjusted for accumulated wealth and housing tenure. This suggests that, although income is associated with smoking, it does not represent the broad spectrum of material deprivation as well as other measures of wealth do. Accumulated wealth and housing tenure are indicators of cumulative prosperity, whereas income measures the purchasing power and financial situation at one moment. Income measures (and derived measures such as living below poverty lines) might therefore be less adequate, compared to accumulated wealth and tenure, in measuring the association of material deprivation with smoking. [37]

In southern Europe, we found for educational level the previously documented pattern of a positive association with smoking among older women, a reversed pattern among younger men, and weak associations among older men and younger women. These patterns reflect the delayed diffusion of the smoking epidemic in southern Europe. [23, 38] The smoking epidemic model describes the diffusion of the smoking habit within societies in four stages. Higher educated men in northern European countries take the lead in the diffusion; lower educated women in southern Europe are the last to follow. The time lag between north and south Europe can be explained by differences in economical development, the delay in spread of information on health hazards of smoking in south Europe, and a closer cultural affinity between north Europe and US where social gradients in smoking changed first.

Remarkably, this “southern” pattern of educational inequalities in smoking was not observed when occupational class and accumulated wealth were used as the socioeconomic indicator. These indicators were inversely associated with smoking within almost all southern subpopulations. This indicates that, on top of the southern pattern that is observed in relationship to educational level, smoking is directly related to a poor occupational position and poor financial situation. Particularly among women aged 40-60 yrs, these two opposite patterns are observed: higher smoking prevalence rates among higher educated women, but also higher rates among those experiencing material deprivation. Among these older female generations, smoking may have been an innovative behaviour, thus explaining the positive association of smoking with educational level. On the other hand, it is also suggested that smoking is a way of coping with deprived circumstances [29, 39], which in its turn explains the inverse association of smoking with occupational class and wealth. This finding illustrates the importance of considering different socioeconomic indicators as they may reflect different pathways through which SEP influences smoking.

Implications

Many studies that have been published until now used only educational level to study the relationship of SEP with smoking. Our study showed that other SEP measures than educational level are also important in relationship to smoking, and in some populations even more important than educational level. The case of older women even showed that, as compared to educational level, measures of occupational class and accumulated wealth can be very differently related to smoking. Therefore, studies monitoring socioeconomic inequalities in smoking should preferably use more indicators than educational level alone. Especially among the older age group, occupational class, accumulated wealth and housing tenure should also be used to identify groups with an increased risk of smoking.

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Tables and figures

Table 1. Socioeconomic characteristics of the study sample by region, sex and age in percents

	Northern Europe				Southern Europe			
	Male		**Female**		**Male**		**Female**	
	25-39	40-60	25-39	40-60	25-39	40-60	25-39	40-60
Sample (N)								
Total 45 765	3364	4494	3478	4692	6965	7705	6851	8216
Education (%)								
High	25.8	22.4	33.5	22.3	17.1	13.2	20.3	9.3
Middle	54.5	43.8	46.6	38.4	33.5	20.2	35.5	16.8
Low	19.7	33.9	19.9	39.3	49.4	66.6	44.2	73.9
Activity status (%)								
Active	90.7	81.8	73.4	59.7	85.1	81.7	57.2	44.4
Inactive	9.3	18.2	26.6	40.3	14.9	18.3	42.8	55.6
Occupation (%)								
Higher salariat [1]	24.7	24.6	24.9	24.4	17.4	18.5	17.0	18.0
Lower salariat [2]	18.7	20.0	19.8	20.2	11.2	13.1	13.3	13.2
Higher white collar workers	13.9	11.7	15.8	13.7	11.1	9.4	13.0	10.6
Higher blue collar workers	4.6	4.6	3.8	4.1	3.4	3.0	3.4	2.9
Lower white collar workers	9.0	7.5	11.4	8.9	9.3	7.9	9.8	8.0
Skilled manual	6.9	6.2	4.9	5.1	13.2	11.0	10.1	10.9
Semi or non skilled manual	7.4	7.7	6.9	7.3	9.4	9.0	9.6	9.9
Farmers	7.1	8.2	5.1	7.8	5.8	7.2	4.5	7.9
Self-employed	7.6	9.4	7.5	8.5	19.1	20.1	19.4	18.6
Income (quintiles) (%)								
Highest quintile	20.2	26.4	17.6	25.0	23.0	24.0	21.4	23.6
4	21.4	23.6	19.0	23.3	22.5	22.5	21.4	21.7
3	23.6	19.2	22.6	18.9	20.4	20.1	20.4	19.7
2	21.0	16.7	22.7	17.7	17.7	17.9	19.1	17.9
Lowest quintile	13.9	14.1	18.1	15.1	16.5	15.5	18.0	17.2
Accumulated wealth (%)								
Highest quartile	53.7	59.8	50.9	58.4	23.4	26.0	24.7	24.0
3	8.8	8.3	8.9	8.5	13.1	13.4	14.0	12.9
2	22.6	18.2	23.4	18.5	31.6	30.5	30.8	30.2
Lowest quartile	14.9	13.6	16.8	14.7	31.9	30.2	30.5	32.9
Housing tenure (%)								
Owner	69.5	83.9	67.6	82.1	73.8	82.8	73.7	83.8
Tenant	30.5	16.1	32.4	17.9	26.2	17.2	26.3	16.2

[1] The term ‘higher salariat’ generally refers to managers, professionals and large employers
[2] The term ‘lower salariat’ generally refers to lower managers and professionals, and higher technicians and supervisors

Table 2. Smoking prevalence (%) by indicators of socioeconomic position

	All	Northern Europe				Southern Europe			
		Male		Female		Male		Female	
		25-39	40-60	25-39	40-60	25-39	40-60	25-39	40-60
Education									
High	30.5	28.6	24.5	18.5	17.5	40.1	45.8	34.5	34.2
Middle	37.7	42.3	35.3	32.9	26.2	48.3	48.2	34.2	34.0
Low	40.9	49.8	40.6	46.7	30.7	59.8	50.6	31.2	17.9
Activity status									
Active	35.4	39.3	32.2	28.3	23.4	52.9	49.0	33.6	24.2
Inactive	40.6	50.9	50.8	37.2	28.9	52.6	52.2	31.3	20.8
Occupation									
Higher salariat	30.8	30.0	25.4	20.3	19.2	46.5	47.3	29.7	27.9
Lower salariat	33.2	38.1	32.4	27.2	22.1	41.3	44.3	32.1	28.4
Higher white collar workers	36.9	43.7	39.0	31.9	29.5	48.1	45.0	32.5	25.7
Higher blue collar workers	39.4	43.3	45.4	40.7	24.9	55.5	45.2	38.4	21.9
Lower white collar workers	40.6	44.2	41.3	41.5	32.2	56.8	51.4	36.5	21.1
Skilled manual	42.7	53.4	47.3	44.6	34.7	60.7	54.2	31.3	15.8
Semi or non skilled manual	44.1	54.8	49.2	46.7	37.5	60.7	53.5	33.0	17.3
Farmers	26.6	32.4	24.7	14.7	11.4	53.7	44.3	21.9	9.6
Self-employed	37.2	41.5	32.5	27.6	27.8	55.1	53.0	36.9	23.7
Income (quintiles)									
Highest quintile	33.4	37.1	28.8	23.7	22.3	45.2	46.6	35.0	28.9
4	33.7	36.6	31.0	25.6	22.3	53.1	46.5	31.6	23.3
3	36.8	39.7	36.9	29.4	28.0	52.8	51.7	33.7	21.8
2	37.3	43.7	38.3	35.7	27.2	54.3	49.3	31.4	18.3
Lowest quintile	40.3	46.0	42.0	38.2	32.7	59.9	54.5	31.0	18.1
Accumulated wealth (quartiles)									
Highest quartile	32.8	35.5	31.1	24.4	22.4	44.0	44.6	32.9	27.6
3	34.2	37.2	30.8	31.1	21.2	47.8	46.3	32.6	26.1
2	37.1	43.6	37.5	32.7	28.2	51.8	48.5	33.9	20.3
Lowest quartile	44.1	53.4	47.0	46.6	38.0	61.8	55.6	31.1	19.2
Housing tenure									
Owner	33.4	35.9	31.4	25.1	22.0	50.4	48.0	32.2	22.2
Tenant	44.7	49.7	50.8	42.3	42.3	58.8	55.7	33.8	24.3

Table 3. Inequalities in smoking by socioeconomic position – Individual and adjusted Rate Ratios and confidence intervals

	Rate Ratios (95% C.I.)			
	Univariate *		Multivariate **	
Education				
High	1.00		1.00	
Middle	1.27	(1.22 - 1.32)	1.16	(1.12 - 1.21)
Low	1.38	(1.33 - 1.43)	1.19	(1.14 - 1.24)
Activity status				
Active	1.00		1.00	
Inactive	1.01	(0.98 - 1.04)	0.95	(0.92 - 0.99)
Occupation				
Higher salariat	1.00		1.00	
Lower salariat	1.07	(1.02 - 1.11)	1.02	(0.98 - 1.07)
Higher white collar workers	1.18	(1.13 - 1.23)	1.09	(1.04 - 1.14)
Higher blue collar workers	1.23	(1.15 - 1.32)	1.14	(1.07 - 1.22)
Lower white collar workers	1.28	(1.22 - 1.34)	1.15	(1.10 - 1.21)
Skilled manual	1.31	(1.26 - 1.37)	1.15	(1.09 - 1.21)
Semi or non skilled manual	1.34	(1.28 - 1.40)	1.17	(1.11 - 1.23)
Farmers	0.92	(0.86 - 0.98)	0.83	(0.77 - 0.89)
Self-employed	1.20	(1.15 - 1.25)	1.16	(1.11 - 1.14)
Income (quintiles)				
Highest quintile	1.00		1.00	
4	1.02	(0.98 - 1.05)	0.93	(0.89 - 0.96)
3	1.09	(1.06 - 1.13)	0.94	(0.91 - 0.98)
2	1.08	(1.04 - 1.12)	0.90	(0.87 - 0.94)
Lowest quintile	1.16	(1.12 - 1.20)	0.95	(0.91 - 0.99)
Accumulated wealth (quartiles)				
Highest quartile	1.00		1.00	
3	1.09	(1.04 - 1.13)	1.08	(1.04 - 1.13)
2	1.15	(1.12 - 1.19)	1.13	(1.09 - 1.16)
Lowest quartile	1.29	(1.25 - 1.33)	1.26	(1.21 - 1.30)
Housing tenure				
Owner	1.00		1.00	
Tenant	1.26	(1.23 - 1.29)	1.18	(1.15 - 1.21)

Note: Rate Ratios are adjusted for age, age*sex, age*country and sex*country
* Results from univariate analyses wherein only one socioeconomic indicator was included in the model
** Results from multivariate analyses wherein all socioeconomic indicators were simultaneously included in the model

Table 4. Inequalities in smoking by socioeconomic position – Individual and adjusted Rate Ratios by region, sex and age group

	Northern Europe				Southern Europe			
	Male		Female		Male		Female	
	25-39	40-60	25-39	40-60	25-39	40-60	25-39	40-60
Education								
RR univariate *	**1.76**	**1.72**	**2.47**	**1.72**	**1.57**	**1.21**	**1.10**	**0.63**
	(1.54-2.01)	*(1.52-1.95)*	*(2.12-2.87)*	*(1.48-1.99)*	*(1.46-1.70)*	*(1.12-1.29)*	*(1.01-1.20)*	*(0.57-0.71)*
RR multivariate **	**1.46**	**1.34**	**1.92**	**1.43**	**1.24**	1.01	**0.86**	**0.67**
	(1.25-1.70)	*(1.16-1.54)*	*(1.62-2.27)*	*(1.21-1.69)*	*(1.14-1.35)*	*(0.93-1.10)*	*(0.77-0.96)*	*(0.58-0.76)*
Activity status								
RR univariate	**1.24**	**1.51**	**1.28**	**1.16**	0.99	**1.07**	**0.87**	**0.78**
	(1.09-1.40)	*(1.36-1.66)*	*(1.15-1.42)*	*(1.05-1.29)*	*(0.92-1.05)*	*(1.01-1.14)*	*(0.81-0.93)*	*(0.72-0.84)*
RR multivariate	1.08	**1.20**	0.93	0.99	0.94	1.00	0.92	0.97
	(0.94-1.24)	*(1.06-1.34)*	*(0.83-1.05)*	*(0.88-1.10)*	*(0.83-1.05)*	*(0.88-1.10)*	*(0.88-1.02)*	*(0.89-1.06)*
Occupation								
RR univariate	**1.84**	**1.87**	**2.22**	**1.82**	**1.30**	**1.21**	1.13	**0.73**
	(1.57-2.15)	*(1.61-2.18)*	*(1.83-2.69)*	*(1.54-2.19)*	*(1.19-1.42)*	*(1.12-1.32)*	*(0.99-1.30)*	*(0.61-0.87)*
RR multivariate	**1.32**	**1.43**	**1.40**	**1.29**	**1.11**	1.06	**1.19**	0.84
	(1.11-1.58)	*(1.21-1.70)*	*(1.14-1.73)*	*(1.04-1.58)*	*(1.01-1.22)*	*(0.97-1.16)*	*(1.06-1.46)*	*(0.69-1.02)*
Income								
RR univariate	**1.23**	**1.46**	**1.68**	**1.43**	**1.31**	**1.16**	**0.88**	**0.65**
	(1.07-1.42)	*(1.28-1.66)*	*(1.41-1.99)*	*(1.23-1.67)*	*(1.22-1.40)*	*(1.08-1.24)*	*(0.78-0.97)*	*(0.57-0.74)*
RR multivariate	**0.82**	1.04	0.86	0.89	1.07	0.99	0.94	**0.81**
	(0.70-0.96)	*(0.87-1.18)*	*(0.96-1.05)*	*(0.74-1.08)*	*(0.99-1.16)*	*(0.91-1.08)*	*(0.82-1.08)*	*(0.69-0.96)*
Accumulated Wealth								
RR univariate	**1.51**	**1.50**	**1.90**	**1.71**	**1.34**	**1.24**	1.03	**0.76**
	(1.36-1.68)	*(1.36-1.66)*	*(1.69-2.15)*	*(1.53-1.92)*	*(1.25-1.43)*	*(1.17-1.32)*	*(0.94-1.12)*	*(0.69-0.85)*
RR multivariate	**1.23**	1.08	**1.41**	**1.27**	**1.24**	**1.22**	1.04	1.07
	(1.09-1.39)	*(0.96-1.22)*	*(1.22-1.62)*	*(1.10-1.46)*	*(1.15-1.33)*	*(1.13-1.33)*	*(0.93-1.16)*	*(0.94-1.20)*
Housing tenure								
RR univariate	**1.40**	**1.53**	**1.79**	**1.90**	**1.16**	**1.16**	**1.14**	**1.24**
	(1.28-1.52)	*(1.40-1.67)*	*(1.62-1.97)*	*(1.72-2.10)*	*(1.11-1.21)*	*(1.11-1.23)*	*(1.06-1.22)*	*(1.12-1.37)*
RR multivariate	**1.30**	**1.33**	**1.47**	**1.57**	**1.11**	**1.09**	1.05	**1.16**
	(1.18-1.42)	*(1.22-1.47)*	*(1.32-1.63)*	*(1.40-1.76)*	*(1.06-1.16)*	*(1.03-1.15)*	*(0.97-1.13)*	*(1.05-1.29)*

Note: **bold** = significant
* Results from univariate analyses wherein only one socioeconomic indicator was included in the model
** Results from multivariate analyses wherein all socioeconomic indicators were simultaneously included in the model

Figure 1a. Explained variance in smoking by different SEP indicators – Northern Europe

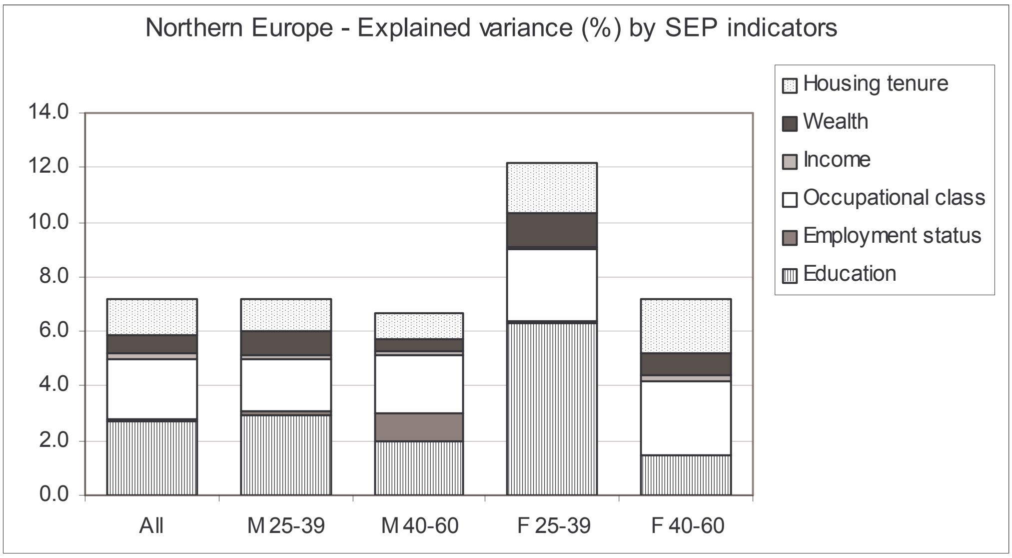
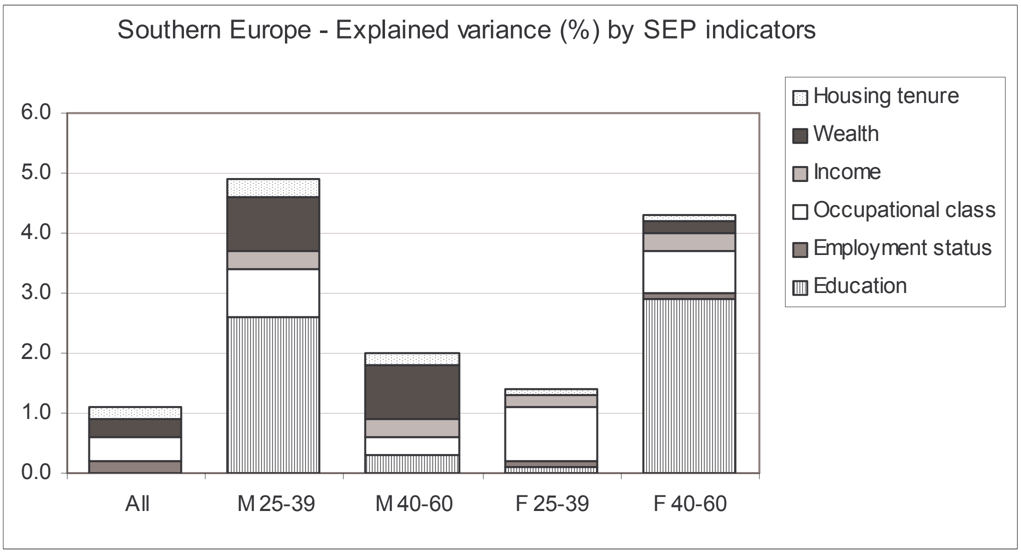


Figure 1b. Explained variance in smoking by different SEP indicators – Southern Europe



Chapter 19

Female smoking initiation by educational level in 19 European countries in relation to economic development and women's emancipation

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Abstract

Background

Large differences in ever smoking among women are found between countries and socio-economic groups. In this study we assessed whether cross-national differences in ever smoking among high and low educated women were associated with economic development and women's emancipation.

Methods

Data on smoking were derived from national health interview surveys from 19 European countries. For each country, age group (25-39, 40-59 and 60+ years) and educational level (high versus low), we calculated cumulative ever-smoking ratios as the proportion of current and former smokers of the total survey population. Relative Inequalities Indexes (RII) were estimated to measure the magnitude of educational differences. In regression analyses we explored the association of ever-smoking ratios of women age 25-39 years with GDP and the Gender Empowerment Measure.

Results

Among women age 25-39 years lower educated were more likely to have ever smoked than higher educated women in all countries except Portugal. Among women age 60+ years lower educated were less likely to have ever smoked in all countries except Norway and England. The size of inequalities varied considerably between countries and age groups. In multivariate analyses the association of ever-smoking ratios with GDP was positive and relatively strong for higher educated women. The association of ever-smoking ratios with GEM was positive for lower educated women, but negative for higher educated women. The magnitude of inequalities in ever smoking was positively related to GEM but inversely to GDP.

Conclusion

Ever-smoking ratios among women in Europe are correlated with both economic development and women's emancipation. Educational inequalities in ever-smoking ratios were larger in more emancipated societies. Lower educated women are relatively vulnerable with regards to smoking in emancipated societies; policies should specifically focus on this group.

Introduction

The habit of smoking spread rapidly in societies in the last century. The smoking epidemic model describes the diffusion of smoking in four stages. In the first stage smoking prevalence is low and mainly a habit of higher socio-economic groups. In stage 2, smoking becomes more fashionable in all socio-economic groups and prevalence rates of men peak at 50-80%. Rates among women also rise but diffusion lags 1 or 2 decades behind that of men. In the third stage, women reach their peak while prevalence rates start to decline among men, especially among higher socio-economic groups. In the final stage prevalence rates keep declining, but at the same time socio-economic inequalities in smoking prevalence increase. (1-3) In Europe the smoking epidemic started earlier in the north. Men in northern European countries took the lead in the diffusion; women in southern Europe were the last to follow. While the smoking epidemic among men is in most countries already in the final stage, the spread of smoking among women is still dynamic. Because of the delay in diffusion of smoking habit among women, large international differences in female smoking prevalence are still to be found.

It has been suggested that the delay in diffusion in southern European countries could be explained by societal factors such as economic development and a closer cultural affinity of northern Europe with the US. (1) In the case of female smoking, factors related to women's emancipation and social-cultural factors might also play an important role in the diffusion of the habit of smoking. In the beginning of the 20th century women's smoking was not socially acceptable. This changed when women joined the workforce and became more and more emancipated. (4, 5) Yet, it is uncertain how large the impact of both women emancipation and economic development is in relation to the spread of female smoking.

Smoking is strongly related to socio-economic status. Higher socio-economic women started smoking first, but were also among the first to quit. It is not unlikely that the importance of societal characteristics in relation to women's smoking differs by socio-economic status. Several studies showed that lower educated women are more responsive to an increase in cigarette price. (6-8) This might indicate a relative large impact of economic factors and national economic development among lower socio-economic groups compared to higher socio-economic groups. The relative low smoking prevalence rates among (low educated) women in southern Europe (an economic less developed region compared to northern Europe) seem to illustrate this. (1, 9)

The aim of this study was to examine the correlation between ever smoking among women in European countries and two societal characteristics: GDP per capita and Gender Empowerment Measure (GEM). The analyses consisted of two steps. First, we assessed national ever-smoking ratios and educational inequalities in ever-smoking ratios among women in 19 European countries. Next, we explored the relation of GDP and GEM with national ever-smoking ratios in high and low educational levels. We used data from 19 European countries including all regions (North, West, Continental, South, East and Baltic). We are the first to present smoking figures of women for that many countries from all European regions.

Methods

Study population

Micro-level data from national health interview surveys of 19 European countries were studied. Data were mainly provided by national statistical offices, except in the case of Finland and the Baltic states for which data derived from the Finbalt Health Monitor. (See table 1) Most surveys were conducted in or after the year 2000, except the German and Portuguese surveys, which were conducted in 1998/1999. Sample sizes were above 4500, except for Estonia, Czech Republic and Slovakia. Non-response rates were relatively low in Italy and Spain (about 15%) and high in Slovakia (49%), percentages in most countries were between 20 and 35 %. Data from 151 313 female respondents, age 25 years and older, were included in the analyses.

Measures

Smoking status was self-reported and respondents were classified as ‘current daily smoker’, ‘occasional smoker’, ‘former smoker’ and ‘never smoker’. Ever-smoking ratios were calculated as the ratios of the number of ever smokers divided by the total number of ever and never smokers. ‘Occasional smokers’ were not included in the analyses.

Educational level represents the highest level of completed education of the respondent. The level of education was initially classified according to national categories, which were subsequently reclassified into four levels of education (1= no or only primary, 2= lower secondary, 3=upper secondary and post non-tertiary, 4=tertiary), approximately corresponding with the following levels of the International Standard Classification of Education (ISCED): 1= ISCED 0-1, 2= ISCED 2, 3= ISCED 3, and 4= ISCED 4-6. Table 2 shows the percentage of higher educated (upper secondary education or higher) by age group.

National figures of Gross Domestic Product (GDP) per capita were used in this study as a measure for economic development. (10) The Gender Empowerment Measure (GEM) measures gender inequality in economic and political spheres of activity. Economic participation and decision making is measured by the percentage of female administrators and managers, and professional and technical workers. Political participation and decision-making are measured by the percentage of seats in parliament held by women. Power over economic resources is measured by Women's GDP per capita (PPP US$). (11) In the Human Development Report of the UNDP in 1998 the GEM was for the first time calculated for most European countries. This data was used in our analyses. Table 2 shows the distribution of the national samples by age category and educational level and the national figures on GDP and GEM.

Statistical analyses

First, age-standardized cumulative ever-smoking ratios were calculated for each country, age group and educational level. The direct method of age standardization was used with the European standard population of 1995 as the standard population structure.

In the next step we quantified the magnitude of educational inequalities in ever-smoking ratios, using the Relative Index of Inequality (RII) and its 95% confidence interval (C.I.). RII is a regression-based measure that takes into account all educational groups separately. It assesses the association between cumulative ever-smoking ratios and the relative position of each educational group across all educational groups. This relative position is measured as cumulative proportion of each educational group within the educational hierarchy. The resulting measure, the RII, can be interpreted as the risk of being an ever-smoker at the very lowest end of the educational hierarchy as compared to the very top of the educational hierarchy. These outcome measures can be compared between age groups and countries. The RII was estimated with log linear regression with control for 5-year age group. The regression model had a log link function and assumed a binomial distribution using the Genmod procedure of SAS. (12, 13) Analyses were performed separately for the three age groups (25-39, 40-59 and 60+ years).

Finally, we explored the correlation between national ever-smoking ratios and the variables GDP and GEM in the age group 25-39 years in linear regression analyses, with countries as units of observation. We first applied univariate regression analyses wherein the ever-smoking ratio was the dependent variable and GDP or GEM the independent variable. In further analyses GDP and GEM were included in the model simultaneously. We limited our correlation analyses to the youngest age group because the societal characteristics (GDP and GEM) are from 1996 and 1998 respectively. Women aged 25-39 years in the year 2000 have probably started smoking in the ’80s and ’90s.

Sample sizes are small for some countries. This leads to imprecise estimates for these countries, which might influence the correlation analyses. We tested this by also running regression analyses wherein the ever-smoking ratios were weighted according to the national sample sizes. Application of these country weights did not change the outcomes of the regression analyses. Therefore, results of only the un-weighted regression analyses are presented in this paper.

Results

National ever-smoking ratios among women 25-39 years were relatively low (<30%) in Lithuania, Slovakia, Portugal and Norway, whereas the highest ratios were found in Spain (57.1%), England (53.4%) and Denmark (53.2%). (See table 3) In this age group 25-39 years, lower educated women were more likely to have ever smoked than their higher educated sisters in all countries except Portugal. Relative inequalities were especially large in Norway (RII:5.54) Finland (RII:2.95) and Ireland (RII:2.99), and small in France and Italy (both RII:1.24).

Among women age 40-59 years, national ever-smoking ratios were low in Portugal (12.3%) and Lithuania (13.8%). The highest ratios were found in The Netherlands (67.7%) and Denmark (60.5%). The results show international diversity in educational inequalities in ever-smoking ratios among women 40-59 years. In most northern and western European countries lower educated women were more likely to have ever started smoking than higher educated women. In southern European countries an opposite pattern was observed; lower educated women were less likely to have ever smoked compared to women with higher educational level. The pattern in eastern Europe is diverse; lower educated women were more likely to have ever smoked than higher educated women in Czech Republic (RII:1.64) and Estonia (RII:1.30), but the opposite was found in Lithuania (RII: 0.52). (See table 3)

In the age group 60 years and older, national ever-smoking ratios of higher educated women were particularly low (<6%) in Portugal, Spain, Slovakia, Lithuania and Latvia. Ever-smoking ratios were high in this age group in Denmark (57.5%) and England (52.7%). In most countries, except Norway and England, ever-smoking ratios were larger among higher educated women compared to lower educated women. Relative inequalities favouring high educated were largest in Spain (RII:0.10), France (RII:0.21) and Italy (RII:0.25). (See table 3)

Among women age 25-39 years, national ever-smoking ratios were positively associated with GDP in 1996. (See table 4) This association was found in both the higher and the lower educated group (See figure 1), although the association was stronger in the higher educated group. After adjustment for GEM, the association of GDP with ever-smoking ratios in the higher educated group became stronger, while the association with ever-smoking ratios in the lower educated group greatly attenuated. (See table 4) As a consequence of the difference in the association with GDP between high and low educated, educational inequalities in ever smoking among women were inversely associated with GDP, implying that inequalities were smaller in countries with more advanced economic development.

In univariate analyses, no association between the gender empowerment measure and national ever-smoking ratios among women age 25-39 years was observed. (See table 4) But GEM was positively related to ever-smoking ratios of low educated women. The association was weak in the case of high-educated women. (See figure 2) After adjustment for GDP, the association between national ever-smoking ratios in the low educated group and GEM attenuated and became inverse in the case of high-educated women. (See table 4) As a result of the difference in association between high and low educated, educational inequalities in ever smoking were strongly positive associated with GEM. (See table 4).

Discussion

Summary

Educational inequalities in ever-smoking ratios reversed within the three age groups. Ratios are high among women in most European countries. National ever-smoking ratios among women age 25-39 years varied from 24.7 % in Lithuania up to 57.1% in Spain. The size of inequalities varied considerably between countries and age groups. In the younger age groups ever-smoking ratios were generally larger among lower educated women compared to their higher educated sisters. Ever-smoking ratios among women age 25-39 years were positive associated with GDP, especially for higher educated women. No association was observed between GEM and national overall ever-smoking ratios among women 25-39 years, but GEM was positive associated with ever-smoking ratios among lower educated women. The magnitude of inequalities in ever-smoking ratios was positive related to GEM but inversely to GDP.

Evaluation of data and methods

Non-response percentages were high in some countries. Non-response could have biased our study results if educational level and smoking status would have been unequally distributed among respondents and non-respondents. Some studies showed that non-respondents can be characterized by lower educational level and unhealthier life-styles. (14, 15) However, several studies observed that even though non-response is related to socio-economic status, the association between smoking and socio-economic status would not greatly change if non-respondents were to be included with respondents. (16-18) Nevertheless, we cannot exclude the possibility that an overrepresentation of lower educated smokers in the non-response group might have led to some underestimation of the socio-economic inequalities in ever-smoking ratios in our study.

Another limitation of our study is the large difference in time of measurement between smoking status and the variables GDP and GEM. In this study we explored the association between ever-smoking ratios of women age 25-39 years and the societal characteristics GDP and GEM. If we assume that most people start smoking between their 15^{th} and 25^{th} birthday, women age 25-39 years in the year 2000 started smoking somewhere between 1975 and 2000. The variables GDP and GEM are measured in respectively 1996, 1998. Unfortunately, data of GDP and GEM from earlier years were not available for all countries. We therefore choose to limit the exploration of the association to the youngest age group in our study. However, the time lag between the societal factors and smoking initiation might still not be appropriate for many women in this age group. We should therefore be cautious in drawing conclusions about causality. Nevertheless, countries with a low score on GEM or a low GDP in the late 90’s are likely to have relatively low scores on GEM or GDP in the 70’s and 80’s too, because these levels of societal factors attained in the 90’s do depend to an important extent on the economic progress and gender emancipation process in decades before. A high correlation between GDP in 1996 and GDP in 1980 of 0.84 (19) indicated that the relative positions of western European countries based on GDP were indeed stable over time.

Our study only included two societal factors, while other societal factors might also be important in relation to the spread of smoking among women in Europe. An important third factor might be female labour force participation rates (FLPR). FLPR are related to women emancipation and empowerment. It has been suggested that women took up men’s-like habits such as smoking when they entered the work force, partly as a consequence of less restrictive social attitudes towards women’s behaviour that coincide with increased female labour force participation rates.(5) FLPR could possibly explain our observation that ever-smoking ratios among women in eastern European countries were higher than those in southern European countries. The FLPR in eastern European countries were much higher than those in southern European countries. In 1980, FLPR were on average 48% in eastern European countries, in southern European countries the average of FLPR was 34%. However, a first explorative analysis of the association between female smoking ever-smoking ratios and FLPR across all countries included in our study did not show strong or statistically significant associations.

Explanations

While lower educated women age 25-39 years were more likely to have ever smoked compared to their higher educated sisters, the opposite is true for the age group 60+ years where higher educated women were more likely to have ever started smoking. Thus, within three age groups the educational inequalities reversed. This finding shows that a rapid diffusion of the smoking epidemic among women from high to lower socio-economic groups occurred across all parts of Europe. As has been shown in earlier studies (1, 20), our data also show that the habit of smoking spread latest among southern European women. Our results confirm the unique position of southern Europe, and especially of Portugal, where even in the youngest age category we still find relatively low prevalence rates and a reversed pattern of inequalities.

Our data suggest that eastern European countries are, in terms of national ever-smoking ratios, somewhere in-between north-western and southern European countries. A similar pattern is found for educational inequalities. In the age group of 40-59 years inequalities were inverse in Lithuania, small in Hungary, Slovakia and Latvia, but attained the ‘northern’ pattern in Estonia and Czech Republic (RII = 1.30 and 1.64). One might perhaps expect, taking into account their poor economic development and restricted cultural influences from the west until the late 1980’s that eastern European countries would be more similar to southern Europe. However, apparently other factors were more important in relation to the diffusion of the smoking epidemic among women in eastern European countries. The large differences in ever-smoking ratios among eastern European countries suggest that the shared history of communism is less relevant to female smoking than other specific national characteristics of these countries.

Ever-smoking ratios among women age 25-39 years were associated with GDP, but not with GEM. In countries that are more economic developed higher ever-smoking ratios among women age 25-39 years were observed. The association between GDP and ever-smoking ratios is not very strong though. The association of GDP with ever-smoking ratios among age 40 years and older was stronger (see appendix). This might indicate a transition in the smoking epidemic when more economic developed countries already experience a decrease in initiation among women (but still have high ever-smoking ratios), while less economic developed countries see an increase in ever-smoking ratios among women age 25-39. Increasing purchasing power may have played a critical role in the association between GDP and ever smoking among women. With economic development, the purchasing power of citizens (both male and female) increases. Smoking used to be a luxury, especially for women from lower socio-economic groups, but cigarettes became accessible to the large public when GDP grew. (4, 21)

Although we did not observe an association between GEM and national ever-smoking ratios of women age 25-39 years, we did find a positive association with ever-smoking ratios of low-educated women. For the age groups 40-59 years and 60+ years we also found a positive association of GEM with national ever-smoking ratios, especially among lower educated women. Regression coefficients for low educated in the age group 40-59 and 60+ were 0.53 and 0.51 respectively (see appendix). Several studies suggested that emancipation of women has been important in relation to uptake of smoking among women.(5, 22, 23) In the beginning of the 20th century, female smoking used to be socially unaccepted. With the emancipation of women and the increase in women's social power and status, female smoking became more and more socially accepted. Women who smoked were no longer seen as prostitutes and fallen women as in the beginning of the 20th century, but as emancipated women. (5, 22) It is noteworthy that the association we found between GEM and ever-smoking ratios is particularly present among low-educated women. This might suggest that low-educated women 'suffered' more from a women-repressive climate than higher educated women who were likely to be the precursors in terms of women emancipation, and that low educated women were also more sensitive to the social acceptability of female smoking.

Images of smoking, in part stimulated by the tobacco industry, might have played a large role in this context. The tobacco industry seized the opportunity when female smoking became more and more associated with women's emancipation, to promote cigarettes as torches of freedom. The tobacco industry was able to link positive values of freedom and emancipation to the habit of smoking cigarettes. (22-24) There is no direct evidence on differences between educational groups in the impact of the tobacco industry and its advertisements. But our results suggest that low educated women have become a highly vulnerable target group for the tobacco industry, unprotected by traditional norms against female smoking, in countries with more gender equity and women emancipation.

Implications

Ever-smoking ratios are high among women in European countries, especially lower educated women. Educational inequalities in ever-smoking ratios were larger in countries with more gender equity and women emancipation. Tobacco control policies aiming to reduce current smoking prevalence should (also) focus on uptake of smoking among young, low educated women. The possible large role of the tobacco industry in the association between women's emancipation and female smoking, underlines the importance of the image that is associated with smoking. Effects of changes in these images are probably largest in younger age groups and especially lower educated groups.

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Tables and Figures

Table 1. Overview of surveys used in the study

Country	Year(s)	Name of survey	Non-response rate (%)
Finland	1994/'96/'98/'00/'02/'04	Finbalt Health Monitor	28.0-35.0
Sweden	2000/2001	Swedish Survey of Living Conditions	23.9 / 22.2
Norway	2002	Norwegian Survey of Living Conditions	29.6
Denmark	2000	Danish Health and Morbidity Survey (DHMS/ SUSY)	25.8
England	2001	Health Survey for England (HSE)	33.0
Ireland	1995/2002	Living in Ireland Panel Survey	18.0 / 22.0 *
Netherlands	2003/2004	General social survey (POLS)	41.7 / 38.7
Belgium	1997/2001	Health Interview Survey	41.5 / 38.6 *
Germany	1998	German National Health Examination and Interview Survey	38.6
France	2004	French Health, Health Care and Insurance Survey (ESPS)	30.0 *
Italy	1999/2000	Health and health care utilization / Multipurpose Family Survey	13.4 / 18.3 *
Spain	2001	National Health Survey	15.0
Portugal	1998/1999	National Health Survey	NA
Hungary	2000/2003	National Health Interview Survey Hungary	21.0 / 28.0
Czech Rep.	2002	Health Interview Survey	29.3
Slovakia	2002	Health Monitor Survey	49.1
Lithuania	1994/'96/'98/'00/'02/'04	Finbalt Health Monitor	28.0-39.0
Latvia	1998/'00/'02/'04	Finbalt Health Monitor	20.0-40.0
Estonia	2002/2004	Health Behavior among Estonian Adult Population	33.0 / 38.0

[1] ever-smokers = former smokers + current daily smokers
* % non-response households

Table 2. Sample characteristics (N) and societal characteristics

	All	25-39 yrs		40-59 yrs		60+ yrs		GDP² 1996 (€)	GEM³ 1998
	N ever¹	N ever¹	% high educated	N ever¹	% high educated	N ever¹	% high educated		
Finland	8290	2981	*92.7*	4462	*72.9*	847	*44.2*	19800	0.73
Sweden	5068	1494	*92.7*	2042	*84.7*	1532	*50.5*	24300	0.79
Norway	2642	801	*96.3*	1061	*83.7*	780	*57.9*	28800	0.79
Denmark	7184	2136	*86.7*	2935	*77.5*	2113	*43.4*	27600	0.74
England	7226	2270	*82.6*	2728	*65.7*	2228	*29.9*	16200	0.59
Ireland	2609	709	*68.5*	1098	*44.5*	802	*23.2*	16100	0.55
Netherlands	6797	1972	*76.8*	2827	*57.4*	1998	*30.6*	21200	0.69
Belgium	7387	2325	*76.8*	2630	*54.7*	2432	*29.9*	21400	0.60
Germany	3225	1058	*76.0*	1334	*56.1*	833	*22.3*	23500	0.69
France	5539	1633	*63.4*	2409	*43.2*	1497	*21.1*	20800	0.49
Italy	53819	16073	*58.8*	18913	*34.1*	18833	*8.8*	17400	0.52
Spain	8903	2808	*49.4*	3024	*23.0*	3071	*5.9*	12400	0.62
Portugal	18437	4435	*31.4*	6670	*11.7*	7332	*2.9*	9200	0.55
Hungary	4747	1300	*55.8*	1832	*48.8*	1615	*18.9*	3500	0.49
Czech Rep.	1046	313	*62.3*	395	*47.3*	338	*24.0*	4700	0.53
Slovakia	474	165	*77.6*	252	*69.0*	57	*52.6*	3100	0.52
Lithuania	5210	2002	*73.2*	2617	*60.0*	591	*33.3*	1800	.
Latvia	786	264	*72.7*	404	*72.0*	118	*46.6*	1800	0.44
Estonia	1924	653	*70.9*	1026	*59.8*	245	*54.7*	2600	0.46

¹ Total number of ever smokers (current + former)
² Gross Domestic Product (€) per capita, source: Eurostat
³ Gender Empowerment Measure, source: UNDP

Table 3 - Educational inequalities in ever-smoking ratios in women

	25-39 yrs					40-59 yrs					60+ yrs				
	Ratios (%)			RII	(95% C.I.)	Ratios (%)			RII	(95% C.I.)	Ratios (%)			RII	(95% C.I.)
		Education					Education					Education			
	All	high	low			All	high	low			All	high	low		
Finland	38.6	37.5	59.6	**2.95**	*(2.46-3.53)*	39.1	37.1	46.6	**1.73**	*(1.51-1.98)*	22.7	23.8	21.4	0.83	*(0.53-1.31)*
Sweden	41.7	40.1	63.1	**2.93**	*(2.39-3.59)*	57.6	56.6	63.6	**1.42**	*(1.23-1.62)*	40.7	43.2	38.5	0.87	*(0.71-1.07)*
Norway	29.3	29.0	38.4	**5.54**	*(3.84-7.98)*	36.0	32.7	55.2	**2.99**	*(2.24-3.97)*	18.5	16.8	21.4	1.75	*(0.98-3.13)*
Denmark	53.2	50.7	71.3	**2.06**	*(1.76-2.41)*	60.5	58.8	67.9	**1.29**	*(1.16-1.44)*	57.5	60.3	57.0	0.91	*(0.79-1.04)*
England	53.4	52.0	61.2	**1.79**	*(1.55-2.07)*	55.0	51.7	62.1	**1.38**	*(1.21-1.57)*	52.7	48.2	55.9	**1.28**	*(1.08-1.51)*
Ireland	45.7	37.3	63.5	**2.99**	*(2.31-3.89)*	42.4	36.2	47.9	**1.77**	*(1.36-2.29)*	37.2	38.3	36.8	1.00	*(0.70-1.04)*
Netherlands	50.0	47.6	58.6	**1.56**	*(1.33-1.83)*	67.7	65.5	71.3	**1.24**	*(1.13-1.36)*	49.9	54.8	48.2	0.86	*(0.74-1.06)*
Belgium	50.0	47.4	59.1	**1.52**	*(1.32-1.77)*	54.3	55.0	53.2	0.95	*(0.84-1.08)*	34.3	42.1	30.5	**0.55**	*(0.45-0.66)*
Germany	48.0	44.7	58.4	**1.85**	*(1.46-2.36)*	40.2	37.0	45.0	**1.35**	*(1.05-1.73)*	18.1	27.5	15.7	**0.37**	*(0.20-0.66)*
France	54.1	51.8	58.8	**1.24**	*(1.05-1.48)*	43.6	49.9	39.0	**0.65**	*(0.55-0.76)*	17.4	31.5	13.4	**0.21**	*(0.15-0.30)*
Italy	36.5	35.0	38.9	**1.24**	*(1.13-1.36)*	37.6	46.7	33.2	**0.50**	*(0.46-0.53)*	17.1	35.0	15.3	**0.25**	*(0.22-0.27)*
Spain	57.1	52.8	62.4	**1.33**	*(1.16-1.51)*	36.2	56.1	30.7	**0.36**	*(0.31-0.43)*	5.5	18.2	4.6	**0.10**	*(0.06-0.15)*
Portugal	27.7	36.8	24.4	**0.29**	*(0.25-0.35)*	12.3	40.3	8.3	**0.04**	*(0.03-0.05)*	2.6	22.8	2.0	0.23	*error*
Hungary	48.0	38.1	60.6	**2.30**	*(1.91-2.77)*	47.9	48.3	48.9	1.01	*(0.86-1.19)*	16.0	29.2	13.1	**0.27**	*(0.20-0.38)*
Czech Rep.	40.0	33.7	49.8	**2.53**	*(1.51-4.26)*	50.6	45.4	57.2	**1.64**	*(1.16-2.32)*	21.7	35.5	17.8	**0.31**	*(0.16-0.60)*
Slovakia	28.3	24.0	48.9	2.65	*(0.92-7.62)*	37.4	35.8	39.2	1.13	*(0.64-2.00)*	5.3	6.7	3.7	0.83	*(0.02-40.79)*
Lithuania	24.7	21.9	33.3	**2.27**	*(1.66-3.11)*	13.8	15.3	12.3	**0.52**	*(0.36-0.75)*	4.6	5.1	4.6	0.73	*(0.23-2.33)*
Latvia	38.4	35.1	47.9	**2.33**	*(1.37-3.99)*	23.8	23.3	27.2	1.16	*(0.56-2.42)*	2.5	3.6	1.6	0.03	*(0.00-3.38)*
Estonia	47.7	42.9	58.9	**2.17**	*(1.62-2.92)*	44.8	43.6	47.8	**1.30**	*(1.00-1.68)*	24.4	27.6	18.9	0.73	*(0.35-1.52)*

Table 4. Association between national ever-smoking ratios and GDP and GEM by educational level - women age 25-39 yrs

	25-39 years			
	Ratios			RII
	All	Education		
		High	Low	
β[1] GDP 1996 (no control)	0.39	0.54*	0.34	0.05
β[1] GDP 1996 (control for GEM)	0.58	0.76*	0.08	-0.62
β[1] GEM 1996 (no control)	0.02	0.13	0.22	0.43
β[1] GEM 1996 (control for GDP)	-0.43	-0.45	0.16	0.89*

[1] regression coefficient
$p < 0.05$

Figure 1. Correlation GDP with ever-smoking ratios among women age 25-39 yrs

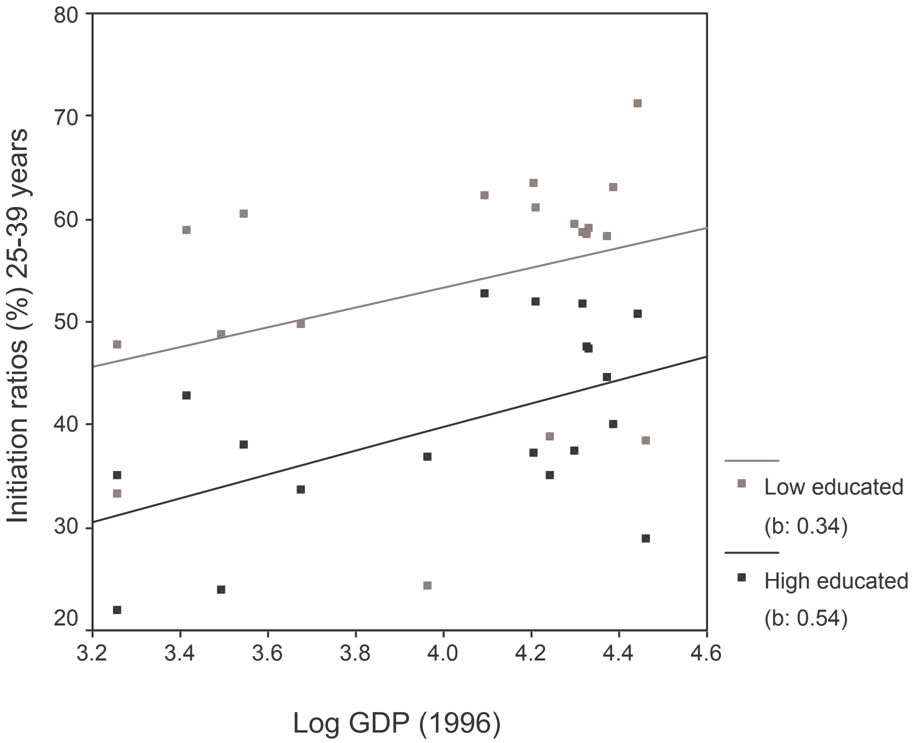
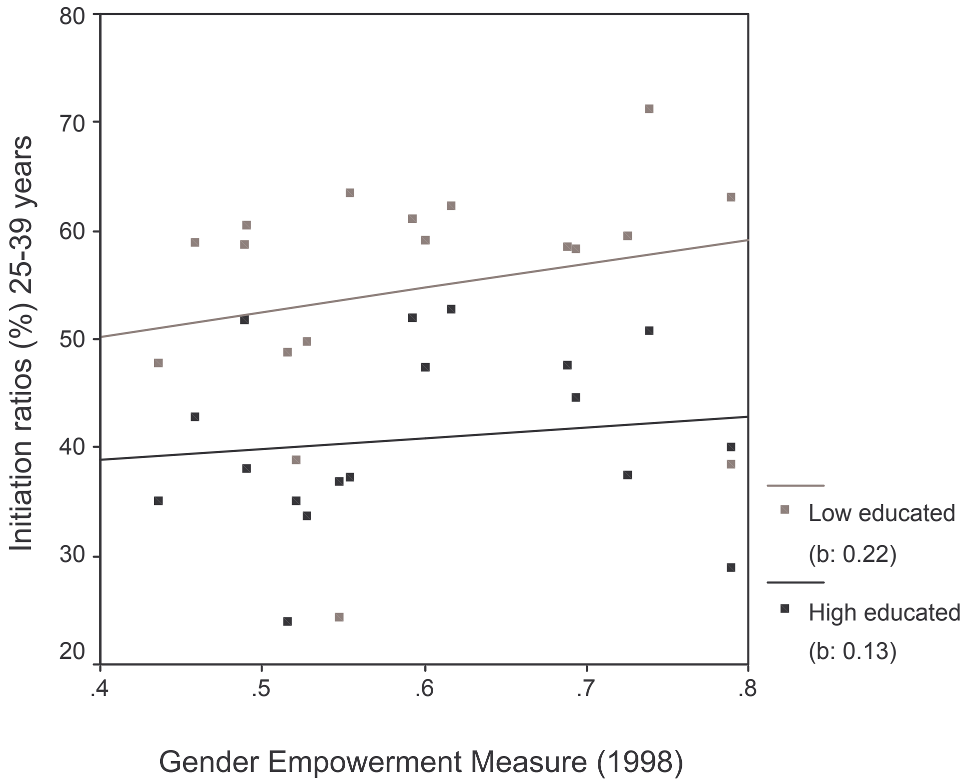


Figure 2. Correlation of GEM with ever-smoking ratios among women age 25-39 yrs



Appendix table

Association between national ever-smoking ratios and GDP and GEM by educational level - women age 40-59 and 60+ years

	40-59 years				**60+ years**			
	Ratios			**RII**	**Ratios**			**RII**
	All	**Education**			**All**	**Education**		
		High	**Low**			**High**	**Low**	
β^1 GDP 1996 (no control)	0.49*	0.57*	0.50*	0.27	0.57*	0.64*	0.59*	0.35
β^1 GDP 1996 (controlled for GEM)	0.19	0.51	-0.06	-0.45	0.38	0.69	0.39	-0.10
β^1 GEM 1996 (no control)	0.37	0.30	0.53*	0.48*	0.47*	0.37	0.51*	0.59*
β^1 GEM 1996 (controlled for GDP)	0.23	-0.10	0.57	0.83*	0.18	-0.15	0.22	0.66

$p < 0.05$

Chapter 20

Effect of nation-wide tobacco control policies on smoking cessation in high and low educated groups in 18 European countries

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Abstract

Background

Recently a new scale was introduced to quantify the implementation of tobacco control policies at country level. Our study used this scale to examine the extent to which these policies are correlated with national variations in cumulative quit ratios. Special attention was given to smoking cessation among lower educational groups.

Methods

Data were derived from national health interview surveys from 18 European countries. In the analyses we distinguished between country, sex, two age groups (25-39 years and 40-59 years) and educational level (high versus low). Cumulative quit ratios were calculated as total former-smokers divided by total ever-smokers. These quit ratios were age-standardised. In regression analyses we explored the correlation between national quit ratios and the national score on the Tobacco Control Scale.

Results

Quit ratios were especially high (>45%) in Sweden, England, The Netherlands, Belgium and France, and relatively low (<30%) in Lithuania and Latvia. Higher educated smokers were more likely to have quitted smoking than lower educated smokers in all age-sex groups in all countries. The national score on the tobacco control scale was positively associated with quit ratios in all age-sex groups. The association of quit ratios with score on TCS did not show consistent differences between high and low educated. Of all tobacco control policies of which the TCS is constructed, price policies showed the strongest association with quit ratios in all subgroups, followed by an advertising ban.

Conclusion

Countries with more developed tobacco control policies have higher quit ratios than countries with less developed tobacco control policies. High and low educated smokers benefit about equally from the nation-wide tobacco control policies.

Introduction

In the last decade many countries have implemented more or less comprehensive tobacco control policies. Tobacco control policies include amongst others: taxes on tobacco products, bans or restrictions on smoking in public places, and advertising bans. Recently, Joossens and Raw (2006) developed the so-called Tobacco Control Scale (TCS) to measure tobacco control activity at country level in Europe. (1) According to this scale, large variations between countries with regard to the implementation of tobacco control policies exist.

An important question is whether these variations in tobacco control policies between countries are correlated with differences in smoking behaviour. Different types of studies (trials, time-series analyses and cross-sectional studies) showed an effect of individual tobacco control measures, mostly within countries or regions, on smoking behaviour. (2-5) However, to our knowledge the effect of nation-wide tobacco control policies on smoking behaviour has not yet been studied in an international study comparing different countries. The TCS created the opportunity to compare many European countries on their efforts to reduce smoking rates and the relation of these efforts with smoking prevalence in national populations.

Socio-economic inequalities in smoking have widened and persisted in the last decades.(6) Tobacco policies need to tackle these inequalities by achieving reductions of smoking prevalence rates among lower socio-economic groups. Nevertheless, it is generally acknowledged that mainly higher socio-economic groups have benefited from early tobacco control policies, such as written information campaigns and health publicity. (7, 8) On the other hand, lower socio-economic groups seem to be more responsive to price policies than smokers with higher socio-economic position.(7-10) It is therefore uncertain whether the impact of nation-wide tobacco control policies differs between high and low socio-economic groups.

The aim of this study was to examine the extent to which tobacco control policies are correlated with smoking cessation. Special attention was given to smoking cessation among lower educational groups. The analysis consisted of two steps. First, we assessed the national levels and educational inequalities in smoking cessation ratios in 18 European countries. Second, we explored the relation of the cessation ratios by educational level with national tobacco control policies as measured by the score on the TCS. We used data from 18 countries from all European regions. For the first time, this international overview of smoking inequalities included data from eastern European and Baltic countries.

Methods

The Tobacco Control Scale was developed by Joossens and Raw (2006) to quantify the implementation of tobacco control policies at country level. The scale is based on six policies that were described by the World Bank as being most important and effective and should be prioritised in comprehensive tobacco control policies. Points were allocated by a group of experts to each policy according to the potential impact on national smoking rates. For all policies together the maximum possible score on TCS is 100. The scale includes the following policies: Price (30 pts), Public place bans (22 pts), Public info campaign spending (15 pts), Advertising bans (13 pts), Health warnings (10 pts) and Treatment (10 pts). (1) Table 1 shows the national scores on the TCS. Countries are ranked by their score on the TCS in 2005. Ireland has the highest score of 74 out of 100 points. Latvia has the least developed tobacco control policy with a score of 29 points.

National Health Surveys

Micro-level data from national health interview surveys of 18 European countries were obtained and analysed. Data were mainly provided by national statistical offices, except in the case of Finland and the Baltic states, for which data were derived from the Finbalt Health Monitor. (See table 1) Most surveys were conducted in or after the year 2000, except the German and Portuguese surveys, which were conducted in 1998/1999. Sample sizes were above 4500 for all surveys, except those from Estonia, Czech Republic and Slovakia. Non-response percentages ranged from about 15% in Italy and Spain up to 49% in Slovakia, while percentages in most other countries were between 20% and 35%. Data from 100,893 respondents who had ever smoked were included in the analyses. We limited our analyses to the adult population aged 25-59 years, in order to exclude the possibility of mortality bias among older smokers.

Smoking status was self-reported and respondents were initially classified as ‘current daily smoker’, ‘occasional smoker’, ‘former smoker’ and ‘never smoker’. Quit ratios were calculated as the ratio of the number of ex-smokers divided by the number of ever-smokers (current + former smokers). ‘Occasional smokers’ were not included in the analyses because it was not clear from the data from most surveys whether they have ever been daily smokers. Furthermore, occasional smokers differ from current daily smokers in terms of socio-economic status and health consequences related to smoking. (11) Table 2 describes the % of ever-smokers in each country and each age-sex group.

Educational level represents the highest level of completed education of the respondent. The level of education was initially classified according to national categories, which were subsequently reclassified into four levels of education (1= no or only primary, 2= lower secondary, 3=upper secondary and post non-tertiary, 4=tertiary), approximately corresponding with the following levels of the International Standard Classification of Education (ISCED): 1= ISCED 0-1, 2= ISCED 2, 3= ISCED 3, and 4= ISCED 4-6. The proportion of respondents aged 25-39 years with upper secondary education or higher is about 75% in north-western Europe, about 55% in central-east Europe and 40% in southern Europe. Compared to the age group 25-39 years, the proportion of respondents 40–59 years with higher education is somewhat smaller in most western and southern European countries, but nearly the same (<3% difference) in central-eastern European countries

Statistical analyses

First, age-standardized cumulative quit ratios were calculated for each country, sex and educational level. The direct method of age standardization was used with the European standard population of 1995 as the standard age-structure.

In the next step we quantified the magnitude of educational inequalities in quit ratios, using the Relative Index of Inequality (RII) and its 95% confidence interval (C.I.). RII is a regression-based measure that takes into account all educational groups separately. It assesses the association between cumulative quit ratios and the relative position of each educational group. This relative position is measured as the cumulative proportion of each educational group within the educational hierarchy with 0 and 1 as the extreme values. The resulting measure, the RII, can be interpreted as the risk of being a former smoker at the very top of the educational hierarchy as compared to the very lowest end of the educational hierarchy. These outcome measures can be compared between age groups and countries, provided that a detailed and hierarchical classification of educational level is used in each country. (12, 13) For this paper, the RII was estimated with log linear regression with control for 5-year age group. The regression model had a log link function and assumed a binomial distribution, using the Genmod procedure of SAS. (14, 15) Analyses were performed separately for men and women, and two age groups (25-39 and 40-59 years).

Finally, we explored the correlation between national quit ratios and the national score on the TCS and the sub scores of the TCS. We applied linear regression analyses, with countries as units of observation. We first applied univariate regression analyses wherein the quit ratio was the dependent variable and the score on the TCS the independent variable. In further analyses we adjusted for GDP in the year 2000. (16) GDP is used in this study as a measure for economical development, which may be related to smoking cessation rates independently from the implementation of tobacco control policies. The regression analyses were performed separately for men and women, and two age groups (25-39 and 40-59).

Sample sizes were small for some countries (see Table 1). This resulted in imprecise estimates for these countries, which might affect the correlation analyses. We evaluated this potential data problem by also running regression analyses wherein the quit ratios were weighted according to the national sample sizes. Application of these country weights did not substantially change the outcomes of the regression analyses. Therefore, we will only present results of the un-weighted regression analyses.

Results

Quit ratios among men varied from 22.4% in Lithuania up to 62.2% in Sweden among men. (See table 3) Generally, the highest quit ratios were found in northern and western European countries, whereas lower quit ratios were found in southern and eastern European countries. Table 4 shows a similar geographical pattern for women.

Among both men and women, higher educated ever-smokers were more likely to have quitted than lower educated ever-smokers. Absolute differences in quit ratios between high and low educated were generally larger in the age group 25-39 years than in the age group 40-59 years. The absolute differences between high and low educated among men 25-39 years differed from 2.4 % in Ireland to 29.2% in Czech Republic. Large variations between countries in absolute gaps were also observed among men 40-59 years (from 1.7% in Portugal to 20.1% in England), among women 25-39 years (from 1.4% in Portugal up to 26.4% in Sweden) and among women 40-59 years (from 0.1% in Portugal to 20% in Ireland).

Relative inequalities, measured as RII, were also largest in the age group 25-39 years (table 3). For men 25-39 years, the largest relative inequalities in quit ratios were found in Czech Republic and Latvia. RII's were smallest in Ireland and Sweden. For men 40-59 years, largest RII's were found in Latvia, Lithuania and Estonia. Relative inequalities in this subgroup were smallest in Portugal and Germany. For women 25-39 years, largest inequalities in quit ratios were found in Latvia and Hungary, while Portugal had small inequalities in this subgroup (table 4). For women 40-59 years, the largest relative differences were observed in Denmark and Slovakia, while small inequalities were observed in Latvia and Portugal. (See table 4) Although the size of the relative inequalities varied across countries, confidence intervals of the RII's for most countries overlap. Therefore, the large differences between countries in size of inequalities might to an important extent be due to chance fluctuations.

Quit ratios were positively associated with score on TCS. (See figure 1) The association was positive for both the high and low educated group but was somewhat stronger among the higher educated group. The regression-coefficients for high and low educated were 0.65 (p-value: 0.004) and 0.57 (p-value:0.014) respectively. This implies that, when the score on TCS increases with 10 points, the cessation ratio increases in absolute terms with 6.5% and 5.7% in high and low educated groups respectively.

The positive association was found consistently for each age-sex group. (See table 5) The results do not show consistently stronger associations among one of the two educational levels. In the age group 40-59 years, the associations were stronger for higher educated men and women, while the associations among the men 25-39 years were strongest in the lower educated group. After adjustment for GDP the associations slightly attenuated but remained significant for low educated men aged 25-39 years and for high-educated men and women aged 40-59 years.

The TCS is a combination of sub-scores on different tobacco control policies such as price of tobacco products, legislation for smoke-free work places and other public places, and treatment to help smokers quitting. Table 6 shows the associations with cumulative quit ratios for each sub-score. Regression coefficients were standardized to facilitate comparisons between the sub scores. Policies related to cigarette price showed the strongest association with quit ratios. Strong associations with price were found in both educational levels, although not in all age-sex groups. A comprehensive advertising ban showed the next-strongest associations with quit ratios in most subgroups. In most age-sex groups, the association was stronger in the higher educated group compared to the lower educated group.

Discussion

Summary of results

Higher educated smokers were more likely to have quitted smoking and thus become former smokers compared to lower educated smokers. Educational inequalities were found for all age-sex groups and in all countries. Inequalities were generally larger in the age group 25-39 years compared to the group of 40-59 years. Quit ratios in all subgroups were positively associated with the national score on the TCS. No consistent differences were observed between high and low educated with regards to the association of quit ratios with score on TCS. Of all tobacco control policies of which the TCS is constructed, price policies showed the strongest association with quit ratios in both educational levels; next came advertising ban.

Evaluation of data and methods

Non-response percentages were high in some countries. Non-response could have biased our study results if both educational level and smoking status would have been unequally distributed among respondents and non-respondents. Some studies showed that non-respondents are characterized by lower educational level and unhealthier life-styles. (17, 18) However, several studies observed that even though non-response is related to socio-economic status, the association between smoking and socio-economic status would not greatly change if non-respondents were to be included with respondents. (19-21) Nevertheless, we cannot exclude the possibility that an overrepresentation of lower educated smokers in the non-response group might have led to some underestimation of the socio-economic inequalities in smoking cessation rates in our study.

Another limitation of our study is the lack of an appropriate time difference in reference periods for the measurements of smoking status and of tobacco control policies. Preferably, the measurement of quit ratios should be subsequent to the measurement of the tobacco control policy. Yet, countries were ranked on the TCS based on information on legislation in force, price of tobacco and tobacco control budget in 2004/2005, and the scores therefore represent the development of tobacco policy until 2005. The surveys on the other hand were mostly conducted between the years 2000 and 2004. Data on smoking status refers to the smoking status at the moment of the survey. Former smokers might have quitted smoking recently or many years ago. Unfortunately, the surveys did not include data on the year of quitting. Thus, the available smoking measure represents ever smoker's history of quitting until 2004, which is before (instead of after) the reference period for the measurement of the tobacco control policies. As there is no appropriate time lag between the measurements of tobacco control policies and smoking behaviour, we should be cautious in drawing conclusions about causality.

Nevertheless, countries with comprehensive tobacco control policies in 2005 are likely to have implemented more comprehensive tobacco control policy already in the years before. The score on TCS in 2005 might therefore also be used as a proxy for the comprehensiveness of tobacco control policies in years before. However, recently large changes in tobacco control policies occurred in some areas, especially public place bans, public info spending and health warnings. As a result the ranking of countries on these three policy areas changed substantially. Comprehensive public place bans, for example, were implemented in some countries in 2003 to 2005. (22) The ranking of countries on other policies like price, advertising bans and treatment has been rather stable over the years. (22) A high correlation (0.66) was for example observed between tobacco prices in 1990 and 2005 (Sale prices of the most popular brand were obtained from the British Tobacco Manufacturing Association). (23) Therefore, we performed the regression analyses also with a stripped TCS, only including the sub scores on price, advertising bans and treatment. With the 'new' TCS none of the regression coefficients as presented in table 5 changed with more than 0.1 pts and the pattern by educational level also remained unchanged (data not shown). This supports the idea that the countries' relative score on TCS in 2005 is a rough proxy for the comprehensiveness of tobacco control policies along a wider span of years. Furthermore, the association between quit ratios and the sub-scores on the TCS is important in this context, since it cuts down the score in different action points. The association with quit ratios is therefore less dependent of the last action and of recent changes in one particular field of tobacco control policy. It is unlikely that we would have found total different results if we had used information on tobacco control policies from an earlier date.

Since the study of the association with TCS is based on an ecological design, with 18 countries, we should be aware of confounding by other contextual factors. In the analyses we controlled for the potentially important confounder GDP per capita. GDP did not affect the association between quit ratios and the score on TCS substantially. The association could also be a reflection of the smoking epidemic, if cessation ratios for example increase with further progression of the smoking epidemic. In order to check for this type of confounding, we adjusted in the analyses also for the proportion of ever-smokers in each country. (See table 2 for ever-smoking rates) Ever-smoking ratio (%) was used as a rough proxy of the stage of the smoking epidemic in countries. The association between quit ratios and TCS did not change substantially after adjustment for ever-smoking ratios, neither did the pattern according to educational level. All regression coefficients, except for men age 25-39 years, changed not more than 0.05 pts (results not shown). Since two potentially important confounders did not significantly affect the association, it is unlikely that the association between score on TCS and quit ratios in this study is completely due to factors unrelated to tobacco control policies.

Explanations

In all countries, relative differences in quit ratios between high and low educated were smaller in the age group 40-59 years than in the group 20-39 years. The smaller inequalities in the older age group could be an age-effect. Several studies showed that smokers are, irrespective their educational level, more likely to have ever quitted when they become older. (24-26) If the age-related increase in quit ratios is similar in both educational groups, the relative differences between high and low educated among older age groups will become smaller. On the other hand, the difference in inequalities between age groups could also represent a cohort effect. This would suggest that the inequalities in smoking cessation in the older age group have not become smaller with the cohort growing older, but have always been relative small within older generations as compared to younger generations. An

Italian study indeed found cohort-specific changes in smoking cessation rates. Relative inequalities in smoking cessation in this study increased from a 23% difference between high and low educated in the birth cohort 1940-1949 to a 30% difference in the birth cohort 1960-1969 among men. Among women inequalities increased from a 13% difference to a 61% difference. (27)

Quit ratios were generally higher in northern and western European countries compared to southern and eastern European countries. Studies on smoking prevalence described a similar north-south gradient in the western part of Europe. (Eastern European countries were not included in previous international overviews.) (6, 28-30) The smoking epidemic model also describes this north-south gradient in the diffusion of the smoking habit; higher educated men in northern European countries take the lead in the diffusion, lower educated women in southern Europe are the last to follow.(31) We found a comparable geographical pattern for smoking cessation, with the difference that not only southern Europe, but also eastern European countries lag behind. Although the pattern we found in cessation is not totally similar to the geographical pattern in prevalence rates, our results suggest that changes in smoking cessation is, in addition to changes in smoking initiation, one of the mechanisms through which the smoking epidemic evolves. Especially in later stages of the smoking epidemic, quitting smoking may contribute to differences in smoking prevalence rates among sub population and nations.

We observed positive correlations between quit ratios and the national score on the TCS. Countries with a more developed and comprehensive tobacco control policy have higher quit ratios in both high and low educated groups. The higher quit ratios might be a direct consequence of tobacco control policies. This would however not be an effect of the tobacco control policies that were measured with the TCS for 2005, but an effect of policies implemented in previous years. Most of the countries with comprehensive tobacco control policies in 2005 are likely to have had more comprehensive policies already in the ‘90s or perhaps even before. The high correlation between tobacco price in 1990 and in 2005 of 0.66 (see the section ‘evaluation of data and methods’) also supports this view. Comprehensive tobacco control policies are not implemented overnight but emerge over years together with an increasingly more anti-smoking environment in societies.

The higher quit ratios in countries with comprehensive tobacco control policies could also partly be a consequence of a growing anti-tobacco environment in the society. A growing negative attitude of people towards smoking, and sympathy with anti-tobacco policies like public place bans, will have a direct impact on smoking cessation. Smokers will be discouraged to continue smoking and those who try to quit will be supported. At the same time, an anti-tobacco environment in societies stimulates policy makers to implement comprehensive tobacco control policies, and it will also partly determine the successfulness of those policies.

Of all sub scores of the TCS, quit ratios were most strongly associated with price policies. This corresponds with the ratings of different tobacco control policies by the expert panel of the TCS and the World Bank, who both judged price policies to be the most effective and important tobacco control measures. (1, 32) Several studies suggest that an increase in tobacco price is a highly effective policy to reduce tobacco consumption, especially among lower socio-economic groups. (32-35) Our results do not support this idea. This might be because we measured prevalence instead of consumption level. An increase in price mainly reduces consumption levels and not so much smoking prevalence rates. (10, 36-38)

Quit ratios were also strongly associated with the sub-score ‘advertising bans’. This suggests that advertising ban is one of the most effective tobacco control measures with regards to smoking cessation included in the TCS. Yet, an advertising ban is maybe not so important on it is own (the experts allocated only 13 points to this policy in the TCS), but probably particularly important in combination with other elements of tobacco control policies. Comprehensiveness of tobacco control policies determines to an important extent the effectiveness of the policies in terms of smoking cessation.(39) A smoker should not only be discouraged to smoke by e.g. high cigarette prices and advertising and public place bans, but should also be encouraged and supported to quit smoking successfully by e.g. quit lines and free nicotine replacement therapy.

We did not find consistent significant differences in association between quit ratios and (sub) score on TCS between high and low educated respondents. Our data thus do not suggest that higher educated smokers benefited more of national tobacco control policies than did lower educated smokers. This does not correspond with the finding of former studies that observed a larger effect of incidental publicity campaigns among higher socio-economic groups compared to lower socio-economic groups.(7, 8) While it is likely that in the 70’s and 80’s higher educated benefited more from the first nation-wide tobacco control policies than did lower educated smokers, our results do not indicate a difference between educational groups in the effect of the more recent tobacco control policies.

Implications

Our findings suggest an effect of tobacco control policies on smoking cessation rates. Countries with more developed tobacco control policies have higher quit ratios in both high and low educated groups. Nation-wide tobacco control policies seem to have a substantial effect on smoking cessation ratios, also when comparing different countries. Tobacco control policies need to be comprehensive (including, amongst others, price policies and bans on smoking advertisement) to reduce smoking prevalence in all socio-economic groups. At the same time, since the educational inequalities in quit ratios persisted irrespective of the extent to which national tobacco control policies have been implemented in different European countries, there is a need for special effort to reduce not only absolute levels, but also relative inequalities. Specific policies and interventions should aim to foster successful cessation among lower educated smokers. To be effective, such cessation policies and interventions should be local, proactive, free-of-charge and directly targeted at low socio-economic groups. (34, 36, 40)

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Tables and Figures

Table 1. Overview of surveys used in this study and national scores on the Tobacco Control Scale (TCS)

Country	TCS	Year(s)	Name of survey	Non-response rate (%)	# ever-smokers[1] aged 25-59
Finland	58	1994/'96/'98/'00/'02/'04	Finbalt Health Monitor	28.0-35.0	6785
Sweden	60	2000/2001	Swedish Survey of Living Conditions	23.9 / 22.2	3601
Denmark	45	2000	Danish Health and Morbidity Survey (DHMS/ SUSY)	25.8	6060
England	73	2001	Health Survey for England (HSE)	33.0	5195
Ireland	74	1995/2002	Living in Ireland Panel Survey	18.0 / 22.0 *	1634
Netherlands	52	2003/2004	General social survey (POLS)	41.7 / 38.7	5902
Belgium	50	1997/2001	Health Interview Survey	41.5 / 38.6 *	5841
Germany	36	1998	German National Health Examination and Interview Survey	38.6	2402
France	56	2004	French Health, Health Care and Insurance Survey (ESPS)	30.0 *	4346
Italy	57	1999/2000	Health and health care utilization / Multipurpose Family Survey	13.4 / 18.3 *	34070
Spain	31	2001	National Health Survey	15.0	6688
Portugal	39	1998/1999	National Health Survey	NA	8303
Slovakia	49	2002	Health Monitor Survey	49.1	395
Hungary	47	2000/2003	National Health Interview Survey Hungary	21.0 / 28.0	3337
Czech Rep.	38	2002	Health Interview Survey	29.3	745
Lithuania	34	1994/'96/'98/'00/'02/'04	Finbalt Health Monitor	28.0-39.0	3306
Latvia	29	1998/'00/'02/'04	Finbalt Health Monitor	20.0-40.0	535
Estonia	45	2002/2004	Health Behavior among Estonian Adult Population	33.0 / 38.0	1748

[1] ever-smokers = former smokers + current daily smokers
* % non-response households

Table 2. National score on Tobacco Control Scale (TSC) and sample characteristics (N)

	Score TCS	Men				Women			
		25-39 yrs		40-59 yrs		25-39 yrs		40-59 yrs	
		N[1]	% ever[2]	N[1]	% ever[2]	N[1]	% ever[2]	N[1]	% ever[2]
Finland	58	1283	*58.4*	2558	*65.4*	1172	*43.7*	1772	*41.9*
Sweden	60	549	*36.7*	1228	*63.5*	634	*42.4*	1190	*58.3*
Denmark	45	1011	*53.2*	2100	*71.2*	1157	*55.6*	1792	*61.8*
England	73	1012	*57.5*	1446	*61.5*	1228	*53.9*	1509	*55.6*
Ireland	74	323	*50.6*	511	*53.0*	330	*49.7*	470	*44.8*
Netherlands	52	1013	*61.4*	1952	*74.9*	1005	*53.8*	1932	*69.5*
Belgium	50	1252	*59.6*	1968	*76.2*	1179	*53.1*	1442	56.9
Germany	36	577	*57.4*	778	*61.0*	521	*49.3*	526	*39.4*
France	56	916	*60.1*	1460	*66.6*	897	*55.0*	1073	*44.3*
Italy	57	8441	*54.0*	12481	*67.6*	5992	*37.3*	7156	*37.8*
Spain	31	1870	*65.3*	2076	*74.4*	1625	*59.4*	1117	*38.3*
Portugal	39	2641	*63.9*	3619	*64.1*	1237	*30.0*	806	*13.2*
Slovakia	49	98	*66.3*	159	*70.2*	45	*37.8*	93	*42.0*
Hungary	47	672	*60.8*	929	*68.2*	712	*58.2*	1024	*60.0*
Czech Rep.	38	162	*63.9*	255	*70.7*	126	*44.2*	202	*54.3*
Lithuania	34	1115	*73.3*	1332	*69.6*	501	*32.2*	358	*17.1*
Latvia	29	146	*75.2*	191	*78.1*	102	*42.0*	96	*26.0*
Estonia	45	424	*77.3*	547	*80.6*	311	*47.7*	466	*45.2*

[1] N = number of ever (current + former) smokers
[2] ever-smoking ratio (%) = total number of ever-smokers divided by total number of respondents (ever + never smokers)

Table 3. National levels and educational inequalities in quit ratios - Men

	All ages	25-39 yrs				40-59 yrs			
	Quit ratio	**Quit ratio**		**RII°**	**(95 % C.I.)**	**Quit ratio**		**RII°**	**(95 % C.I.)**
		high¹	**low²**			**high¹**	**low²**		
Finland	43.1	35.0	23.6	**2.45**	*(1.70-3.52)*	53.7	45.5	**1.32**	*(1.15-1.50)*
Sweden	62.2	59.9	46.8	**1.61**	*(1.19-2.18)*	65.6	57.2	**1.45**	*(1.23-1.71)*
Denmark	34.8	31.3	16.1	**3.14**	*(2.10-4.71)*	42.6	29.9	**2.08**	*(1.68-2.58)*
England	48.3	39.1	27.6	**2.64**	*(1.83-3.82)*	64.0	43.9	**1.95**	*(1.67-2.28)*
Ireland	37.9	29.7	27.3	1.44	*(0.72-2.89)*	57.1	39.4	**1.84**	*(1.37-2.47)*
Netherlands	48.6	46.1	30.4	**2.52**	*(1.86-3.41)*	58.2	43.2	**1.70**	*(1.47-1.97)*
Belgium	43.5	41.1	24.5	**3.03**	*(2.23-4.13)*	54.8	41.2	**1.75**	*(1.49-2.04)*
Germany	39.2	27.7	20.7	**1.86**	*(1.08-3.20)*	52.7	48.1	1.17	*(0.93-1.47)*
France	48.3	45.2	32.1	**2.05**	*(1.48-2.85)*	58.6	53.9	**1.21**	*(1.02-1.44)*
Italy	37.3	29.3	23.5	**1.76**	*(1.48-2.10)*	49.5	44.4	**1.20**	*(1.12-1.29)*
Spain	30.1	25.3	17.9	**2.37**	*(1.57-3.59)*	41.5	35.5	**1.39**	*(1.14-1.69)*
Portugal	33.8	25.9	19.2	**1.65**	*(1.23-2.21)*	46.2	44.5	1.10	*(0.94-1.29)*
Slovakia	42.5	41.6	25.7	1.90	*(0.69-5.22)*	51.9	47.3	1.39	*(0.77-2.50)*
Hungary	26.0	20.6	17.0	1.40	*(0.72-2.74)*	32.1	32.1	1.15	*(0.82-162)*
Czech Rep.	37.4	51.2	22.0	**7.63**	*(3.45-16.89)*	48.3	37.5	**2.01**	*(1.29-3.13)*
Lithuania	22.4	19.7	11.1	**3.28**	*(1.89-5.71)*	33.8	22.1	**2.13**	*(1.60-2.85)*
Latvia	25.0	21.2	13.2	**5.02**	*(1.13-22.26)*	33.5	22.9	**3.61**	*(1.39-9.38)*
Estonia	28.0	25.9	21.4	**3.32**	*(1.13-4.77)*	35.3	24.9	**2.13**	*(1.33-3.44)*

° Relative Index of Inequality
¹ high educated (upper secondary level or higher)
² low educated (no, primary or lower secondary level)

Table 4. National levels and educational inequalities in quit ratios - Women

	All ages	25-39 yrs				40-59 yrs			
	Quit ratio	Quit ratio		RII°	(95 % C.I.)	Quit ratio		RII°	(95 % C.I.)
		high¹	low²			high¹	low²		
Finland	45.8	44.0	20.4	**2.32**	*(1.72-3.14)*	51.9	38.4	**1.70**	*(1.42-2.03)*
Sweden	53.9	53.7	27.3	**2.20**	*(1.57-3.08)*	56.7	42.8	**1.91**	*(1.54-2.37)*
Denmark	37.6	38.4	24.8	**2.78**	*(1.99-3.87)*	41.9	24.4	**2.61**	*(2.08-3.26)*
England	48.3	45.8	25.3	**2.74**	*(2.05-3.67)*	58.6	42.3	**1.68**	*(1.43-1.96)*
Ireland	35.3	33.8	20.1	**3.89**	*(1.85-8.19)*	54.6	34.6	**2.20**	*(1.55-3.13)*
Netherlands	55.0	55.2	33.0	**2.76**	*(2.14-3.56)*	65.2	48.8	**1.70**	*(1.49-1.93)*
Belgium	50.3	50.6	35.6	**2.51**	*(1.92-3.28)*	59.4	42.7	**1.90**	*(1.59-2.28)*
Germany	40.4	35.7	22.6	**3.10**	*(1.80-5.36)*	51.3	42.2	**1.67**	*(1.19-2.36)*
France	53.1	55.7	37.1	**2.19**	*(1.63-2.95)*	58.0	52.7	**1.35**	*(1.10-1.66)*
Italy	38.5	37.9	30.3	**1.86**	*(1.56-2.21)*	44.6	38.4	**1.31**	*(1.18-1.45)*
Spain	30.1	31.3	21.2	**3.16**	*(2.11-4.74)*	36.0	31.4	**1.51**	*(1.11-2.06)*
Portugal	36.2	31.9	30.5	0.96	*(0.69-1.33)*	40.0	39.9	1.19	*(0.84-1.67)*
Slovakia	49.4	50.9	29.6	**3.17**	*(1.01-9.90)*	61.6	49.9	**2.45**	*(1.07-5.61)*
Hungary	21.1	21.3	16.3	1.42	*(0.81-2.46)*	25.1	18.3	**1.88**	*(1.24-2.87)*
Czech Rep.	43.0	51.3	30.3	**3.75**	*(1.62-8.65)*	48.8	36.1	**2.00**	*(1.10-3.61)*
Lithuania	27.0	26.9	19.3	1.87	*(0.97-3.60)*	29.5	24.1	1.59	*(0.80-3.14)*
Latvia	26.9	31.6	13.0	**5.57**	*(1.29-24.14)*	31.2	17.8	1.14	*(0.35-3.70)*
Estonia	38.0	40.0	34.2	**2.30**	*(1.25-4.23)*	39.7	31.0	**1.61**	*(1.02-2.54)*

° Relative Index of Inequality
¹ high educated (upper secondary level or higher)
² low educated (no, primary or lower secondary level)

Figure 1. Scatter plot of 18 countries according to their score on the Tobacco Control Scale (TCS) and their cumulative quit ratios, for high and low educated; men and women together.

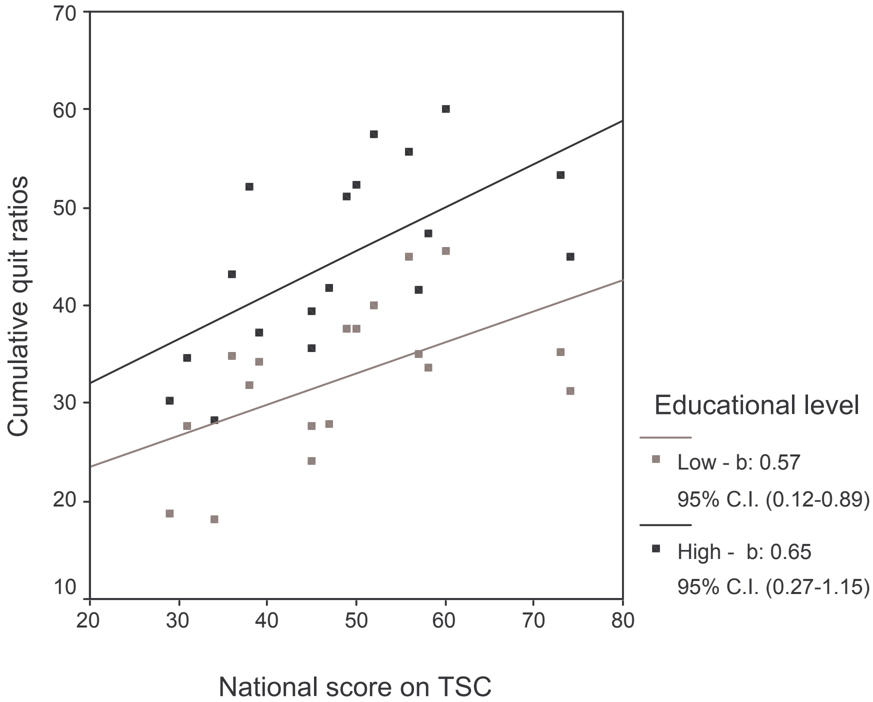

Table 5. Association between national quit ratios and score on TCS by age-sex group and educational level

	All ages	25-39 yrs		40-59 yrs	
		High education	Low education	High education	Low education
Men					
β¹ (no control)	0.65	0.43	0.66	0.77	0.51
95% C.I.	*(0.18 -0.78)*	*(-0.04 - 0.76)*	*(0.16 - 0.65)*	*(0.32 - 0.82)*	*(0.05 - 0.74)*
β¹ (control for GDP)	0.47	0.34	0.59	0.57	0.29
95% C.I.	*(0.04 - 0.66)*	*(-0.17 - 0.74)*	*(0.08 - 0.64)*	*(0.19 - 0.65)*	*(-0.12 - 0.57)*
Women					
β¹ (no control)	0.55	0.43	0.22	0.67	0.47
95% C.I.	*(0.07 - 0.69)*	*(-0.04 - 0.64)*	*(-0.16 - 0.35)*	*(0.23 - 0.87)*	*(0.01 - 0.68)*
β¹ (control for GDP)	0.45	0.40	0.25	0.56	0.24
95% C.I.	*(-0.07 - 0.66)*	*(-0.11 - 0.68)*	*(-0.18 - 0.44)*	*(0.10 - 0.82)*	*(-0.12 - 0.64)*

¹ regression coefficient

Table 6. Association between national quit ratios and sub scores on TCS adjusted for GDP – by age-sex group and educational level

Sub scores	**All ages**		**25-39 yrs**		**40-59 yrs**	
			Education		**Education**	
			high	**low**	**high**	**low**
Men	β[1]	*95% C.I.*	β[1]	β[1]	β[1]	β[1]
Price	2.08	*(-0.36 - 8.48)*	0.94	2.13	2.83*	2.01
Advertising bans	1.33	*(1.11 - 8.02)*	1.37*	1.47*	1.19*	0.72
Public place bans	0.94	*(-2.43 - 5.89)*	0.73	2.12	1.02	0.77
Treatment	0.74	*(-1.19 - 6.84)*	0.61	0.83	0.98	0.35
Campaign spending	0.54	*(-3.05 - 6.17)*	0.09	0.46	0.89	-0.01
Health warnings	-0.40	*(-7.32 - 2.31)*	-0.13	-0.65	-0.32	-0.18
Women						
Price	2.07	*(-1.09 - 8.66)*	1.48	1.18	2.66*	2.45
Advertising bans	1.59	*(1.39 - 8.67)*	1.56*	1.22	1.42*	0.99
Public place bans	0.41	*(-3.84 - 5.26)*	0.34	0.24	0.89	0.34
Treatment	0.83	*(-1.40 - 7.22)*	0.90	0.46	1.16*	0.53
Campaign spending	0.54	*(-3.52 - 6.41)*	0.31	0.36	0.57	0.40
Health warnings	-0.42	*(-9.51 - 3.43)*	-0.19	-0.77	-0.29	-0.30

* $p < 0.05$

[1] β: standardized regression coefficient

Chapter 21

Assessing the impact of smoking cessation services on reducing health inequalities in England: observational study

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Abstract

Background

NHS stop smoking services are expected to play a key part in achieving the life expectancy health inequality target in England by reducing smoking prevalence in deprived areas. This paper assesses the extent to which services have made a contribution to reducing inequalities in smoking between 2003/4 and 2005/6.

Methods

Synthetic estimates of baseline smoking prevalence data were compared with national monitoring data about the numbers of smokers in receipt of services and the proportion who self-report quitting at four weeks. The social distribution of service recipients and quitters was compared with estimates of smoking prevalence to assess impact on inequalities. Comparisons were made between officially-designated disadvantaged areas (the Spearhead Group) and others.

Results

Short term cessation rates were lower in disadvantaged areas (52.6%) than elsewhere (57.9%) ($p < .001$), but the proportion of smokers being treated was higher (16.7% compared with 13.4%) ($p < .001$). The net effect was that a higher proportion of smokers in the most disadvantaged areas reported success (8.8%) than in more advantaged areas (7.8%) ($p < .001$). Using the evidence-based assumption that three-quarters of short-term quitters will relapse within one year, the absolute and relative rate gaps in smoking prevalence between spearhead areas and others are estimated to fall by small but statistically significant amounts from 5.2 and 1.21489 (CIs: 1.216449, 1.213332) to 5.0 and 1.21175 (CIs: 1.213317, 1.210174) between 2003/4 and 2005/6.

Conclusions

NHS stop smoking services have probably made a modest contribution to reducing inequalities in smoking prevalence. To achieve government targets, however, requires both the development of more innovative cessation interventions for the most addicted smokers and action to ensure that other aspects of tobacco control policy make a larger contribution to inequality goals.

Introduction

Reducing inequalities is a central objective of English health policy[1]. But despite a decade of concerted effort the health divide is widening[2]. Part of the explanation for the lack of progress is that convincing evidence about effective interventions to achieve greater health equity is in short supply[3]. Nevertheless, there is a growing recognition that inequalities in smoking are the largest single contributor to those inequalities in health[4] (such as life expectancy and infant mortality) that are of greatest policy concern in England[5]. This paper aims to contribute to filling a major gap in the evidence base by investigating the potential for NHS stop smoking services to reduce health inequalities.

Smoking cessation services were established in the UK following the publication of the tobacco white paper *Smoking Kills*[6], to be delivered by the NHS[7]. From their inception, the services were intended to focus on particular groups, including economically disadvantaged smokers. An early indication of this focus on inequality was that the first allocation of funds was provided to some of the most deprived areas in England, Health Action Zones (HAZs)[8]. Following the development of services in HAZs in 1999, the services were rolled out to other parts of the UK from 2000. Guidance was issued to all new services that emphasised the importance of treating priority groups, in particular disadvantaged smokers[9].

Health Action Zones and later health authorities in all parts of the country were required to build on the evidence-base, outlined in a review published in the journal *Thorax* in 1998 and updated in 2000[10,11]. Smoking cessation treatment was defined as including behavioural interventions such as brief advice, counselling and intensive support plus the administration of effective pharmacotherapies, specifically nicotine replacement therapy (NRT) and bupropion. The early guidance described the effectiveness of brief advice (delivered by health care professionals as part of routine practice) but the new cessation monies were intended to fund more intensive services. These were to include specialist clinics offering group-based support of the kind developed by the Maudsley clinic in London as well as services often based in primary care and delivered on a one-to-one basis[12].

The impact of smoking cessation services is being assessed in a number of different ways. Services were required from the outset to collect a minimum dataset and report their results on a quarterly basis to the Department of Health. However, this routine monitoring provides no direct information to help assess progress towards reducing smoking-related inequalities. The Department of Health also commissioned a national evaluation of smoking cessation services. This study took place between 2000 and 2004 and reported in 2005[12]. It described the process of service development and evaluated short (4 week) and longer term (52 week) outcomes as well as assessing the effectiveness of services in reaching disadvantaged smokers[13,14,15].

Two national surveys of smoking cessation coordinators in England were carried out (in 2001 and 2002) to assess key elements of service development, including the strategies employed to target disadvantaged smokers[16]. Almost all services (92 per cent) were using primary care venues in deprived areas. Seventy per cent were also locating services in secondary care and non-health care settings in deprived areas (69 per cent). Efforts were also made (71 per cent) to publicise smoking cessation in disadvantaged communities. A number of services were also training volunteers or community workers as advisers (49 per cent), an approach that later research was to find was an effective strategy in treating disadvantaged smokers[13].

The national evaluation of smoking cessation also assessed the extent to which services in 19 (former health authority) areas were reaching disadvantaged smokers and supporting them to set a quit date. The research found that in all areas there was evidence of ‘positive discrimination’ meaning that services were effectively reaching a higher proportion of smokers living in the most disadvantaged areas compared with more affluent areas[15]. Other studies have identified the same pattern in several different parts of England[17,18,19]. This suggests that to some extent NHS stop smoking services are reversing the ‘inverse care law’, which states that the availability of health services varies inversely with population health needs[20]

Health policy in England now includes a very explicit assumption that smoking cessation services should make a significant contribution to reducing health inequalities in relation to the headline targets associated with life expectancy and infant mortality[5] The aim of this paper is to assess whether treatment services do have a realistic role to play in reducing inequalities in smoking prevalence that might contribute to achieving the headline health inequality targets in England, and to estimate the size of any beneficial impact. It uses small area estimates of smoking prevalence and national monitoring data for NHS stop smoking services to compare changes over time between relatively advantaged and disadvantaged areas in England. For these purposes, the focus of policy attention is increasingly on a set of disadvantaged local authority areas collectively known as the Spearhead Group that accounts for about 30 per cent of the adult population.

The spearhead group is made up of 70 local authorities - and 88 NHS primary care trusts (prior to the reorganisation of October 2006) that map to them - based upon those that are in the bottom fifth nationally for three or more of the following five indicators:

- Male life expectancy at birth
- Female life expectancy at birth
- Cancer mortality rate in under 75s
- Circulatory disease mortality rate in under 75s
- Index of Multiple Deprivation 2004 (IMD) (Local Authority Summary), average score (see Box).

Box 1	Index of Multiple Deprivation

The Index of Multiple Deprivation 2004 (IMD 2004) is a measure of multiple deprivation at the small area level. The IMD 2004 contains seven Domains of deprivation: Income deprivation, Employment deprivation, Health deprivation and disability, Education, skills and training deprivation, Barriers to Housing and Services, Living environment deprivation and Crime. Each Domain contains a number of indicators. The criteria for inclusion of these indicators are that they should be 'domain specific' and appropriate for the purpose (as direct as possible measures of that form of deprivation); measuring major features of that deprivation (not conditions just experienced by a very small number of people or areas); up-to-date; capable of being updated on a regular basis; statistically robust; and available for the whole of England at a small area level in a consistent form.

http://www.communities.gov.uk/index.asp?id=1128444

This paper is predicated on a number of assumptions. The first is that health inequalities can be expressed in terms of the average experiences of people living in areas with different levels of disadvantage. The second is that reducing inequalities in smoking will make a major contribution to reducing inequalities in life expectancy and infant mortality that are major goals of health policy in England. Finally, that if evidence can be found that smoking cessation services are helping proportionately more smokers to quit in spearhead areas than in other parts of England then this constitutes prima facie evidence of a contribution to reducing health inequalities.

Methods

Small area synthetic estimates of smoking prevalence rates for electoral wards in 2000-02 and then aggregated to the level of PCTs were obtained from the ONS Neighbourhood statistics website[21]. All other data about the relative sizes of adult populations, the numbers of people treated by smoking cessation services and the numbers who self-reported quitting at four week follow up were obtained from annual statistical reports produced by the DH[22,23,24]. Population data were derived from resident population mid-2003 figures based on the 2001 census counts provided by the Office of National Statistics in April 2004 and reported in Statistical Bulletins on NHS Stop Smoking Services[23]. Monitoring of the NHS stop smoking services is carried out through quarterly monitoring returns as set out in guidance issued in 2001[25].

Key indicators employed in this study are the estimated numbers and proportions of smokers who receive treatment services and self report quitting at four week follow up together with estimates of the cessation rate in the Spearhead Group and other areas. The statistical significance of differences between areas is shown using Pearson’s chi-square. Simple measures of health inequality are calculated in terms of absolute rate gaps and relative rate ratios (with 95% confidence intervals) between the Spearhead Group on the one hand and non-Spearhead areas and England as a whole.

The estimated smoking prevalence rate for PCTs was applied to adult population sizes to estimate the actual numbers of smokers in each area in 2003. These data were then aggregated to produce 2003 baseline estimates of the numbers of smokers in Spearhead group and other areas. These statistics were combined with national monitoring data to obtain estimates of the proportion of smokers treated and successfully quitting at 4 weeks in spearhead and non-spearhead areas. Estimates of the impact of services on prevalence rates were obtained by deducting estimates of the numbers of smokers successfully quitting at 4 weeks and by applying a more realistic estimate of probable one year success rates based on a detailed analysis of 52 week CO validated follow up[14], which reported that approximately three-quarters of short term quitters relapse within one year.

Reanalysis of data obtained from Ferguson et al suggests that relapse rates may be higher in the most disadvantaged areas comprising approximately 30 per cent of the population (broadly equivalent to the Spearhead Group), but the rates are not statistically significantly different between smokers living in the most disadvantaged three deciles of the distribution (74.6 per cent: 95% CIs 67.4, 81.8) and other parts of England (71.3 per cent: 95% CIs 57.7, 84.8). As a result, we assume an average relapse rate of 75 per cent for both Spearhead and non-spearhead areas.

Results

Table 1 provides baseline information for 2003 about the relative size of the adult population in spearhead and non-spearhead areas together with synthetically-estimated data about smoking prevalence rates from which the total number of smokers are derived. Approximately 30 per cent of the adult population of England lived in spearhead areas in 2003 compared with 35 per cent of all smokers. The difference between the estimated prevalence rate in the spearhead areas (29.2) and non-spearhead areas (24.0) is one indicator of the health gap that can be expressed both as an absolute rate gap (5.2) and a relative rate ratio (1.21).

Table 2 summarises national monitoring data about NHS Stop Smoking Services in England, for the period 2003/4 to 2005/6. Column 2 shows the number of smokers setting a quit date, which is the only measure available of those smokers who were treated by the services. Column 3 shows the number of self-report quitters at four-week follow-up. In total, almost 1.5 million smokers were treated in England during the period as a whole. Fifty-five per cent (832,678) of smokers accessing treatment services and setting a quit date self-reported that they had quit at short-term follow up.

Column 4 shows that the cessation rate was lower (52.6% overall) in the Spearhead Group areas than elsewhere (57.9%) ($p < .001$). On the other hand, column 5 indicates that the proportion of all smokers treated was higher (16.7%) in the more disadvantaged areas than in the remainder of England (13.4%) ($p < .001$). The net results are shown in columns 6 and 7. Overall, the proportion of all smokers who were estimated to have quit at 4 and 52 week follow up was higher in the spearhead areas (8.8% and 2.2%) than elsewhere (7.8% and 1.9%) ($p < .001$).

It is important to note that the statistics shown in Table 2 assume that each smoker treated is a unique individual, but this assumption is almost certainly incorrect. An unknown but probably relatively small number of smokers will have undertaken more than one course of treatment during the period under review. To the extent that this is the case, the estimates shown in Table 2 will tend to overestimate the impact of services.

Table 3 illustrates the impact of smoking cessation services on some conventional measures of health inequality. The second column of Table 3 shows baseline smoking prevalence data for 2003 together with four indicators of inequality; the absolute rate gaps and relative rate ratios (ARG1, RR1) between the Spearhead and non-Spearhead areas, and between the Spearhead Group and England as a whole (ARG2, RR2). For example, it is estimated that in 2003 the adult smoking prevalence rate in the Spearhead Group areas was approximately 29.2 per cent compared with about 24 per cent in the more advantaged parts of England; an absolute rate gap of 5.2 percentage points and a relative rate ratio of 1.21489 (CIs: 1.216449, 1.213332).

The third column of Table 3 uses the data from Table 2 to estimate the size of the potential impact of NHS Stop Smoking Services on inequalities. Column 3 makes the assumption – based on a detailed analysis of 52 week CO validated follow up[14]– that 75 per cent of short term quitters will relapse within less than one year. This implies small reductions in prevalence rates across the board, and a small narrowing of inequalities. For example, it is estimated that the absolute rate gap between Spearhead and non-Spearhead areas was reduced from 5.2 to 5.0, and the relative rate ratio from 1.21489 (CIs: 1.216449, 1.213332) to 1.21175 (CIs: 1.213317, 1.210174), between 2003 and 2006.

Discussion

Perhaps the most important finding in this paper is that lower success rates for disadvantaged groups do not necessarily exacerbate inequalities. The social distribution of prevalence rates is only partly a function of the success rate; it also depends on the relative numbers of smokers in different social groups or disadvantaged areas who are treated.

This study examined the extent to which NHS stop smoking services were treating smokers in disadvantaged groups and supporting them to quit. Although disadvantaged groups had proportionately lower success rates than their more affluent neighbours, services were treating many more clients in disadvantaged communities. Overall, therefore, the net effect of service intervention was to achieve a greater proportion of quitters amongst smokers living in the most disadvantaged areas. This is a considerable achievement, particularly given existing research evidence regarding some of the challenges of accessing and supporting disadvantaged populations to change their health behaviours[26].

The findings reported here are consistent with a number of other studies in showing that cessation rates are lower among more disadvantaged groups. Detailed analyses of the impact of smoking cessation services in the UK - in places as varied as Cumbria, Glasgow and Nottingham, in different settings such as specialist groups, one to one counselling or community pharmacies, and with different follow-up times and processes – have all found that smokers living in more disadvantaged areas have a higher probability of being more addicted and have lower cessation rates than those living in less deprived areas[27,13,14]. However, the results in this paper also support previous studies showing that NHS stop smoking services are particularly successful at reaching smokers living in the most disadvantaged areas[15,17,18,19].

The value of this study is constrained by its reliance on national monitoring data collected by local services and submitted to the Department of Health. The data record a quit attempt (in the form of a quit date set) and the four week outcome related to a single quit attempt. A person can set a quit date with the services more than once in a year, but this is unusual and therefore the incidence of ‘double counting’ is likely to be small. However, what is unknown is whether any double-counting varies between Spearhead and non-Spearhead areas. Any substantial and systematic variation between the two could account for the observed differences in rates of treatment. In addition, the study estimates one year outcomes based on research evidence regarding the expected rate of relapse between four weeks and one year. We know from other studies that relapse can continue beyond one year[28].

It is also possible that relapse rates vary by areas in relation to the level of disadvantage. However, the existing evidence does not support this. Outcomes data from the national evaluation of smoking cessation show that relapse rates are almost identical in contrasting areas. In Nottingham, which is relatively disadvantaged, the CO validated 4 week cessation rate was 47.4% whereas in the relatively more advantaged Cumbria it was 58.4%[13]. However, the proportion of 4 week quitters who had relapsed by 52 week follow up was almost identical; 74.6% in Cumbria and 75.3% in Nottingham[14].

Another point worth noting is that the study is limited to NHS stop smoking services and therefore does not include the large number of smokers who quit without formal support or who stop following brief advice from their GP or other health professional and use of appropriate pharmacotherapies[29]. Insofar as these efforts might have a greater impact in non-spearhead areas then they would tend to exacerbate inequalities in smoking rates and increase the size of the equity dimension of the task facing NHS stop smoking services.

Despite the emerging evidence of modest effectiveness outlined in our analysis, the impact of NHS stop smoking services on reducing inequalities in smoking prevalence is likely to be small. In part, of course, this is because NHS services can do nothing to change the social circumstances of smokers that give rise to and perpetuate inequalities. Nevertheless, it is worth asking what more can be done. First, in order to maximise the potential contribution of NHS stop smoking services, added investment is required to continue to allow services to expand, particularly in communities where smoking prevalence rates are highest. Some services across England currently have waiting lists to see clients and there is little doubt that more resources would permit them to treat larger numbers of smokers. Additional funding for service development would also allow services to operate in a wide range of settings (including, importantly, community pharmacies), maximising their accessibility to smokers. Equally importantly, quit rates amongst disadvantaged smokers, who tend to be heavily addicted, need to be improved. There is very limited research evidence to guide services on how best to do this. It is possible that some smokers may benefit from more intensive interventions in terms of more frequent contact with trained advisers or additional pharmacotherapy, but more evidence is required. More innovative approaches, in particular in relation to relapse prevention, are also needed if outcomes are to improve.

Secondly, and perhaps more importantly, services should be seen as just one part of a broader tobacco control strategy at national and local level. The other strands involve: banning smoking in public places and reducing exposure to second hand smoke; reducing tobacco promotion through the implementation of the Tobacco Advertising Act 2002; communications and education, with continued investment in hard-hitting advertising campaigns; tobacco regulation, including picture warnings on cigarette packets; raising tobacco taxes by more than the rate of inflation; and continuing attempts to reduce the availability and supply of tobacco, with new strategies being put in place to reduce smuggling. Many of the measures already underway, such as banning smoking in public places, have significant potential to reduce smoking prevalence over time. What the actual impact will be on reducing inequalities between social groups and over what timescale, however, is still unknown.

Conclusion

The findings presented here outline new evidence of progress in addressing the health divide caused by smoking. They suggest that NHS stop smoking services may have a potentially important role to play in reducing inequalities, especially if they can be modified to take more effective account of the level of addiction and other adverse circumstances associated with smokers living in the most disadvantaged areas. However, substantial progress towards meeting government targets will probably be dependent on wider aspects of tobacco policy for which there is as yet virtually no evidence about their likely impact on inequalities.

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Table 1

Inequalities in Smoking, England, 2003

	Adult Population[1]	Estimated No. of Smokers[2]	Estimated Prevalence Rate
Spearhead	12,304,019	3,591,063	29.186
Non Spearhead	27,748,222	6,666,133	24.024
England	40,052,236	10,257,196	25.610

Notes:

1. Population data are derived from resident population mid-2003 figures based on the 2001 census counts provided by the Office of National Statistics in April 2004 as used in “Statistics on NHS stop smoking services in England, April 2004 to March 2005”, Statistical Bulletin 2005/03/HSCIC, NHS Health and Social Care Information Centre, Lifestyles Statistics, Table 19 and Annex B para. 4.
2. Derived from Statistics on NHS stop smoking services in England.[22,23,24]

Table 2

NHS Stop Smoking Services, England, 2003/4 – 2005/6

Area	Smokers Setting a Quit Date[1]	Smokers Quit at 4 weeks[1]	Cessation Rate	Treated as % of all smokers	4 week Quit as % of all smokers	52 week quit smokers as % of all smokers
	N	N	%	%	%	%
Spearhead	599,361	315,219	52.6	16.7	8.8	2.2
Non Spearhead	894,247	517,459	57.9	13.4	7.8	1.9
χ^2 (df:1)	-	-	4,044	20,127	3,226	761
p value			<.001	<.001	<.001	<.001

Notes:

1. Derived from Statistics on NHS stop smoking services in England.[22,23,24]

Table 3

Inequalities in Smoking, England, 2003 - 2006

Area	Smoking Rate 2003	2006 [1]
	%	%
Spearhead	29.2	28.6
Other	24.0	23.6
England	25.6	25.1
ARG 1 [2]	5.2	5.0
ARG 2 [3]	3.6	3.5
RR 1 [4]	1.21489 CIs: 1.216449, 1.213332	1.21175 CIs: 1.213317, 1.210174
RR 2 [5]	1.140 CIs: 1.141, 1.138	1.138 CIs: 1.139, 1.136

Notes

1. 2003 prevalence rates less cumulative number of 4 week quitters from April 2003 to March 2006, adjusted for 75 per cent relapse rate
2. Absolute rate gap between Spearhead and non Spearhead areas
3. Absolute rate gap between Spearhead and England
4. Relative rate ratio between Spearhead and non Spearhead areas
5. Relative rate ratio between Spearhead and England

Part V

Health related behaviours: obesity and physical activity

Chapter 22

European overview of educational disparities in diabetes and the role of obesity

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Abstract

Background

In Western societies, a lower educational level is often associated with a higher prevalence of diabetes. Obesity is a known risk factor for diabetes. It remains largely unknown to what extent inequalities in obesity can explain inequalities in diabetes, and whether this contribution differs between countries OBJECTIVES: To assess the contribution of relative body weight to inequalities in diabetes across Europe.

Design

Data were derived from national health interview surveys from 17 European countries (*N* = 1 391 – 71 125; ages 45 years and older). Multivariate regression analyses were employed to measure educational inequalities in diabetes. We assessed obesity's possible explanatory role by controlling for relative body weight.

Results

Among people with lower education diabetes was 1.5 and 2.7 times more common for men and women, respectively. Obesity was 1.6 times and 1.9 times among men and women with lower education. Inequalities in both diabetes and obesity were generally larger among women, especially those from southern European countries. Large inequalities in diabetes appeared to go in tandem with similarly large inequalities in obesity, and vice versa. In Europe as a whole, obesity explained 26 % (men) and 36 % (women) of the inequalities in diabetes.

Conclusion

Obesity is a major explanatory factor for inequalities in diabetes. In Europe, inequalities in obesity appear to translate in similar-sized inequalities in diabetes. Combating inequalities in obesity prevalence is very likely to also impact inequalities in diabetes, especially in Southern Europe.

Introduction

Diabetes and obesity are strongly linked. Indeed, the intimate relationship between diabetes (Type II diabetes will in this text be referred to as 'diabetes') and obesity has given rise to the term "diabesity" to characterize the close association of these two disorders [1]. Obesity is an established risk factor for diabetes. Obesity and its associated risks are said to kill 320 000 men and women annually Western Europe [2] – a given that illustrates the emergency of finding effective and efficient entry-points for intervention..

The prevalence of both diabetes and obesity vary throughout the population. In Western countries, the risk of developing diabetes and risk factors associated with the disease are linked to a low socioeconomic position (SEP)[3,4,5,6]. The relationship between SEP and diabetes has been demonstrated when SEP was operationalized as deprivation [4,5,7-9] or educational [10-12], income [12-14] or occupational level [15-17]. For example, more diabetic and obese patients were found to live in deprived areas [5]. Hazard ratios of diabetes were found to decrease with increasing levels of education in both men and women, although patterns were not always perfectly regular[10,11]. As is the case with obesity [18], the SEP gradient of diabetes is generally found to be steeper or more regular in women [19], meaning that the difference in likelihood of having diabetes between most and least advantaged groups is greater among women.

The quantitative contribution of relative body weight to the risk of diabetes is not yet clear. Several studies concluded that established risk factors for diabetes, such as physical activity and obesity, contributed in part to the risk of diabetes but could not fully account for the SEP differences in diabetes. This would provide proof for the existence of other, unknown risk factors for diabetes. Because of this focus on unexplained variations, few studies quantified the unique contribution of individual risk factors (such as obesity) to the risk of diabetes.

An investigation that was part of the NHANES I study[11] found that adjustment for BMI and four other potential mediators (physical activity, smoking, alcohol use, diet) resulted in attenuated educational gradient of diabetes among women, but found no effect in men. BMI at age 25 was used as a measure for lifetime weight. The unique contribution of BMI to the risk of having diabetes was not established.

A Swedish study[17] showed that the relative contribution of BMI to the risk of diabetes was greater among women and people of lower SEP. It was found that in men, BMI explained 14 % and 21 % of the risk of having diabetes (estimated as OR) in the middle and the lowest occupational level, respectively. In women, BMI explained 18 % of the risk in the middle and 35 % of the risk in the lowest occupational class.

In the Alameda County study associations between education and diabetes were found to be largely eliminated after covariate adjustment [10]. Before adjustment for risk factors, men and women with $<$ 12 years of education had a 50 % excess risk of diabetes compared to those with more education; this percentage was halved after control for BMI and behavioural factors (physical activity, smoking status, alcohol consumption). Re-calculation of the data of this study showed that controlling for body composition led to a 35 % reduction of the risk of diabetes among the low educated, and to a 8 % reduction among the high educated.

In a Whitehall study, the explanatory value of conventional risk factors for coronary heart disease for the relationship between occupational status and diabetes was evaluated. Among men, adjustment for nine risk factors including BMI lead to a decrease in the relationship between diabetes and occupation. However, a strong inverse occupational gradient of diabetes remained even after this adjustment. Among women, however, the risk factors could entirely account for the occupational gradient. After controlling for confounders and physiological mediators (blood pressure, height, etc.) adjustment for BMI, exercise and smoking led to a small (6 %) decrease in odds for the incidence of diabetes in the middle, and to a larger decrease (13 %) in the odds for diabetes lowest occupational class [15].

In conclusion, from the findings in existing literature we conclude BMI contributes 5 – 35 % to in inequalities in diabetes. This is a fairly wide range that may be related to cultural, temporal and methodological variation. Also, countries differ in the overall rates of diabetes and obesity, for example because of international differences in welfare level or lifestyle factors. Thus, there is a need for a comprehensive and international approach.

The objective of this study is to quantify the contribution of obesity to educational inequalities in diabetes in sixteen European countries. We will investigate this in three steps. We first describe the educational inequalities in diabetes across Europe. Next, we evaluate the relationship between inequalities in diabetes and inequalities in obesity across Europe. Finally, we analyze to what extent relative body weight can explain inequalities in diabetes. European overviews of this kind are absent. We utilized a unique database compiled from national health surveys from most EU member states, which cover different geographical parts of Europe. Utilization of identical methodologies for each country facilitated international comparisons.

Methods

Data sampling

Table 1 gives an overview of the survey data that were used in this study. We used cross-sectional data of 16 countries. Most surveys dated from after 2000.

Participants

Table 2 shows demographic data of obesity and diabetes across Europe. The sample size amounted 196 660 persons (53.4 % women) and ranged from 1391 for Czech Republic to 71 125 for Italy. The lower age limit was 45 years. There was generally no upper age limit, except in Finland, Estonia and Latvia, where it was 65 years. Percentages of missing values were generally low, but the rates of missing values of diabetes were higher in France (24 %) and the Netherlands (14 %). The rates of missing values of BMI were higher Spain (15 %).

Independent variables

In each country there was a maximum of eight age categories, depending on whether there was an upper age limit or not. Sexes were always analyzed separately

Educational attainment generally had four levels and were coded according to the International Standard Classification of Education (ISCED) [20]. This classification was designed to enable international comparability of educational systems. This variable had four descending levels: (1) ‘Tertiary education’ (corresponding to ISCED 5-6); (2) ‘Upper secondary and post-secondary non-tertiary’ (ISCED 3-4); (3) Lower secondary education (ISCED 2) and ‘No or only primary education’ (ISCED 1).

The BMI was calculated from the self-reported weight (kilograms) divided by the squared height (meters). When BMI was used to predict inequalities in diabetes, it was categorized in ten categories of three BMI points each (10-12, 13-15, …., 43-45). BMIs below ten were considered missing values.

Dependent and miscellaneous variables

The survey items about diabetes aimed to measure whether the respondent currently had diabetes type I or type II. The presence of this disease was measured (if available) in a recall period of 12 months. In the original surveys this disease was called ‘diabetes’ (most countries) or ‘diabetes mellitus’ (Belgium) or ‘high blood sugar (diabetes)’ (Estonia, Slovak Republic). In Sweden it had been scored by a GP according to the ICD-10 classification system [21]. It had either two (‘yes’, ‘no’) or three (‘yes’, ‘have had’, ‘have never had’) response categories. In the latter case, only respondent who *currently* had diabetes scored positively on this disease.

When BMI was used for the calculation of prevalence rates, it was divided into four categories: (1) underweight ($10 \leq \text{BMI} < 18$) (2) normal weight ($18 \leq \text{BMI} < 25$) (3) moderately overweight ($25 \leq \text{BMI} < 30$) and obese ($\text{BMI} \geq 30$). In order to give an equal weight to each country the pooled analyses were weighted to simulate equal sample size. Relatively small samples assigned relatively large weights to individual respondents, and vice versa.

Statistical analyses

Prevalence rates were age-standardized using the direct method. The European Standard Population of 1995 was used as a reference. The Prevalence Rate Ratio (PRR) expresses the prevalence of a condition (e.g., diabetes) in the group of interest relative to the prevalence of that condition in the highest educational level. PRRs and 95% confidence intervals were estimated by regression with the log link function and assuming binomial distribution [22] using the Genmod procedure of SAS[23]. PRRs were always adjusted for age category and, where applicable, for country.

The log-binomial approach to calculating PRRs is known for its numerical instability when the maximum likelihood estimates of the prevalences approaches or surpasses 100 %. Given the binomial error distribution, estimates over 100% cannot be evaluated with the standard approach. Therefore, when model and data did not converge, PRR estimates were calculated using the COPY Method[24], using 1000 copies. This method consists of expanding the original data set to include a large number of copies of the original data set together with one copy of the original data set with cases and controls reversed. The estimated standard error of the prevalence ratio on the expanded data set is then adjusted to obtain the correct estimate of this standard error.

The Relative Index of Inequality (RII)[25-27] is a summary measure of the magnitude of inequalities in diabetes prevalence across all educational groups. It takes into account both the population size and the relative educational level of groups. The ranking variable was created by quantifying each educational level as the proportion of the population that had a higher position in the educational hierarchy. The RII was expressed as PRR.

The explanatory value of obesity for the relationship between educational level and diabetes was quantified by calculating the percentage change in the PRR of diabetes before and after controlling for BMI category (10 units). The following formula was used:

$$\Delta\,\% = (PRR_{[before\ control]} - PRR_{[after\ control]}) / (1 - PRR_{[before\ control]}) * 100\%$$

The formula used in existing literature[28,29] was modified in such a way that a decreased PRR after control for BMI was expressed as a negative value, and vice versa.

Results

Table 3 shows age-adjusted prevalence of diabetes in three BMI categories for men and women. Among men, diabetes is 1.7 and 2.6 more common among those with overweight and obesity, respectively. The prevalence of diabetes in each of the three BMI categories differs between countries. Among obese men, diabetes is least common in the Latvia and Estonia and most common in Hungary. Among women, diabetes is 1.7 and 3.1 more common among those with overweight and obesity, respectively. Among obese women, diabetes is least common in the Lithuania and Latvia, and most common in Hungary and Czech Republic.

Table 4 shows RIIs, expressed as PRR of obesity for both sexes. For men in Europe at large the RII was 1.65. The RII was slightly below one in Latvia, indicating an excess of obesity among men of higher education. The inequalities in obesity were largest in France, Norway and Italy (RII ≥ 2.46). All confidence intervals were small enough to assume reasonable precision. Among women, inequalities in obesity were generally larger than those among men. For women in Europe at large the RII was 2.20.The inequalities were smallest in Lithuania, Latvia, Hungary and Norway (RII ≤ 1.77) and largest in Southern European countries (RII ≥ 3.93).

Figure 1 shows an overview of the prevalence of diabetes by educational level across Europe for men and women. Diabetes was more common among men of the lowest and second-lowest educational class. In most cases, a regular pattern of increasing prevalence of diabetes with decreasing level of education could be seen. The overall level of diabetes was lower in the Baltic and the Nordic countries. For women, more or less the same picture applied, but the overall level of diabetes was lower and the educational differences in the prevalence of diabetes were generally greater. The overall prevalence of diabetes was higher in Czech Republic, Hungary and Germany.

Table 5 shows RIIs of diabetes, expressed as PRRs, before and after control for BMI, stratified by country among men. In Europe at large, inequalities in obesity explain about 26 % of the inequalities in diabetes among men. Obesity’s ability to explain inequalities in diabetes varied. In Latvia and Hungary, obesity did not explain inequalities in diabetes. Conversely, obesity explained about one third or more of the inequalities in diabetes in France, Germany, Italy, Estonia and about half or more in the Netherlands, Finland and Sweden. In absolute terms, obesity explained most of the variance of diabetes in France, Estonia and Czech Republic. The estimates could be considered accurate as shown by reasonably narrow confidence intervals.

Table 6 shows RIIs of diabetes, expressed as PRRs, before and after control for BMI, stratified by country among women. The educational inequalities in diabetes varied greatly across Europe. In Europe at large, inequalities in obesity explained about 36 % of the inequalities in diabetes among women. Obesity’s ability to explain inequalities in diabetes varied from 20-25 % in Czech Republic, Lithuania and Hungary to 73 % in Estonia. The RIIs were below two in Lithuania, Finland, Estonia, Norway and Hungary and above four in the Mediterranean countries and Czech Republic. The PRR estimates sometimes had wide confidence intervals, which indicates lack of precision. The absolute differences before and after control for obesity were largest in the Mediterranean countries.

Figure 2 shows scatterplots that illustrate the relationship between educational inequalities in diabetes and obesity among men and women. For men, the magnitude of the inequalities in diabetes appeared to generally coincide with those in obesity. Countries with large inequalities in obesity had more or less comparably large inequalities in diabetes, and vice versa. In Latvia, diabetes was more common among those with a lower educational level, while obesity was more common among the higher educated. For women, a similar, but amplified picture applied. There was a more or less one-on-one relationship between inequalities in diabetes and obesity. The southern European countries had the largest inequalities in both measures.

Discussion

Compared to the highest educational level, diabetes was 1.5 times more common, and obesity was 1.6 times more common among men of lower education. Among women of lower education, diabetes and obesity were 2.7 and 1.9 times more common, respectively. Inequalities in both diabetes and obesity were generally larger among women. Inequalities in diabetes and obesity were smallest in Latvia and Lithuania (men and women) and largest in the southern European countries (women). Large inequalities in diabetes appeared to go in tandem with similarly large inequalities in obesity, and vice versa. In Europe as a whole, obesity explained 26 % (men) and 36 % (women) of the inequalities in diabetes

There were several issues that should be considered before drawing conclusions from these analyses. One such issue is self-report bias. There appears to be a fairly close match between the self-reported and the 'true' level of diabetes [30]. One study found that physician-diagnosed diabetes usually (in 93 % of the cases) is also detected by self-reports [31]. However, recent estimates indicate that about 35 % of all Americans with diabetes have not been diagnosed [32], which probably means that self-reports yield similar underestimations. Nonetheless, educational differences in misreporting of diabetes were found to be small or absent in a number of studies [31,33,34].

Similarly, people with a high true BMI have a tendency to underreport their weight, while most people overreport their height [35]. A self-report-based BMI is therefore likely to be an underestimation of the corresponding true BMI. Most [36-39], but not all [40,41], studies found that people with lower education overestimated their height more than their higher educated counterparts, which would lead to underestimations of inequalities in BMI. In absolute terms, however, the differences may be less important [42].

In conclusion, we cannot exclude the possibility of an educational gradient in the self-report bias in diabetes, weight and height. In absolute terms, however, this effect appears to be small. The fact that diabetes often goes undetected, and hence cannot be reported does in itself not necessarily mean that the educational differences in diabetes are affected, but the possibility cannot be excluded.

We confirmed the results of other studies that obesity appears to mediate at least part of the association between SEP and diabetes [10,11,15]. Our finding that socioeconomic differences in diabetes [4,43] and obesity [44] were larger among women is generally also found in other studies. We found that, in Europe at large, BMI explained 22 % of the inequalities in diabetes among men, and among women about twice that percentage. The findings in of other studies [17,10,15] vary from 5 – 35 % among women. For men, the percentages are generally lower.

The socioeconomic differences in diabetes and obesity were generally larger among women in Southern European countries An international study found that educational differences in total energy intake tended to be larger in southern than in northern European countries. A similar, but attenuated picture applied to physical activity [45]. Role patterns in the Mediterranean countries may be more 'traditional' than those of other European countries, which may help explain the striking inequalities among women. For example, labour participation among women is relatively low, compared to most other European countries [46]. Especially for women with primary and lower secondary education, working in the labour market appears to be scarcely compatible with child rearing [47]. Conversely, for Mediterranean women of higher education, the relation between fertility and labour participation is null [48]. Parity itself may be closely related to obesity [49]. Second, a lower degree of labour participation may be related to smaller amounts of physical activity [50].

In the Baltic countries and Hungary, the stage socioeconomic development may play a role. Chronic diseases like obesity and diabetes have long been viewed as 'diseases of affluence'[44]. This would explain the positive socioeconomic gradient in for example obesity that is still seen in some developing countries. However, depending on (among others) national welfare level, this pattern slowly shifts to a situation where the burden of disease lies on the socioeconomically disadvantaged [51]. The Baltic countries and Hungary may be in an earlier phase of socioeconomic development than the 'western' countries, where clear negative gradients in both diabetes and obesity are already present.

Something that may be at odds with external findings is the low (overall) prevalence of diabetes in the Baltic countries and Hungary. It is known that high-fat diets, alcohol use and smoking are more common in the Baltic countries and Hungary. These factors are all risk factors for diabetes and yet the overall prevalence of diabetes is among the lowest in Europe. This is especially surprising in case of the men of this region. One explanation for this lies in the quality of the healthcare system in these countries, which is relatively poor [52]. This may imply that a relatively large overall percentage of diabetes cases go undetected. Moreover, patient's educational level may be a predictor for healthcare accessibility and utilization, as the availability of healthcare for people of lower strata may be more limited [53]. This would mean that cases of diagnosed diabetes are skewed towards the higher end of the educational spectrum. To a lesser extent, this upstream mechanism may also work in other countries, thus increasing inequalities in diabetes.

Implications and conclusion

Almost anywhere in Europe, but especially in Southern Europe, obesity is a major explanatory factor for inequalities in diabetes. Across Europe, larger inequalities in obesity appear to translate in comparably large inequalities in diabetes. Combating inequalities in obesity prevalence is very likely to also impact inequalities in diabetes, especially in Southern Europe.

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Tables and figures

Table 1. Overview of the national surveys used in this study

Country	Name of survey and responsible institute	Year(s) of survey
Finland	Finbalt Health Monitor National Public Health Institute, Helsinki	1994/'98/'00/'02/'04
Sweden	Swedish Survey of Living Conditions (ULF) Statistics Sweden, Stockholm	2000/’01
Norway	Norwegian Survey of Living Conditions Statistics Norway, Oslo	2002
Denmark	Danish Health and Morbidity Survey (DHMS/ SUSY) Danish National Institute of Public Health , Copenhagen	2000
Ireland	Living in Ireland Panel Survey Economic and Social Research Institute (ESRI), Dublin	1995/'02
England	Health Survey for England (HSE) Department of Health, London	2001
Netherlands	General social survey (POLS) Statistics Netherlands, Voorburg	2003/'04
Belgium	Health Interview Survey Institute of Public Health (IPH), Brussels	1997/'01
Germany	German National Health Examination and Interview Survey Robert Koch Institute (RKI), Berlin	1998
France	French Health, Health Care and Insurance Survey (ESPS) Institut de recherche et documentation en économie de la santé (IRDES), Paris	2004
Italy	Health and health care utilization National Institute of Statistics (ISTAT), Rome	1999/'00
Spain	National Health Survey Ministry of Health and Consumption (MSC), Madrid	2001
Portugal	National Health Survey Instituto Nacional de Saude Dr Ricardo Jorge (INSARJ), Lisbon	1998/’99
Slovakia	Health Monitor Survey Public Health Institute of Slovak Republic, Bratislava	2002
Hungary	National Health Interview Survey Hungary National Public Health and Medical Officer Service (NPHMOS), Budapest	2000/’03
Czech Rep	Health Interview Survey Institute of Health Information and Statistics of the Czech Republic	2002
Lithuania	Finbalt Health Monitor	1994/'98/'00/'02/'04
Latvia	Finbalt Health Monitor	1998/'00/'02/'04
Estonia	Health Behavior among Estonian Adult Population National Institute for Health Development, Tallinn	2002/'04

Table 2. Demographic data

Country	N_{total}	Educational distribution				Diabetes Missing (%)	BMI Missing* (%)	Highest age cat.
		Lowest	Second lowest	Second highest	Highest			
		%	%	%	%	%	%	
Finland	11,017	24.3	10.8	48.5	16.5	0.0	1.3	65
Sweden	6,896	22.7	7.5	43.8	26.0	0.0	3.3	none
Norway	4,003	-	23.0	52.2	24.6	0.1	2.2	none
Denmark	10,198	27.5	3.3	51.7	17.6	0.2	2.0	none
Netherlands	9,717	19.5	24.7	33.8	22.1	14.0	2.3	none
Belgium	11,071	29.6	23.9	24.3	22.2	1.3	3.4	none
Germany	4,285	2.3	51.8	30.7	15.2	4.9	0.7	none
France	10,392	28.3	38.6	13.4	19.8	3.4	7.0	none
Italy	71,125	53.3	21.6	19.1	5.9	0.0	0.0	none
Spain	11,569	62.1	18.8	10.2	8.8	0.0	14.7	none
Portugal	25,852	84.8	7.0	3.4	4.8	0.1	2.6	none
Hungary	6,487	41.7	22.0	23.0	13.3	0.4	1.9	none
Czech Republic	1,391	23.7	38.3	24.9	13.0	0.0	0.4	none
Lithuania	6,213	20.9	26.0	34.7	18.4	0.0	1.9	none
Latvia	4,188	22.2	21.2	36.2	20.5	0.0	2.6	65
Estonia	2,256	19.3	26.0	35.4	19.4	4.0	1.5	65
Total	196,660	30.1	22.8	30.3	16.8	1.9	3.0	-

Note.
Ages 45 years and older
Hyphen = category does not exist
* Missing values in height, weight, or both

Table 3. Age-adjusted prevalence (%) of diabetes in three BMI categories for men and women

Country	Men			Women		
	Normal weight*)	Over-weight	Obese	Normal weight*)	Over-weight	Obese
Finland	3.0	4.8	13.1	1.9	2.7	10.9
Sweden	3.0	7.4	12.4	2.9	5.3	10.6
Norway	5.2	6.0	12.7	2.8	7.2	14.3
Denmark	4.6	5.2	10.7	1.9	5.2	10.1
Netherlands	5.6	9.0	17.9	3.4	8.0	15.2
Belgium	4.2	7.5	13.7	3.1	7.4	12.9
Germany	8.1	11.0	17.4	8.2	10.4	14.1
France	6.4	10.3	19.3	2.8	7.7	19.8
Italy	6.8	8.3	13.2	5.9	8.9	15.7
Spain	8.0	11.2	13.8	6.8	9.5	15.6
Portugal	6.6	11.0	15.8	8.5	11.5	16.9
Hungary	7.1	14.7	20.6	9.7	12.6	20.2
Czech Republic	7.3	12.0	16.5	10.7	16.7	21.3
Lithuania	3.1	12.1	5.6	0.6	2.2	4.4
Latvia	1.4	3.1	8.5	1.4	2.3	6.9
Estonia	4.0	5.9	9.9	3.0	7.5	20.8
Total	*5.3*	*8.7*	*13.8*	*4.6*	*7.8*	*14.4*

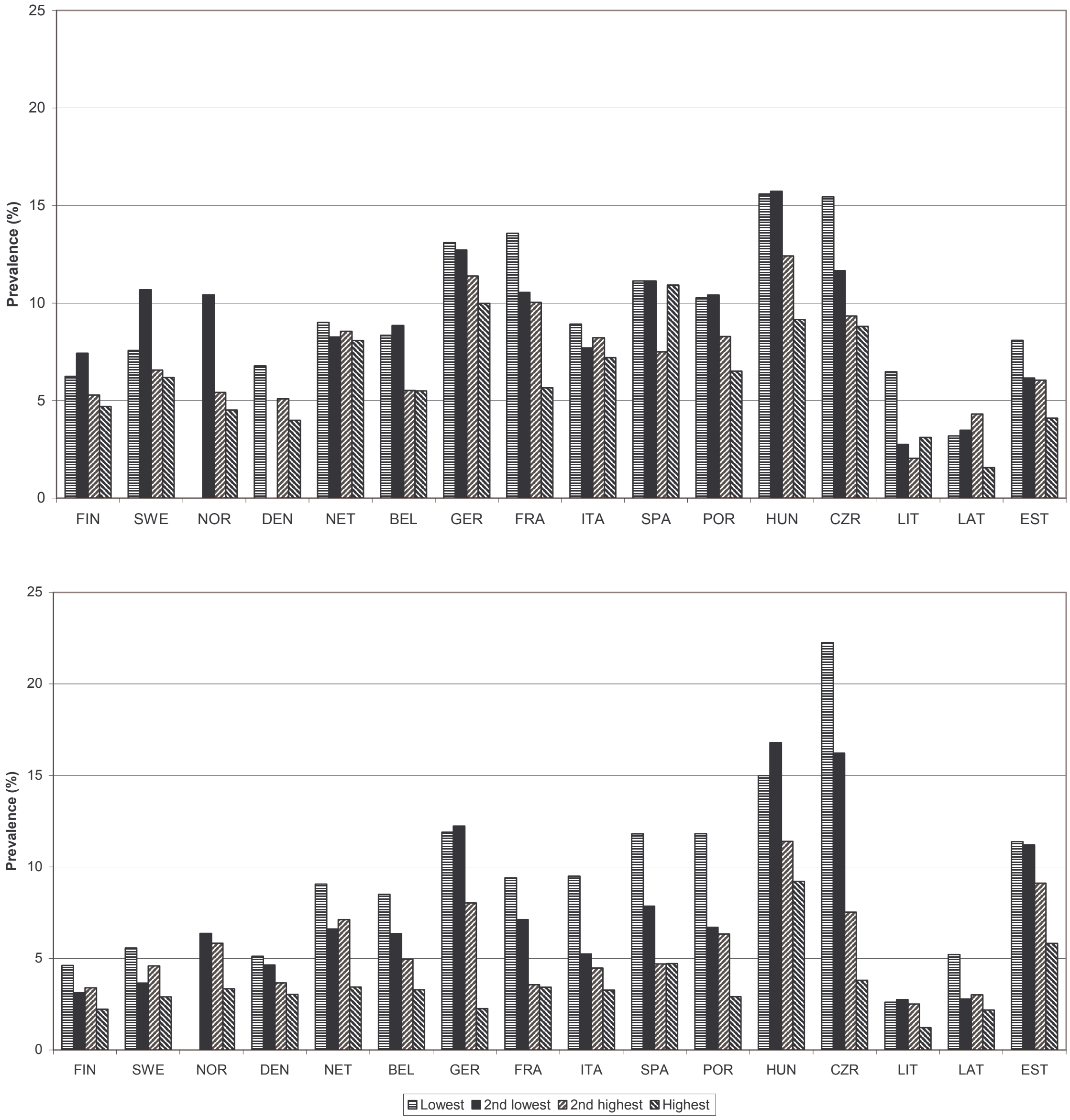
Note. * Underweight not included

Table 4. Relative indexes of inequality of obesity, expressed as prevalence rate ratios (men and women)

Country	Men		Women	
	PRR	Low Up	PRR	Low Up
Finland	1.71	(1.34- 2.18)	1.81	(1.41- 2.32)
Sweden	1.92	(1.34- 2.77)	2.02	(1.39- 2.93)
Norway	2.71	(1.51- 4.87)	1.77	(1.02- 3.07)
Denmark	2.41	(1.78- 3.26)	2.92	(2.10- 4.05)
The Netherlands	2.27	(1.65- 3.11)	2.12	(1.55- 2.91)
Belgium	1.98	(1.56- 2.52)	3.75	(2.89- 4.87)
Germany	1.67	(1.25- 2.24)	3.07	(2.23- 4.22)
France	2.80	(2.02- 3.89)	4.62	(3.29- 6.50)
Italy	2.46	(2.18- 2.78)	4.65	(4.02- 5.37)
Spain	1.72	(1.29- 2.29)	3.93	(2.82- 5.46)
Portugal	2.36	(1.78- 3.13)	4.89	(3.58- 6.67)
Hungary	1.26	(0.97- 1.64)	1.70	(1.35- 2.13)
Czech Republic	1.76	(0.94- 3.30)	3.20	(1.96- 5.20)
Lithuania	1.01	(0.75- 1.38)	1.42	(1.14- 1.76)
Latvia	0.88	(0.59- 1.33)	1.44	(1.14- 1.82)
Estonia	1.18	(0.70- 1.98)	2.26	(1.57- 3.25)
*Total****	*1.65*	*(1.53- 1.78)*	*2.20*	*(2.06- 2.35)*

Note.
* Total PRRs and associated 95% confidence intervals (CI 95%) were weighted to simulate equal sample size for each country. Lower and upper boundary of the CI 95% is parenthesized.

Figure 1. Prevalence of diabetes by educational level across Europe for men (above) and women (below)



Note. (1) Norway does not have a category “Lowest education” (2) In Denmark (men), the group size of the second-lowest educational group is *N* = 8. This prevalence estimate was therefore omitted.

Table 5. Prevalence rate ratios expressed as relative index of inequality of obesity and diabetes by country (MALES)

Country	[1] Diabetes			[2] Diabetes, contr.*			□ %**
	PRR	low	high	PRR	low	high	[1 - 2]
Finland	1.47	(0.93-	2.31)	1.22	(0.78-	1.90)	-53.6
Sweden	1.38	(0.80-	2.36)	1.18	(0.68-	2.04)	-51.9
Norway	3.46	(1.64-	7.30)	3.26	(1.52-	7.02)	-8.0
Denmark	1.93	(1.17-	3.19)	1.7	(1.03-	2.82)	-24.7
Netherlands	1.29	(0.85-	1.95)	1.03	(0.69-	1.55)	-89.0
Belgium	1.95	(1.30-	2.92)	1.71	(1.14-	2.56)	-25.7
Germany	1.5	(0.89-	2.54)	1.33	(0.78-	2.26)	-34.9
France	2.39	(1.55-	3.68)	1.84	(1.19-	2.84)	-39.4
Italy	1.37	(1.16-	1.62)	1.24	(1.05-	1.47)	-34.3
Spain	1.36	(0.92-	2.01)	1.25	(0.84-	1.86)	-30.7
Portugal	1.71	(1.17-	2.49)	1.53	(1.05-	2.24)	-24.8
Hungary	1.94	(1.29-	2.91)	1.98	(1.32-	2.97)	4.40
Czech Republic	2.16	(0.84-	5.55)	1.79	(0.72-	4.46)	-31.9
Lithuania	0.82	(0.36-	1.89)	0.87	(0.38-	2.01)	-28.1
Latvia	1.46	(0.50-	4.22)	1.66	(0.58-	4.73)	43.8
Estonia	2.17	(0.74-	6.38)	1.78	(0.63-	5.01)	-33.7
*Total******	1.78	(1.58-	2.02)	1.58	(1.40-	1.79)	-25.6

Note.
Estimates that were obtained using the COPY method are underlined.
[*] Controlled for BMI category (ten levels)
[**] Percentage change in PRR of diabetes after controlling for BMI.
[***] Total PRRs and associated confidence intervals (CI 95%) were country-weighted
Lower and upper boundary of the CI 95% is parenthesized.

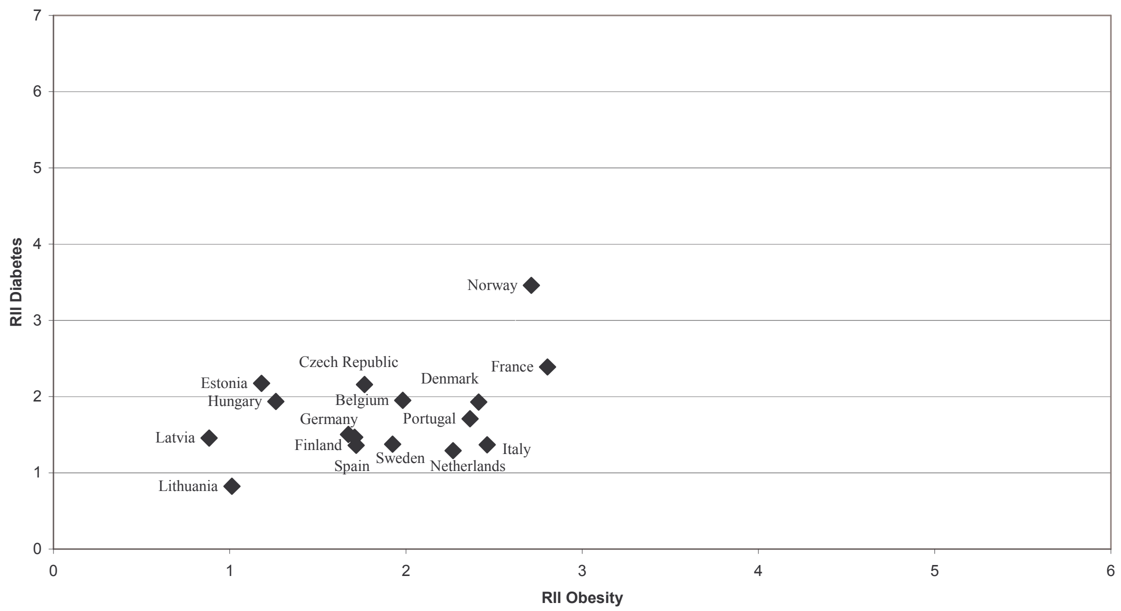
Table 6. Prevalence rate ratios expressed as relative index of inequality of obesity and diabetes by country (FEMALES)

Country	[1] Diabetes			[2] Diabetes, contr.[*]			□ %[**]
	PRR	low	high	PRR	low	high	[1 - 2]
Finland	1.76	(0.97-	3.19)	1.31	(0.73-	2.35)	-59
Sweden	2.44	(1.25-	4.79)	1.93	(1.00-	3.70)	-35.9
Norway	1.92	(0.86-	4.28)	1.52	(0.73-	3.16)	-43.3
Denmark	2.32	(1.28-	4.19)	1.64	(0.90-	2.98)	-51.4
Netherlands	2.28	(1.37-	3.79)	1.77	(1.07-	2.94)	-39.4
Belgium	3.23	(2.05-	5.08)	2.25	(1.43-	3.53)	-44
Germany	2.61	(1.26-	5.43)	2.17	(1.02-	4.60)	-27.8
France	4.49	(2.60-	7.75)	2.21	(1.29-	3.80)	-65.2
Italy	4.58	(3.65-	5.76)	3.48	(2.76-	4.37)	-30.9
Spain	4.4	(2.57-	7.51)	3.17	(1.84-	5.45)	-36.3
Portugal	6.55	(3.83-	11.20)	5.03	(2.94-	8.61)	-27.5
Hungary	1.96	(1.34-	2.86)	1.75	(1.20-	2.55)	-22.1
Czech Republic	4.96	(2.37-	10.41)	3.94	(1.93-	8.05)	-25.7
Lithuania	1.57	(0.80-	3.08)	1.43	(0.74-	2.79)	-24.6
Latvia	2.71	(1.21-	6.03)	2.05	(0.92-	4.54)	-38.4
Estonia	1.92	(0.99-	3.71)	1.25	(0.65-	2.39)	-72.7
Total[***]	2.83	(2.50-	3.21)	2.18	(1.92-	2.47)	-35.5

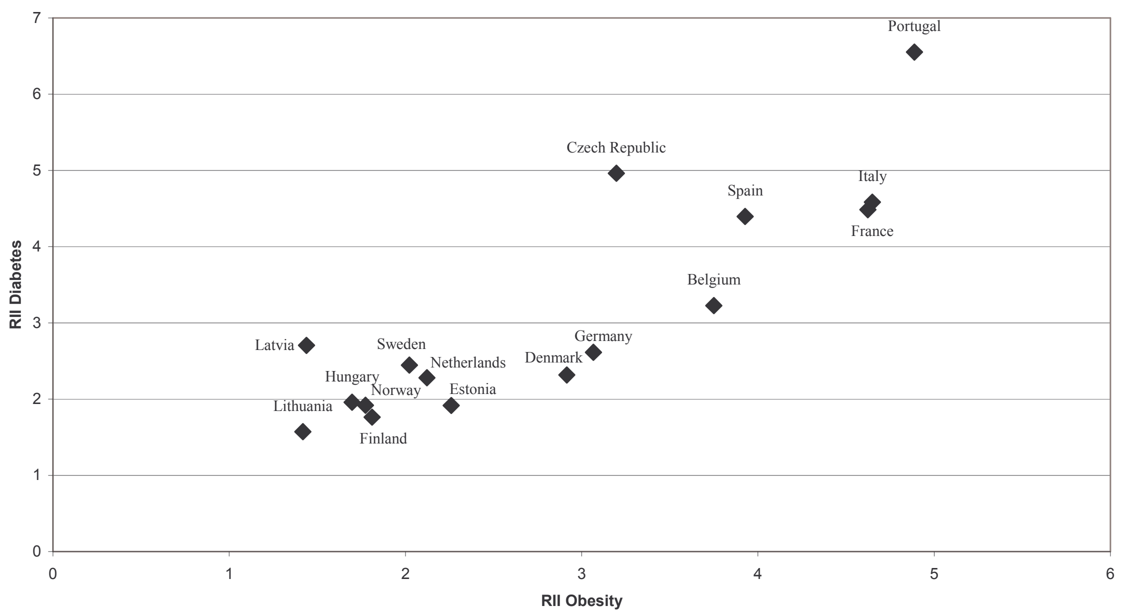
Note.

See notes previous table.

Figure 2. The relationship between educational inequalities (RII) in diabetes (y-axis) and obesity (x-axis) across Europe for men (*above*) and women and



women (*below*)



Chapter 23

Overview of inequalities in overweight and obesity across Europe

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Abstract

Background

In Western societies, a lower educational level is often associated with a higher prevalence of overweight and obesity. However, there may be international differences in the strength and direction of this relationship. General welfare level may partially explain inequalities in overweight and obesity.

Objectives

To describe educational inequalities in overweight and obesity across Europe. To explore the role general welfare level in the explanation of cross-national differences in educational inequalities in overweight and obesity in Europe.

Design

Cross-sectional data were derived from national health interview surveys from 19 European countries (*N* = 127,018; age range = 25-44 years). Multivariate regression analyses were employed to measure educational inequalities in overweight and obesity, and current smoking. Gross Domestic Product per person was used as a measure of general welfare level.

Results

Baltic and Eastern European men with a higher education were slightly more likely to be overweight or obese. Apart from those two regions, inverse educational gradients in overweight and obesity are a generalized phenomenon among European men and even more so among women. The strength of the relationship between education and overweight and obesity varies between countries. When general welfare levels increased, overweight and obesity became increasingly more common among men of lower education, while the opposite was true for men of higher education. Women did not show a clear effect of general welfare level on inequalities in overweight and obesity.

Conclusion

In most countries the burden of overweight and obesity now lies on those with lower educational attainment. When general welfare levels increased, overweight and obesity became increasingly more common among men of lower education, while the opposite was true for men of higher education. Women did not show a clear effect of general welfare level on inequalities in overweight and obesity.

Introduction

The phenomenon of socioeconomic inequalities in overweight and obesity has recently been reviewed [1] to update a well-known, older paper [2] on the same topic. Although less pronounced than in the mid-1980s, the results for women indicated that overweight and obesity are more common among women of lower socioeconomic position (SEP). The results for men were less consistent [1,2]. The observed magnitude of the inequalities in overweight and obesity varied depending on what aspect of SEP is studied. Typically, the relations are strongest when educational level is used as an indicator of SEP.

Another factor that determines the size of the 'obesity gap' is the level of socioeconomic development of a country 1,3,4. Obesity, at least until recently 5, is more common among people of higher socioeconomic status in developing countries, whereas in developed countries, the opposite is true. There are indications that, above a certain threshold, the burden of obesity shifts to the socioeconomically disadvantaged in proportion with the general welfare level 4,5. In a review, it was concluded that the shift of obesity towards women of lower SEP apparently occurs at an earlier stage of socioeconomic development than it does for men 5. Similarly, McLaren concluded on the basis of a review of 333 studies that, for both men and women, a decrease in general welfare levels positive associations between SEP and overweight and obesity become increasingly more common, while negative associations become increasingly less common 1. In sum, general and individual socioeconomic development appeared to mutually interact.

General welfare level can probably not fully explain all international patterns in inequalities in overweight and obesity in Europe. In Europe, there are at least two major geographical patterns of health, which also determine international patterns in inequalities in overweight. The first pattern is the relatively healthy lifestyle of southern Europeans as compared to other Europeans. There is evidence suggesting that adherence to the Mediterranean diet leads to a lower morbidity and mortality rates [6,7]. Nonetheless, in a paper by the International Obesity Task Force, the Mediterranean region is mentioned specifically for its high rates of overweight and obesity [8], possibly because of the decreasing popularity of the diet. It has been argued that people of lower SEP adhere less to the Mediterranean diet [9].

A second pattern is the sharp divide in health and mortality between central/eastern and western Europe [10], a pattern that has even deteriorated after the collapse of the communist regimes in 1989 [11]. This divide also becomes manifest as high prevalences of overweight and obesity in central/eastern Europe, which was estimated to be about 80 % in one study [12]. Unhealthy diet, alcohol use (higher mortality of liver cirrhosis) [10,13] and other behaviors may all be linked to the high levels of overweight and obesity in this region. Although economic hardship probably plays a role in this, social circumstances are probably also needed to explain the patterns. The feeling of little control over life and life style has been mentioned on several occasions as a possible explanation for the relatively poor health in this region [10,14]. It may be reasoned that those with the smallest 'buffer' for social stress, i.e. those of lower SEP, are most vulnerable for the effects of the social and political transition [15].

The objectives of this study are to give an up-to-date European overview of the inequalities in overweight and obesity, and to explain international patterns in those inequalities by using information on general welfare level. Strong features of this study are that (1) nineteen countries are included, (2) among which Eastern European and Baltic countries, (3) that the surveys are relatively large, and (4) that the data are relatively recent, which is important in light of the sharp rise of the prevalence of obesity over the past decades [16,17]. Research questions in this study were (1) whether the phenomenon of inverse gradients in overweight and obesity is a generalized phenomenon in Europe by now; (2) whether there are important international differences in the size of the inequalities. We hypothesized that there are socioeconomic differences in obesity everywhere in Europe, and that these are partially related to general welfare level. Primary objective of this study is to determine whether inequalities in obesity and overweight exist in every country of the study. Secondary objective is to explore the possible role of general welfare level on the magnitudes of inequalities in overweight and obesity.

The analyses will be conducted in three major steps. First, we will investigate whether there are educational inequalities in overweight and obesity in Europe as a whole. Second, educational inequalities in overweight and obesity will be stratified by country. In a third, supplementary, step the possible associations between welfare level with inequalities overweight and obesity will be explored. We will analyze to what extent general welfare level is correlated with the size of the educational inequalities in overweight and obesity in the various countries. We hypothesize that there are international differences in the size of the obesity gap. We expect that the size and directionality of these gradients depend on, among others, general welfare level.

Methods

Data sampling and participants

Table 1 gives an overview of the cross-sectional survey data that were used in this study. The total sample size was N = 127 018 and varied from N = 635 (Slovak Republic) to N = 41 613 (Italy). Most surveys dated from after 2000. Data of height and/or weight were missing in 3.1 % of all cases on average, ranging from 0.01 % (Italy) to 7.0 % (France). Sexes were always analyzed separately, except in demographic data such as sample sizes. Te analyses were limited to participants aged between 25-44 years.

Variables

Country data were usually (except for pooled estimates) analyzed separately. To correct for between-country age differences, data were adjusted for five-year age category (see below). Gross Domestic Product per capita (GDP/capita, in Euros) was used as a measure for general welfare level (International Monetary Fund, World Economic Outlook Database, September 2005).

Educational attainment generally had four levels and were coded according to the International Standard Classification of Education (ISCED) [18]. This classification was designed to enable international comparability of educational systems. This variable had four descending levels: (1) 'Tertiary education' (corresponding to ISCED 5-6); (2) 'Upper secondary and post-secondary non-tertiary' (ISCED 3-4); (3) Lower secondary education (ISCED 2) and 'No or only primary education' (ISCED 1).

The BMI was calculated from the self-reported weight (kilograms) divided by the squared height (meters). It was dichotomized into overweight (BMI $\geq$ 25) and obesity (BMI $\geq$ 30).

Statistical analyses

Prevalence rates were age-standardized using the direct method. The European Standard Population of 1995 was used as a reference. In pooled analyses, a standardized weight for country size was used to simulate equal sample sizes. The Prevalence Rate Ratio (PRR) expresses the prevalence of overweight or obesity in the group of interest relative to the prevalence of overweight or obesity in the highest educational level. PRRs and 95% confidence intervals were estimated by regression with the log link function [19] using the Genmod procedure of SAS [20]. PRRs were always adjusted for age category and, where applicable, for country.

When model and data did not converge, PRR estimates were calculated using the COPY Method [21], using 1000 copies. This method consists of expanding the original data set to include a large number of copies of the original data set together with one copy of the original data set with cases and controls reversed. The estimated standard error of the prevalence ratio on the expanded data set is then "adjusted" to obtain the correct estimate of the standard error of the prevalence ratio.

We summarized the association between overweight and each SEP indicator by calculating the Relative Index of Inequality (RII) and its 95% confidence intervals [22-24]. RII is a regression-based measure that can be applied to each SEP indicator. It assesses the association between overweight ratios and the relative position of each socioeconomic group separately. This relative position is measured as the cumulative proportion of each socioeconomic group within the socioeconomic hierarchy, with 0 and 1 as the extreme values. The resulting measure, the RII, can be interpreted as the risk of being overweight at the very top of the socioeconomic hierarchy as compared to the very lowest end of the socioeconomic hierarchy. An RII above (below) 1 indicates a negative (positive) relationship between SEP and overweight. The RII can be compared between the three SEP indicators, provided that a detailed and hierarchical classification is used for each indicator. In the same way, the RII can be used to make comparisons between countries.

Results

Table 2 shows educational inequalities in overweight among men across Europe. The inequalities are expressed as prevalences, stratified by educational level, and as RII, expressed as PRR. The size and the direction of the relationship between educational level and overweight prevalence showed considerable between-country variation. Estonia, Lithuania, Latvia, Slovak Republic and Hungary showed an increasing prevalence of overweight with an increasing level of education (PRR $<$ 1). Countries with a high overall prevalence of overweight often showed no educational inequality in overweight (PRR $\cong$ 1). France showed the largest educational inequalities in overweight (PRR = 1.63).

Table 3 is similar to the previous table and shows educational inequalities in overweight among women across Europe. Overweight was least common among the highest educated Italian (9.9 %) women, and most common among Swedish (73.5 %) and English (60.5 %) women of the lowest educational category. Educational inequalities in overweight were smallest in Ireland (PRR = 1.36) and largest in Portugal (PRR = 3.72). Inequalities were largest in Portugal and Italy; PRR $\geq$ 3.30). These countries also had the smallest overall prevalence of overweight among women.

Table 4 shows educational inequalities in obesity across Europe. Among men, the overall prevalence of obesity was 11 %, and ranged from 6.0 % in France to 21.6 % in France. Like in the previous table, considerable between-country variation in inequalities among men could be observed, both in terms of prevalence rates and RIIs. The RII indicated a positive relationship between educational level and obesity in Lithuania and Latvia (*ns*). In other cases, educational level and obesity prevalence were negatively related. Sweden, Czech Republic and the Netherlands showed the largest ‘negative’ educational inequalities in obesity (RII $\geq$ 3.61) and Ireland, Latvia and Lithuania the smallest (RII $\leq$ 1.34).

Among women, the overall prevalence of obesity was 11 %, and ranged from 5.0 % in Italy to 23.3 % in England. The educational inequalities in obesity were smallest in Latvia, Finland and Norway (RII $\leq$ 1.75) and largest in Portugal (RII = 6.78). However, these, and also the Czech, the Slovakian and the Belgian estimates were unlikely to represent the population, as indicated by wide 95 % confidence intervals.

Figure 1 shows scatterplots of the prevalence of overweight obesity (*y*-axis) by general welfare level (GDP/capita in Euros; *x*-axis), divided by educational attainment (lowest two levels combined, second-highest and highest level). Men of the lowest two educational levels showed an increase in the prevalence of overweight and obesity when welfare level increased. Conversely, men of the highest educational level showed a decrease in the prevalence of overweight and obesity with increasing welfare level. Men of the second-highest educational level were in between these two patterns. For obesity prevalence, a similar picture emerged (figure not shown).

Women of all educational levels showed a slight increase in the prevalence of overweight and obesity with increasing general welfare levels. The overall levels of overweight and obesity were always highest among women of the lowest two educational levels, except in Latvia. In England, high prevalence rates of overweight and obesity were found in all educational levels. These rates were clearly higher than those of countries with comparable general welfare levels.

Discussion

Summary of the results

After evaluating nineteen European populations, we conclude that the long-known phenomenon of inverse gradients overweight and obesity is now present almost anywhere in Europe, especially among women. Exceptions were men in all Baltic and most Eastern European countries of the study, where overweight was (slightly) more common among men with higher educational attainment. The inequalities were largest among women of Southern Europe. When general welfare levels increased, overweight and obesity became increasingly more common among men of lower education, while the opposite was true for men of higher education. Women did not show a clear effect of general welfare level on inequalities in overweight and obesity.

Evaluation of data and methods

There were several issues that should be considered before drawing conclusions from these analyses. One such issue is self-report bias. People with a high true BMI have a tendency to underreport their weight, while most people overreport their height [25]. A self-report-based BMI is therefore likely to be an underestimation of the corresponding true BMI.

Most studies found that people with lower education overestimated their height more than their higher educated counterparts, which would lead to underestimations of inequalities in BMI [26-29]. Other studies found that no evidence for educational differences in reporting bias for height [30], or that lower educational levels predicted higher levels of overestimation of height [31]. In abolute terms, however, the differences may be less important. For example, a Swedish study found that the mean difference between self-reported and measured height was 0.6 cm for men and 0.8 cm for women, which leaves little room for large socioeconomic variations [32]. Conversely, a French investigation found that higher education predicted overreporting of weight, with men and women overreporting 0.26 and 0.49 kg more compared to the lowest educational category [36]

In conclusion, while we acknowledge that self-report bias could have affected the effect size estimates, we also feel that, in absolute terms, this bias is probably small. Underreporting of height among people with higher education and overreporting of weight among people with lower education may both have lead to slight underestimations of the ‘true’ corresponding BMI. It is conceivable that these two effects cancel each other out, thereby diminishing the possible distorting effect of educational gradient in the self-report bias.

Misclassification of educational level is another potential source of bias. We applied the ISCED classification to make educational levels comparable between countries. This yielded plausible frequency distributions with good external validity [33]. Despite of this process of standardization some international comparability problems may have remained. It is impossible to completely disentangle country differences that are classification artifacts from ‘real’ country differences in educational distributions. However, we employed the RII, a measure that not only uses information on the frequency distribution (‘penalizing’ small educational categories, and ‘rewarding’ large categories), but also uses the element of hierarchy. Level of education is an intrinsically hierarchical variable, and we feel confident that this hierarchy is present and consistent in all individual survey data. Therefore, we deem it unlikely that the use of other, perhaps more refined measures of educational would have yielded systematically different patterns in educational inequalities in overweight and obesity. We do acknowledge that international differences should not be over-interpreted.

Comparison to previous studies

The general finding of an inverse relationship between education and overweight and obesity among women has been shown many times [1,2]. This also applies to the somewhat less clear picture among men. In the European Union at large, Martinez et al.[34] found that there was an inverse relationship between educational level and obesity. The relationship between obesity and educational level differed between sexes, with steeper gradients among women. However, it remained unclear whether and to which extent inequalities in overweight and obesity varied between individual European countries and sexes. Klumbiene et al. [35] used the same data for Estonia, Finland and Lithuania. Naturally, our results coincided, although subtle differences arose, probably related to use of different analysis methods and age ranges. International overviews on social inequalities in overweight and obesity are rare. A worldwide MONICA [36] study in 26 countries also showed an inverse association between educational level and BMI in almost all female, and about half of the male populations. Like our study, England showed little inequality for either sex. For women, France, Germany, Belgium, and the Czech Republic were among those with relatively high inequalities. For men, the Czech Republic, Poland, Yugoslavia and Russia were among those without or with a positive relationship between education and BMI. These findings appear to coincide with the Eastern European and Baltic results found in our study. However, countries were sometimes subdivided into regions in this study, which occasionally showed significant regional inequality differences.

Explanation and interpretation of results

Modernization and globalization lead to changes in terms of nutrition and physical exercise, but the impact of these factors within societies is not equal. Given a high enough general welfare level, the burden may in fact fall disproportionally on persons of lower SEP [1,5]. According to one view [37], socioeconomic development leads to the dissipation of factors that are protective of obesity among poor people. Changes in amounts of nutrition and physical exercise are key in this. First, cheap, energy-dense foods become widely available, especially for those of lower SEP, while at the same time modernization leads to an overall decrease of physical activity (both work-related and leisure-time). Second, people of lower SEP generally have lower levels of health literacy and think less about things to keep healthy [38], which makes them less likely to make healthy food choices. Also, food demand is more price-sensitive and income-sensitive among the poor [39,40]. Seen from this perspective, men of the poorest countries of our study – which were about as rich as the richest countries of the study by Monteiro et al. [5] – may be in a phase of the nutrition transition just prior to or during the obesity shift. Conversely, women, even in the poorest countries of our study, may already have been beyond the phase of the nutrition transition where the ‘obesity shift’ takes place.

Clearly, for women, an additional explanation is needed. The finding that there are educational differences in timing and spacing of childbearing may offer this explanation. Those with lower education are generally less likely to postpone maternity. Although postponement of childbearing is common among all socioeconomic groups, it is much more common among women with a higher educational attainment. Labour participation is lower among women of lower education. This is possibly related to the fact that lower educated women may assume more traditional role patterns than higher-educated women [41]. A direct effect is that parity itself may be closely related to obesity [42]. Second, a lower degree of labour participation may be related to smaller amounts of physical activity [43]. Third, the more limited availability of upstream facilities may increase the relative importance of skills, knowledge and cognitions that are related to educational level. In this sense, a relative scarcity of upstream factors amplifies the importance of downstream factors.

Role patterns in the Mediterranean countries may be more 'traditional' than those of other European countries. Mediterranean countries show a combination of low fertility (among the lowest in Europe) and low labour participation that is favoured by a family-centred welfare system, a family-biased production system and a family-oriented value system [44]. The percentage of women with a first birth on the age of 28 or younger is 36 % in Italy, compared to e.g. 52 % in Finland [45]. Also, labour participation among women is relatively low, compared to most other European countries [44]. Especially for women with primary and lower secondary education, working in the labour market appears to be scarcely compatible with child rearing [46]. Conversely, for Mediterranean women of higher education, the relation between fertility and labour participation is null [47]. Furthermore, these educational differences are not 'buffered' by institutional factors, since in the Mediterranean countries, childcare support is much less generous and there are less opportunities for part time work compared to many other European countries [48,49]. The distinctive Mediterranean societal architecture may widen inequalities in overweight and obesity.

Implications and conclusion

Among men of lower education, general welfare level appeared to lead to a decreased protection against overweight and obesity. Conversely, men of higher education benefited from an increased general welfare level. Among women, the burden of obesity always lay on those with a lower SEP, especially on women of the western Mediterranean countries. Men and women respond differently to increasing wealth. Next to wealth, other institutional factors, such as labor market flexibility and availability of childcare support, determine the magnitude of the inequalities in overweight and obesity between countries. Thus, macro-level factors such as general welfare level and institutional factors are needed to explain international differences in the level of inequalities in overweight and obesity.

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Tables and figures

Table 1. National surveys used in this study

Country	Name of survey and responsible institute	Year(s) of survey	GDP/capita (EUR)	N_{total}
Finland	Finbalt Health Monitor National Public Health Institute, Helsinki	1994/'98/ '00/'02/'04	27,318	8223
Sweden	Swedish Survey of Living Conditions (ULF) Statistics Sweden, Stockholm	2000/'01	29,483	3990
Norway	Norwegian Survey of Living Conditions Statistics Norway, Oslo	2002	41,820	2529
Denmark	Danish Health and Morbidity Survey (DHMS/ SUSY) Danish National Institute of Public Health , Copenhagen	2000	34,320	5821
Ireland	Living in Ireland Panel Survey Economic and Social Research Institute (ESRI), Dublin	1995/'02	34,984	2064
England	Health Survey for England (HSE) Department of Health, London	2001	27,227	5583
Netherlands	General social survey (POLS) Statistics Netherlands, Voorburg	2003/'04	28,589	5607
Belgium	Health Interview Survey Institute of Public Health (IPH), Brussels	1997/'01	25,939	6932
Germany	German National Health Examination and Interview Survey Robert Koch Institute (RKI), Berlin	1998	25,575	2786
France	French Health, Health Care and Insurance Survey (ESPS) IRDES, Paris	2004	25,207	6048
Italy	Health and health care utilization National Institute of Statistics (ISTAT), Rome	1999/'00	22,223	41613
Spain	National Health Survey Ministry of Health and Consumption (MSC), Madrid	2001	19,393	7741
Portugal	National Health Survey Instituto Nacional de Saude Dr Ricardo Jorge (INSARJ), Lisbon	1998/'99	12,241	12297
Slovakia	Health Monitor Survey Public Health Institute of Slovak Republic, Bratislava	2002	5,823	635
Hungary	National Health Interview Survey Hungary NPHMOS, Budapest	2000/'03	7,838	3618
Czech Rep	Health Interview Survey Institute of Health Information and Statistics of the Czech Republic	2002	8,030	789
Lithuania	Finbalt Health Monitor (see under Finland)	1994/'98/'00/ '02/'04	4,948	5465
Latvia	Finbalt Health Monitor (see under Finland)	1998/'00/'02/'04	4,499	3537
Estonia	Health Behavior among Estonian Adult Population National Institute for Health Development, Tallinn	2002/'04	6,490	1740

Table 2. Age-adjusted prevalence (%) of overweight by educational level across the studied countries (MALES)

Country	Overweight/education				PRR		
	Highest	2nd highest	2nd lowest	Lowest	PRR	Lo	Hi
Finland	45.3	50.9	51.8	39.0	1.16	(1.02-	1.32)
Sweden	39.7	52.1	60.1	63.4	1.62	(1.37-	1.93)
Norway	47.3	56.1	53.3	-*)	1.25	(1.02-	1.54)
Denmark	38.6	46.4	52.3	56.9	1.53	(1.31-	1.79)
Ireland	59.8	54.9	62.9	57.0	1.02	(0.84-	1.24)
England	63.0	66.4	65.6	64.5	1.02	(0.92-	1.13)
Netherlands	35.9	41.4	48.8	45.4	1.47	(1.24-	1.73)
Belgium	37.6	46.4	50.5	42.5	1.38	(1.21-	1.58)
Germany	50.1	61.8	65.8	69.2	1.25	(1.08-	1.45)
France	31.8	39.9	43.2	42.3	1.63	(1.31-	2.02)
Italy	33.3	42.3	49.0	52.0	1.46	(1.38-	1.54)
Spain	47.3	54.3	58.1	59.5	1.23	(1.11-	1.37)
Portugal	42.5	49.9	51.1	53.3	1.20	(1.08-	1.33)
Slovak Republic	70.4	60.4	62.7	40.6	0.64	(0.46-	0.89)
Hungary	58.4	59.8	58.7	54.6	0.91	(0.79-	1.06)
Czech Republic	43.0	59.3	53.7	49.0	1.05	(0.76-	1.46)
Lithuania	53.2	46.8	46.1	41.7	0.84	(0.72-	0.98)
Latvia	49.6	40.3	36.7	39.6	0.71	(0.57-	0.89)
Estonia	48.5	48.5	43.9	41.9	0.83	(0.63-	1.09)
Total	*47.1*	*51.5*	*53.4*	*51.5*	*1.10*	*(1.07-*	*1.13)*

Note.
*) Could not be calculated (*N* = 3).
RII = relative index of inequality, expressed as PRR = prevalence rate ratio; PRR = adjusted for age group (all) and country (only total); Totals are weighted for country size.
Lo, Hi = Lower and Higher boundary of 95% confidence interval

Table 3. Age-adjusted prevalence (%) of overweight by educational level across the studied countries (FEMALES)

Country	Overweight/education				PRR		
	Highest	2nd highest	2nd lowest	Lowest	PRR	Lo	Hi
Finland	24.1	32.2	35.4	25.1	1.65	(1.37-	1.98)
Sweden	23.2	32.7	39.4	73.5	2.09	(1.60-	2.73)
Norway	25.0	34.2	37.6	-*)	1.67	(1.19-	2.35)
Denmark	23.4	30.5	40.5	43.1	1.95	(1.57-	2.44)
Ireland	30.4	35.3	35.4	43.7	1.36	(1.00-	1.84)
England	39.3	51.0	54.7	60.5	1.62	(1.40-	1.87)
Netherlands	24.0	35.5	40.9	48.0	2.12	(1.75-	2.56)
Belgium	18.1	30.8	34.0	45.6	3.01	(2.47-	3.68)
Germany	21.6	34.7	49.6	38.1	2.46	(1.90-	3.19)
France	16.2	25.7	31.0	48.6	2.91	(2.18-	3.89)
Italy	9.9	16.5	23.8	37.5	3.30	(2.98-	3.65)
Spain	18.4	20.1	31.5	45.4	2.89	(2.34-	3.56)
Portugal	18.0	24.2	27.6	44.6	3.72	(3.17-	4.37)
Slovak Republic	18.9	26.4	34.2	43.1	2.22	(1.18-	4.19)
Hungary	28.5	35.0	42.1	41.8	1.46	(1.20-	1.77)
Czech Republic	18.7	23.6	38.7	44.2	3.12	(1.77-	5.51)
Lithuania	26.2	36.6	40.8	44.0	1.64	(1.38-	1.94)
Latvia	29.0	36.5	36.2	35.4	1.28	(1.02-	1.60)
Estonia	22.1	31.5	35.0	49.3	2.11	(1.52-	2.95)
Total	*22.9*	*31.2*	*37.3*	*45.1*	*1.98*	*(1.91-*	*2.06)*

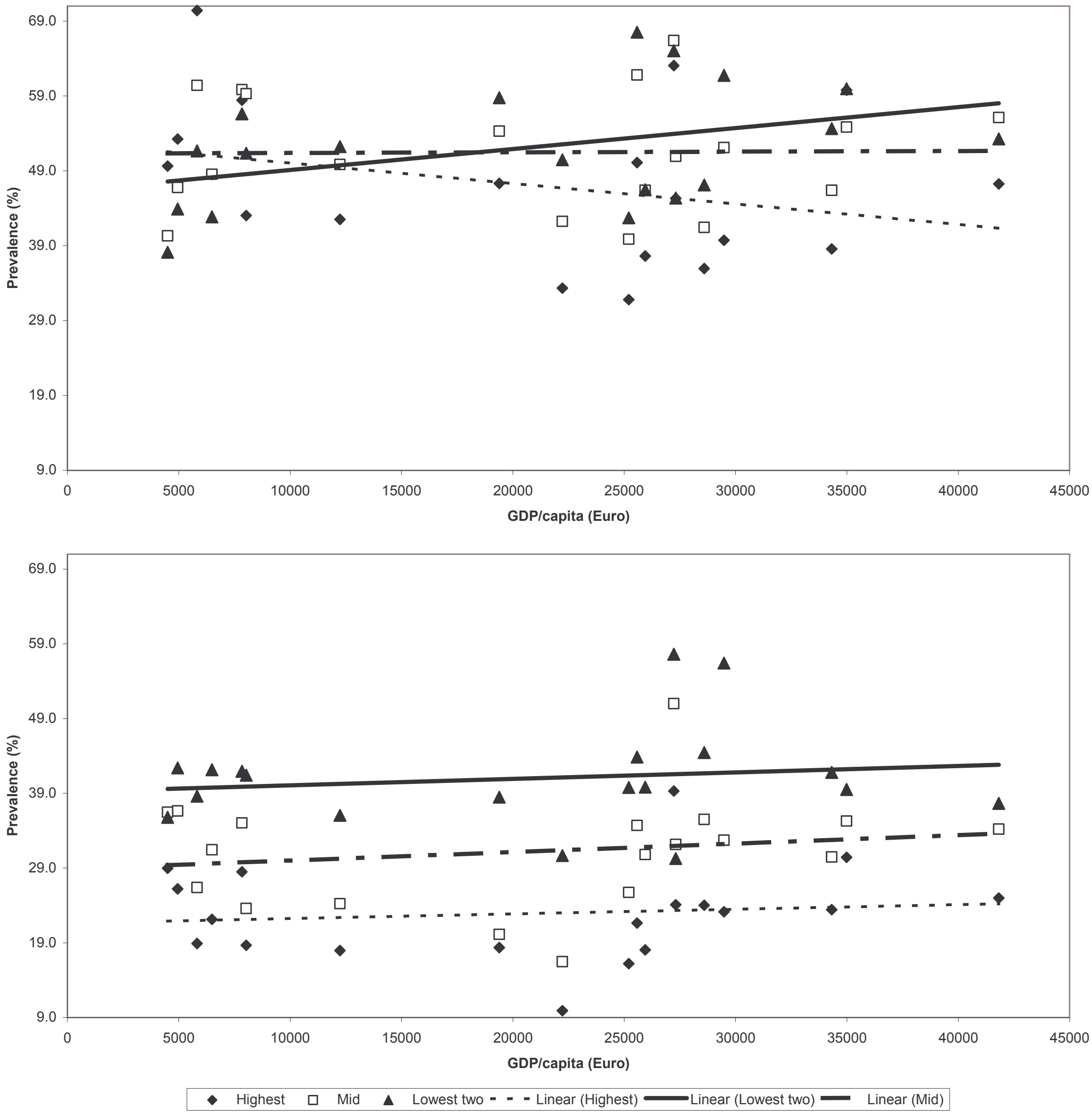
Note.
*) Could not be calculated (*N* = 3).
RII = relative index of inequality, expressed as PRR = prevalence rate ratio; PRR = adjusted for age group (all) and country (only total); Totals are weighted for country size.
Lo, Hi = Lower and Higher boundary of 95% confidence interval

Table 4. Prevalence (%) and educational inequalities in obesity across the studied countries

Country	Men							Women						
	Prevalence (%)					RII		Prevalence (%)					RII	
	Over-all	Highest	2nd High	2nd Low	Lowest	RII	Lo-Hi	*Over-all*	Highest	2nd High	2nd Low	Lowest	RII	Lo-Hi
Finland	*8.8*	7.3	9.7	9.3	8.8	1.52	(1.01-2.29)	*7.4*	6.9	9.4	11.0	2.2	1.59	(1.06-2.37)
Sweden	*11.6*	4.4	10.6	12.6	18.8	4.33	(2.39-7.83)	*13.5*	4.7	9.9	11.3	28.2	3.87	(2.12-7.04)
Norway	*10.1*	5.6	12.1	12.5	-	3.42	(1.70-6.92)	*6.8*	5.9	8.2	6.4	-	1.75	(0.76-4.01)
Denmark	*9.7*	5.3	7.5	12.9	13.1	3.11	(1.87-5.17)	*12.2*	7.0	9.0	13.8	19.1	2.7	(1.70-4.29)
Ireland	*10.6*	8.1	10.9	9.8	13.5	1.34	(0.67-2.65)	*8.1*	4.4	9.3	7.9	10.7	1.98	(0.94-4.19)
England	*21.6*	16.3	20.1	23.4	26.5	1.7	(1.26-2.29)	*23.3*	15.6	22.2	26.1	29.4	2.19	(1.66-2.87)
Netherlands	*10.1*	4.9	8.9	12.2	14.3	3.61	(2.28-5.73)	*11.4*	6.4	9.7	12.6	17.0	2.87	(1.89-4.34)
Belgium	*10.1*	6.5	11.1	11.3	11.3	2.17	(1.48-3.19)	*10.7*	4.2	8.6	10.7	19.1	6.25	(4.05-9.65)
Germany	*14.5*	9.1	16.0	17.9	15.0	1.66	(1.06-2.61)	*15.2*	4.9	11.1	20.4	24.6	5.07	(2.95-8.71)
France	*6.0*	4.4	6.0	9.7	3.9	3.28	(1.74-6.19)	*11.1*	5.0	8.8	10.9	19.9	4.21	(2.46-7.21)
Italy	*7.0*	4.1	6.0	8.1	9.7	2.31	(1.90-2.79)	*5.0*	1.5	3.1	5.5	9.7	6.03	(4.71-7.71)
Spain	*10.4*	6.4	8.3	11.6	15.4	2.72	(1.88-3.93)	*7.0*	3.0	4.4	8.1	12.3	5.09	(3.08-8.44)
Portugal	*8.1*	4.1	7.8	10.1	10.3	2.02	(1.42-2.87)	*6.6*	3.0	4.2	7.1	12.0	6.78	(4.55-10.10)
Slovak Republic	*10.3*	12.8	9.1	19.5	-	1.58	(0.53-4.76)	*11.3*	3.6	5.3	8.5	-	5.85	(1.41-24.24)
Hungary	*17.7*	16.7	15.2	18.3	20.9	1.44	(0.97-2.15)	*13.9*	6.2	14.6	15.3	19.8	2.28	(1.57-3.31)
Czech Republic	*11.1*	7.7	4.6	12.3	19.6	3.64	(1.09-12.16)	*10.0*	1.7	8.6	11.0	18.6	5.3	(1.54-18.22)
Lithuania	*8.6*	8.5	8.9	8.4	8.7	0.96	(0.59-1.56)	*11.7*	7.3	10.5	15.8	13.2	2.68	(1.84-3.90)
Latvia	*8.6*	11.3	6.2	7.3	9.8	0.86	(0.45-1.62)	*9.7*	8.0	10.8	12.7	7.2	1.5	(0.92-2.45)
Estonia	*13.3*	9.6	12.3	15.3	15.7	1.69	(0.84-3.38)	*12.1*	4.6	10.5	10.4	22.8	3.33	(1.67-6.66)
Total	*11.0*	*8.1*	*10.1*	*12.8*	*13.1*	*1.97*	*(1.81-2.15)*	*11.0*	*5.5*	*9.4*	*11.9*	*17.4*	*2.99*	*(2.75-3.26)*

Note.
RII = relative index of inequality, expressed as PRR = prevalence rate ratio, adjusted for age group (all) and country (only total); Totals are weighted for country size.
Lo, Hi = Lower and Higher boundary of 95% confidence interval

Figure 1. Educational inequalities in overweight and obesity by welfare level in Europe for MEN (above) and WOMEN (below)



Note. Solid line/triangle = Lowest two educational levels; Long dash/square = Second highest educational level; Short dash/rhombus = Highest educational level.

Chapter 24

The predictive value of different socio-economic indicators for overweight in nine European countries

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Abstract

Objective

To assess which socioeconomic indicator best predicts overweight in the European Union: educational attainment, occupational class and household income.

Setting

The prevalence of overweight is strongly related to socioeconomic position. The relative importance of different socioeconomic dimensions is uncertain, and might vary between countries.

Design and subjects

Cross-sectional data of the European Community Household Panel were obtained from nine countries (*N* = 52 855; age 25-64 years). Uni- and multivariate regression analyses were employed to predict overweight (body mass index > 25) in relationship to socioeconomic indicators. Occupational class was measured using the new European Socio-Economic Classification

Results

Large socioeconomic differences in overweight were observed in all countries, especially for women. For both sexes, a low educational attainment was the strongest predictor of overweight. After control for education, overweight was negatively related to household income in women, but positively in men. Similar patterns were found for occupational class. For women, but not for men, educational inequalities in overweight were generally greater in Southern European countries. A similar pattern of inequalities in overweight was observed for all ages between 25 and 64 years.

Conclusions

Across Europe, overweight was more strongly and more consistently related to educational attainment than to occupational class or household income. People with lower educational attainment should be a specific target group for the programs and policies that aim to prevent overweight.

Introduction

In Europe, overweight and obesity are estimated to account 8% of the overall burden of disease [1] and 5% of the total healthcare expenditures [2]. Numerous studies have shown that Body Mass Index (BMI) differs by socio-demographic variables. A consistent finding is an inverse association of socio-economic position (SEP) with BMI, especially in females [3].

The unequal distribution of overweight across socio-economic groups offers an entry point for prevention activities. Overweight prevention approaches might be more cost-effective if they specifically target groups of lower SEP. However, SEP is a multidimensional construct of which individual components, such as educational attainment, occupational class, or income level, represent different dimensions. These different dimensions do point to different mechanisms (e.g. different critical phases in life course), and in addition they represent in part different groups of people. It is therefore important to know which aspect of SEP is most closely related to overweight.

In this study, we were interested specifically in the magnitude of the independent effects that educational, income and occupational levels have on the prevalence of overweight. While many studies have reported associations between one SEP indicator and overweight, few studies have investigated the relative importance of different SEP indicators.

An American study that investigated simultaneously the associations between different components of SEP and body weight among women, showed that there was a significant relationship between education, but not income [4]. Among men, the relationship with educational attainment was inconsistent, while a positive relationship between income and BMI was found [5]. In the UK, lower occupational level predicted female obesity better than educational level or an indicator of material deprivation. The same study found that BMI was negatively related to income among men, while occupational level showed irregular patterns [6]. Another study that used a pooled sample of men and women from 15 countries of the European Union (EU) found that educational level had the greatest relative predictive value for obesity, compared to social class [7]. However, the measure of “social class” was defined by level of income in some countries, while in others it was defined by occupation in other countries. An Australian study found that BMI and SEP domains were associated [8]. Lower scores on the employment domain were associated with a higher risk of being overweight. However, educational attainment was not measured in this study.

Our study aimed to investigate the relative contribution of three complementary dimensions of SEP (educational attainment, household income, occupational class) to the risk of overweight. Data from the European Household Panel (ECHP) [9] were used to measure inequalities in overweight across nine EU member states. The ECHP is a standardized, internationally comparable survey conducted using large samples. It contains detailed measurements of educational attainment, household income, and occupational class. Occupational class was measured using the European Socioeconomic Classification (ESEC), a new and finely-graded measure designed to enable better international comparability of the variable [10].

We analyzed our data in three major steps. First, we utilized the pooled data from all countries to analyze the relative contributions of each SEP in the EU at large. Second, we investigated variations between countries by stratifying the analysis per country. Third, we analyzed the data by age group to assess variations between age groups in the relative importance of education, income and occupation. Men and women were consistently analyzed separately.

Subjects and methods

Data sampling

We used cross-sectional data of the European Community Household Survey (ECHP) conducted by Eurostat [9]. The ECHP is a survey based on a standardized questionnaire, which is employed in the annual interviewing of a representative panel of households and non-institutionalized individuals aged 16 years and older in each EU member state. National Statistical Institutes or research centers collected the data, while Eurostat performed checks, weightings and imputations centrally. All surveys were based on a non-stratified random sampling design. The target population was made up of all national private households. All persons in the panel households were individually interviewed. The data collection was carried out in most EU countries by paper-and-pencil interviewing, except in UK, The Netherlands, Portugal and Greece, where computer-assisted personal interviewing was used. Design, procedure [9 11] and statistical issues [12] of the ECHP were described in more detail elsewhere.

The ECHP data used in this study were obtained from Wave 7 – the ECHP survey conducted in 2000. We decided to choose the seventh wave for reasons of *availability* (more countries than previous waves), *sample size* (due to attrition there are more cases per country than in later waves) and *recency* (although the sample sizes of earlier waves were a bit larger, they were also less recent). Data from nine member states of the EU were available for the analyses: Finland, Denmark, Belgium, Ireland, Austria, Italy, Spain, Greece and Portugal.

Participants

Basic information on the study population can be found in Table 1. A total of 52,855 non-institutionalized persons (50.8% females) aged 25 to 64 comprised the data that were used in the analyses. The 25-64 years age range was selected because of the variations in age ranges available per country. Also, the validity of BMI as a measure for fat mass may be hampered in the elderly, as muscle mass may decrease above the age of 60 [13].

In Wave 7, all countries except Ireland (ca. 75%) had a response rate of above 80%, while Greece, Italy and France obtained the highest response rates (> 95%). Main reasons for not responding were contact failure (person temporarily away) and lack of co-operation (inability or unwillingness to respond).

Independent variables

We utilized three SEP indicators: educational, occupational and income level. Educational attainment was defined as the highest level of general or higher education completed. Data were coded according to the International Standard Classification of Education (ISCED)[14]. This classification was designed to enable international comparability of educational systems. This variable had three descending levels: (1) recognized third level education (corresponding to ISCED 5-7, or $>$ 12 years of education); (2) second stage of second level education (ISCED 3, or 10-12 years of education); and (3) less than second stage of second education (ISCED 0-2, or $\leq$ 9 years of education).

Occupational class was measured using the new ESEC scheme. The ESEC distinguishes nine social classes that differ in terms of employment relationships. It is an occupationally based classification that has rules to provide coverage of the whole adult population. The information required to assign people to these classes was: occupation coded to the minor groups (i.e. 3-digit groups) of the International Standard Classification of Occupations 1988 (ISCO88 (COM)); details of employment status, i.e. whether an employer, self-employed or employee; number of employees at the workplace; whether a worker is a supervisor [10]. Using this information, a total of nine quasi-hierarchical categories could be discerned (Table 2). Occupational class was assigned to each household member using the dominance approach [15], which meant that the household member with the highest occupational class determined the class of each individual household member. Unclassifiable individuals were reported as 'ESEC unknown'.

Household income was defined as the pooled net household income divided by the square root of the number of persons in the household [16]. Each country-specific sample was divided into income percentiles in order to enable international comparability of different currencies.

Above a certain level, the interdependence between independent variables may cause problems in the effective estimation of model parameters. Multicollinearity is considered 'harmful' when correlations between independent variables are below r = .80 [17]. Inspection of the SEP indicators showed that their mutual interdependence was well below that level (Spearman correlation coefficients $\rho \leq .53$).

Covariates

Age was categorized into 5-year classes for most purposes. In all regression models, age and country were added as categorical variables in order to control for their possible non-linear confounding effects. Men and women were always analyzed separately.

Dependent variable

BMI was defined as the self-reported weight (kilograms) divided by the squared height (meters). For most purposes, the BMI was categorized into (1) underweight ($10 \leq \text{BMI} < 18$); (2) normal weight ($18 \leq \text{BMI} < 25$); (3) moderately overweight ($25 \leq \text{BMI} < 30$) and (4) obese ($\text{BMI} \geq 30$). BMIs below 10 were considered missing (N = 1).

When BMI was dichotomized, the cut-off point was set at BMI = 25 (with BMI ≥ 25 referred to as “overweight”).

Statistical analyses

Prevalence rates were age-standardized using the direct method with the 1995 EU population as the standard. The Prevalence Rate Ratio (PRR) expresses the prevalence of overweight in the group of interest relative to the prevalence of overweight in best-off socioeconomic group. PRRs and their 95% confidence intervals were estimated through regression with the log link function[18] using SAS’[19] Genmod procedure. All models converged with the data. SPSS [20] was used for most other calculations.

In the next step we summarised the association between overweight and each SEP indicator by calculating the Relative Index of Inequality (RII) and its 95% confidence intervals [21-23]. RII is a regression-based measure that can be applied to each SEP indicator. It assesses the association between overweight ratios and the relative position of each socioeconomic group separately. This relative position is measured as the cumulative proportion of each socioeconomic group within the socioeconomic hierarchy, with 0 and 1 as the extreme values. The resulting measure, the RII, can be interpreted as the risk of being overweight at the very top of the socioeconomic hierarchy as compared to the very lowest end of the socioeconomic hierarchy. An RII above (below) 1 indicates a negative (positive) relationship between SEP and overweight. The RII can be compared between the three SEP indicators, provided that a detailed and hierarchical classification is used for each indicator. In the same way, the RII can be used to make comparisons between countries and between age groups.

For this paper, the RII was estimated with log linear regression with control for 5-year age group. The regression model had a log link function and assumed a binomial distribution, using the Genmod procedure of SAS. [18 24]. We conducted two types of hierarchical analyses which controlled for: (1) age category and country (confounders) and one SEP indicator; or (2) confounders and all SEP indicators.

Results

Table 1 shows that overall prevalence of overweight (BMI ≥ 25) were 35.7% (females) and 55.9% (males). . Overweight was most prevalent in Greece and Finland (both sexes) and Spain (men). For women, the prevalence of overweight ranged from 26.8% in Italy to 43.1% in Finland. For men, the prevalence of overweight ranged from 49.9% in Italy to 65.1% in Greece. Percentages of missing values were comparable between countries and were within the normal range (≤ 2.7%), with the exception of Spain (8.1 % for women and 7.1% for men).

Table 2 shows generally showed strong negative gradients for women, meaning that overweight prevalence rates sharply increased when SEP decreased. Based on prevalence rate ratios (PRR), this gradient was strongest for education. Differences between adjacent educational categories were significant, as shown by non-overlapping confidence intervals. Controlling for the other SEP indicators caused an important reduction in educational differences in overweight. For example, the lowest educational group's PRR was 2.76 before and 1.93 after controlling for the other SEP indicators.

Compared to educational level, occupational differences in overweight was smaller (and slightly irregular), but still pronounced. Controlling for the other SEP predictors only slightly reduced the predictive value of occupational class. Occupational class and overweight were more or less negatively linearly related, with slight irregularities in the gradient for the categories 'Lower salariat', 'Farmers', and 'Higher grade blue collar'. Most adjacent occupation categories were not significantly different from each other, but differences between the highest two occupational levels and the lowest three categories attained statistical significance.

The income-related gradient in overweight was relatively weak (and slightly irregular), but like the occupational gradient, it remained pronounced. Controlling for the other SEP predictors caused a sharp reduction in the predictive values of income. There was an inverse relationship between income and overweight (less income, more overweight) within the poorest seven income deciles. The relationship was absent within the three richer deciles, i.e., the relationship flattens with increasing income. Only the highest two differed from the lowest two income deciles with statistical significance.

Table 3 shows the prevalence rates and PRRs of overweight for male participants. After control for confounders and other SEP indicators, the PRRs of overweight indicated that overweight was associated with lower education (PRR = 1.48). For the other indicators, the patterns were irregular (occupation) or even slightly curvilinear (income). After controlling for other SEP predictors, the associations with income and occupational class were not statistically significant. Adjustment for other SEP indicators had virtually no effect on the predictive value of education.

Figure 1 shows a cross-country comparison of inequalities in overweight using the RII for education level, occupational class and household income, with mutual control among these SEP indicators. The first set of bars, which represents the pooled data, shows that for either sex, the independent contribution to predict the likelihood of being overweight was greatest for education. The odds for women of being overweight was three times greater for hypothetical lower end compared to the upper end of the educational hierarchy (RII = 2.98). For men, a similar but attenuated association was observed (RII = 1.66).

For women in all countries, except in Denmark and Finland, education was the strongest predictor of inequality in overweight. In Denmark, occupational class was the strongest predictor. In Finland, the differences in the predictive value between the three indicators were negligible. Occupational level (RII $\cong$ 2) was usually about half as predictive for overweight as educational level (RII $\cong$ 3). Income level had the smallest independent effect in most countries. The magnitude of income-related inequalities in overweight, as expressed by the RII, ranged from 0.99 to 1.78, compared to 1.39 - 4.91 for educational level and 1.13 – 2.37 for occupational level.

For men, education was the strongest predictor of overweight in all countries. In most Southern European countries (Italy, Greece, Spain) the magnitude of educational inequality was relatively small compared to non-Southern countries. In most countries (except Austria and Italy), income was positively related to overweight. Differences in overweight according to occupational class were generally small and inconsistent in terms of directionality.

Figure 2 shows inequalities in overweight in four age groups using the RII for education level, occupational class and household income. Among women, education was the strongest predictor for overweight in all age groups. Compared with younger age groups, educational inequalities in overweight were much smaller in the oldest age group (55-64 years). Inequalities according to occupational class showed no clear variation between age groups. Household income showed smaller inequalities in the older age groups.

Among men, the pattern of inequalities in overweight was fairly similar between age groups. Level of education was negatively related to the prevalence of overweight in all age groups. Similar to women, educational level was also the strongest predictor for overweight. None of the age groups showed a systematic relationship between occupational class and overweight. Overweight was slightly positively related to income in all age groups, except for the youngest age quartile (in which a gradient was absent).

Discussion

Summary

Our study revealed education attainment as a stronger predictor for overweight, especially among women, as compared to occupational class and household income. This finding holds for most EU countries and all age categories. For women, occupational class and income levels both show a relatively weak and negative relation to overweight. For men, the same relation was found between occupational level and overweight, while income level was weakly positively related to overweight (i.e. more overweight at higher income levels).

Data and methods evaluation

People with a high true BMI have a tendency to underreport their weight [25]. Given that people of low SEP are over-represented in higher BMI categories, under-reporting may occur more frequently in lower SEPs. However, there is no evidence that at any level of weight, the level of underreporting of weight depends on the SEP indicator used. Estimates of relative inequalities in overweight (such as the RII) may therefore remain unaffected even though absolute levels of overweight are underestimated.

Ethnicity appears influence BMI independently of educational level [26 27]. We evaluated the possible confounding effect of ethnicity by excluding foreign-born respondents (1005 women and 877 men) from our regression analyses. Migrants were defined as being born abroad, or being born in the present country but having lived in a different country. The educational inequalities were notably larger among migrant women ($RII_{migrants}$ = 6.24), but their exclusion did not substantially influence the observed patterns ($RII_{nonmigrants}$ = 2.82 and RII_{total} = 2.98).

Countries strongly differ in their educational systems and this may have lead to problems regarding the comparability of educational classifications. Part of the international variation in the predictive value of education may therefore be an unavoidable classification artifact: the lowest educational level in country A may not be equal to that in country B. Income (being intrinsically quantitative in nature) and occupation (being measured with an internationally validated instrument) may be less sensitive to this comparability problem. Nevertheless, for the majority of countries, educational attainment appeared to be the best predictor of overweight. Also, this was observed when deploying the RII, a measure that could be applied in a comparable way to each country and each socioeconomic indicator with a detailed hierarchical classification.

To improve international comparability, educational level was measured according to only three standard categories. This rather crude categorization implies that there may be a significant educational heterogeneity *within* each category. The observed educational inequalities may have been greater with the use of a more finely graded educational categorization, especially within the lower educational levels. If so, this would imply that educational attainment would perform even better (as compared to occupation class and household income) in predicting variations in overweight.

Comparison with previous studies

The observed gender differences in the association between SEP and overweight were consistent with previous findings [3] and suggested that educational aspects of SEP impact differentially on body weight for men and women.

In accordance with our findings, Flegal [4] observed that the relative importance of education for the prediction of BMI was greater compared to income. A study that used a large sample of EU citizens also revealed educational level to have a stronger association with obesity than surrogate measures of occupational class [7]. Lähteenkorva et al. [28] found that educational inequalities in obesity were greater than occupational inequalities in Finland among men and women, but in Denmark only among men.

Our findings support these and some other findings [29]. However we are the first to show that a greater predictive power of educational level is observed almost consistently for each sex, country, and age group. Moreover, we deployed standardized instruments in our study for the measurement of educational attainment, occupational class and household income, thus reducing measurement bias

A UK research reported occupational level as the strongest independent predictor of obesity among women, but not among men [6]. Even though we observed similar results for some cases (e.g. women in Denmark), our results imply that the findings of this British study do not represent a generalized pattern.

Explanation and interpretation of results

Why is educational attainment so strongly related to overweight? A higher predictive value of educational level as compared to the other SEP indicators was observed for most populations across all parts of Western Europe. The persistency of this pattern suggests that causes of inequalities in overweight are intimately linked with educational level.

Both predispositional and environmental factors might underlie the association between SEP and BMI. From a large twin study, genetic factors were concluded to be the main determinants of education-based BMI differences [30]. Intelligence was identified as one potential explanation for the correlation between education and BMI [31]. Next, environmental factors play a crucial role in the origination of inequalities in overweight and obesity, for instance through physical activity patterns learnt in home (parental) and school environments during youth [32]. Another review demonstrated that parental level of education and fruit/vegetable intake were positively related [33].

The relative predictive value of educational level may exceed that occupational and income level because it is an aspect of SEP that precedes occupational and income level. This chronology implies, because of its longer duration than the other two SEP predictors, a greater cumulative effect on overweight. Moreover, environment during childhood may have a long-term impact on overweight later in adulthood [34], because childhood may represent a critical phase in terms of development of overweight in later life.

On the other hand, our results also suggest that occupational class and income exert an additional effect independent from educational level [6]. Income may be weakly related to overweight through access to material resources. Individuals with higher incomes have more options in food access and food choices as well as in voluntary energy expenditure, although actual caloric intake may not vary by income [35]. Occupational class as defined in the ESEC is related to overweight despite relatively small differences between occupational levels in industrialized societies in the amount of physical labor performed in the job. ESEC classes differ in terms of intrinsic job characteristics, including level of support, long-term economic security, and sense of control [36]. Social relationships at work may differ in more specific ways, such as the extent to which social pressures favor or disfavor excessive eating and favor physical exercise. Through these psychosocial factors, people's occupational class may exert an additional effect on overweight independent of educational level.

Strong secular changes in the association between SEP and BMI have occurred in a relatively short period [37,38], which suggests a crucial role for the environment. An underlying predisposition to overweight may or may not become manifest depending on the environment as a factor. Thus, the 'obesogenic' environment may have triggered overweight in vulnerable individuals, and an increase in knowledge about the harmful effects of overweight may have had a protective effect on others.

Another ECHP-based study concluded that childbearing negatively affects material well-being of women, especially Mediterranean women [39]. In the Mediterranean countries, childcare support is much less generous and there are less opportunities for part time work compared to many other European countries [39 40]. This may explain why this region spearheads the 'lowest-low' fertility countries in Europe. Especially for women with primary and lower secondary education, working in the labour market appears to be scarcely compatible with child rearing. For Mediterranean women of higher education, fertility and labour participation do not appear to be related [41]. Education has a positive impact on women's wage and therefore, indirectly, a positive effect on participation and a negative effect on fertility [42]. The relationship with obesity may take shape in several ways. First, parity itself has been found to be closely related to obesity [43]. Second, childbearing events negatively affects material well-being [39], thus leaving less money to spend on healthy foods. Third, a lower degree of labour participation may be related to smaller amounts of physical activity [44].

Thus, educational level may partly reflect the ability to combine work and family life. This ability may be determined by 'own' organizational skills to combine household and work activities (which may be more limited in those with lower levels of education), as well as the willingness of society to facilitate working mothers (which may be greater in those with jobs of higher status). The latter would offer an explanation for the fact that occupational status also strongly predicted overweight in our study. In addition to all this, the fact that overweight is far more stigmatized in women than in men [45] may have reinforced cross-national differences in educational inequalities in the case of women.

Implications and conclusion

The results suggest that the educational dimension of SEP is much more strongly related to overweight than the occupational or income dimensions. This is crucial for understanding inequalities in overweight and for developing strategies and interventions to prevent overweight in lower socioeconomic groups [46].

Causes of inequalities in overweight must primarily be thought of as inequalities in cognitive, attitudinal, and cultural factors that are best approximated by the level of education. People with lower educational attainment should be a specific target group for the programs and policies that aim to prevent overweight. These groups may benefit from a focus on health literacy, aimed at increasing their understanding of and abilities to modifying behaviors with regards to diet and physical activity [6].

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Tables

Table 1. Sample sizes (*N*) missing values and age-adjusted prevalence (%) of overweight and obesity (BMI 25+) and obesity (BMI30+).

Country	Females				Males			
	N_{total}	Miss.[1]	BMI25+	BMI30+	N_{total}	Miss.[1]	BMI25+	BMI30+
	N	%	%	%	N	%	%	%
Finland	2626	1.6	43.1	13.5	2621	0.7	57.6	12.6
Denmark	1514	2.6	35.7	9.3	1483	0.6	50.5	11.4
Belgium	1935	2.7	34.2	10.9	1753	2.1	52.2	11.2
Ireland	2043	2.3	35.0	8.3	1994	2.0	56.2	9.7
Austria	2200	1.9	36.1	9.0	2102	0.5	54.4	10.1
Italy	5471	1.1	26.8	5.0	5443	1.2	49.9	8.5
Spain	4302	8.1	35.3	9.1	4168	7.1	62.7	14.8
Greece	3196	0.1	40.6	8.2	3065	0.7	65.2	11.0
Portugal	3583	1.1	34.3	8.1	3356	2.0	54.0	8.5
Total	*26870*	*2.5*	*35.7*	*9.1*	*25985*	*2.2*	*55.9*	*10.9*

[1] Missing values: no data for weight, height or both.

Table 2. Proportional distribution, crude prevalence and Prevalence Rate Ratios of overweight (BMI ≥25) by class variables across Europe (FEMALES).

Variable Level	**Propor-tion** (%)	**Preva-lence** (%)	**Prevalence Rate Ratio (PRR)** [1] **Model 1** PRR (95%CI)	**Model 2** PRR (95%CI)
Education				
Highest	18.3	23.1	1.00 - -	1.00 - -
Mid	30.9	29.2	1.59 (1.35- 1.87)	1.27 (1.16- 1.39)
Lowest	50.8	48.3	2.76 (2.38- 3.22)	1.93 (1.75- 2.12)
Occupational class				
Higher salariat	18.6	31.1	1.00 - -	1.00 - -
Lower salariat	14.6	30.3	0.98 (0.85- 1.14)	1.04 (0.95- 1.15)
Higher grade white collar	11.6	31.8	1.14 (0.97- 1.34)	1.01 (0.91- 1.13)
Self-employed	13.3	38.2	1.37 (1.19- 1.57)	1.15 (1.04- 1.28)
Farmers	5.9	49.9	1.07 (0.89- 1.29)	1.25 (1.10- 1.43)
Higher grade blue collar	3.1	42.5	1.44 (1.15- 1.79)	1.28 (1.09- 1.51)
Lower grade white collar	8.5	40.7	1.32 (1.11- 1.56)	1.25 (1.11- 1.40)
Skilled workers	7.8	44.8	1.28 (1.09- 1.50)	1.29 (1.15- 1.46)
Routine	8.3	46.2	1.42 (1.21- 1.67)	1.34 (1.19- 1.50)
ESEC unknown	8.3	45.3	1.08 (0.89- 1.31)	1.12 (0.99- 1.26)
Income decile				
Highest	9.7	27.8	1.00 - -	1.00 - -
P90	9.6	31.9	1.20 (0.96- 1.51)	1.13 (1.00- 1.29)
P80	9.8	34.9	1.66 (1.34- 2.06)	1.28 (1.13- 1.45)
P70	9.8	36.8	1.75 (1.41- 2.17)	1.33 (1.17- 1.51)
P60	9.7	38.9	2.01 (1.63- 2.49)	1.43 (1.26- 1.63)
P50	9.9	39.5	1.87 (1.51- 2.31)	1.40 (1.23- 1.60)
P40	10.0	40.7	2.61 (2.13- 3.20)	1.46 (1.28- 1.67)
P30	10.3	40.9	2.24 (1.83- 2.76)	1.45 (1.28- 1.66)
P20	10.4	42.1	2.10 (1.71- 2.58)	1.46 (1.28- 1.66)
Lowest	10.7	43.1	2.32 (1.89- 2.84)	1.47 (1.29- 1.68)

[1] Model 1 = BMI25+ predicted by one SEP variable and corrected for age category and country (confounders); Model 2 = Model 1 + other SEP variables; 95%CI = 95% confidence interval.

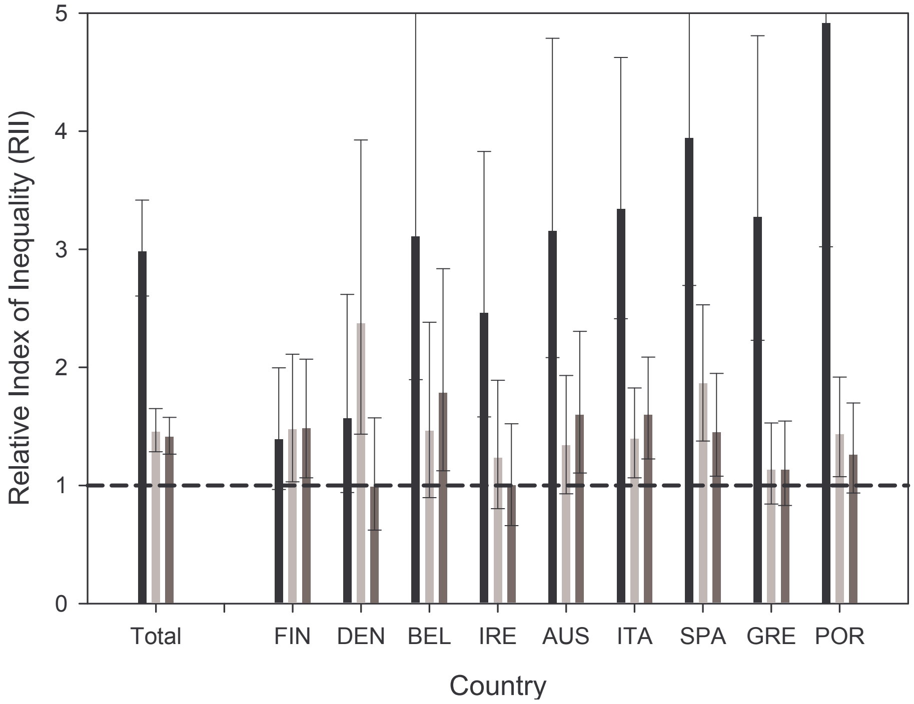
Table 3. Proportional distribution, crude prevalence, Prevalence Rate Ratios of overweight (BMI ≥25) by class variables across Europe (MALES).

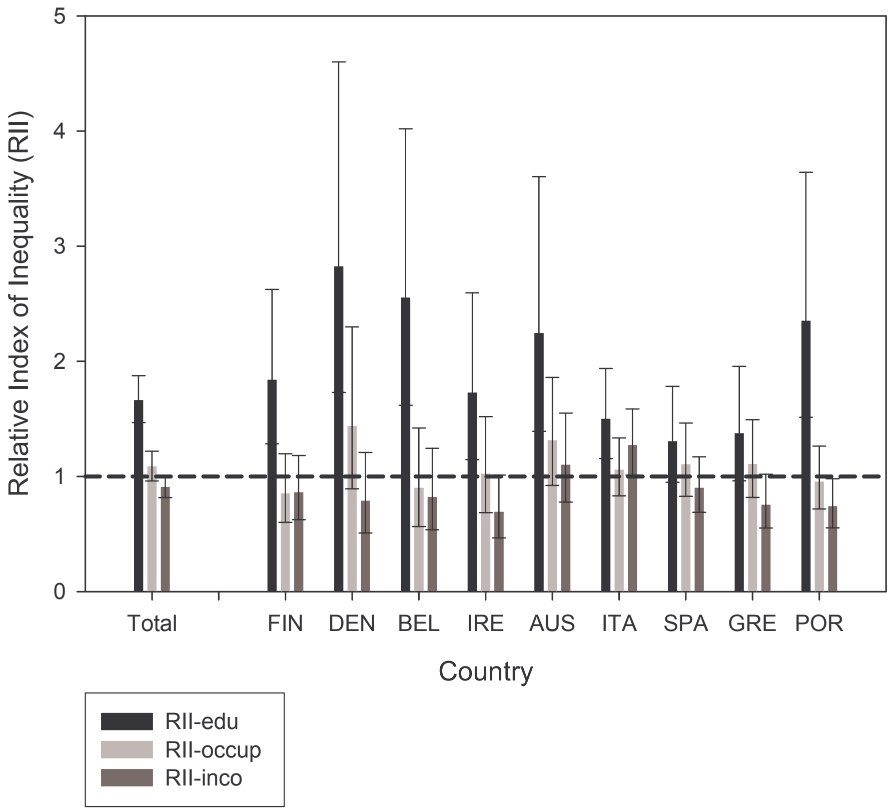
Variable Level	Proportion (%)	Prevalence (%)	Prevalence Rate Ratio (PRR) [1] Model 1 PRR	Model 1 (95%CI)	Model 2 PRR	Model 2 (95%CI)
Education						
Highest	17.9	49.3	1.00	- -	1.00	- -
Mid	34.2	53.8	1.32	(1.22- 1.42)	1.32	(1.21- 1.43)
Lowest	47.9	60.7	1.46	(1.36- 1.58)	1.48	(1.36- 1.61)
Occupational class						
Higher salariat	19.4	54.9	1.00	- -	1.00	- -
Lower salariat	14.2	52.8	0.96	(0.88- 1.05)	0.93	(0.85- 1.02)
Higher grade white collar	10.4	53.9	1.05	(0.95- 1.15)	0.95	(0.85- 1.05)
Self-employed	14.4	59.8	1.21	(1.10- 1.32)	1.09	(0.99- 1.19)
Farmers	6.7	59.9	1.10	(0.98- 1.23)	0.98	(0.87- 1.11)
Higher grade blue collar	3.5	58.3	1.21	(1.04- 1.41)	1.05	(0.90- 1.23)
Lower grade white collar	7.9	58.5	1.22	(1.10- 1.37)	1.07	(0.95- 1.20)
Skilled workers	9.3	55.1	1.07	(0.96- 1.18)	0.93	(0.83- 1.03)
Routine	8.4	58.8	1.19	(1.07- 1.32)	1.04	(0.93- 1.16)
ESEC unknown	5.8	54.9	0.98	(0.87- 1.11)	0.91	(0.80- 1.04)
Income decile						
Highest	10.3	55.7	1.00	- -	1.00	- -
P90	10.4	54.9	1.03	(0.92- 1.15)	0.96	(0.86- 1.08)
P80	10.3	55.8	1.07	(0.96- 1.20)	0.98	(0.87- 1.09)
P70	10.4	57.6	1.16	(1.03- 1.29)	1.03	(0.92- 1.16)
P60	10.3	56.1	1.10	(0.98- 1.23)	0.96	(0.86- 1.08)
P50	10.1	57.8	1.19	(1.06- 1.33)	1.03	(0.91- 1.16)
P40	10.0	58.2	1.17	(1.04- 1.31)	1.00	(0.88- 1.12)
P30	9.7	57.8	1.18	(1.06- 1.33)	1.00	(0.89- 1.13)
P20	9.4	55.2	1.07	(0.95- 1.20)	0.90	(0.79- 1.01)
Lowest	9.1	53.6	0.97	(0.86- 1.09)	0.81	(0.72- 0.92)

[1] Model 1 = overweight predicted by one SEP variable and corrected for age category and country (confounders); Model 2 = Model 1 + other SEP variables; 95%CI = 95% confidence interval.

Figure 1. Inequalities in overweight for females (above) and males (below).

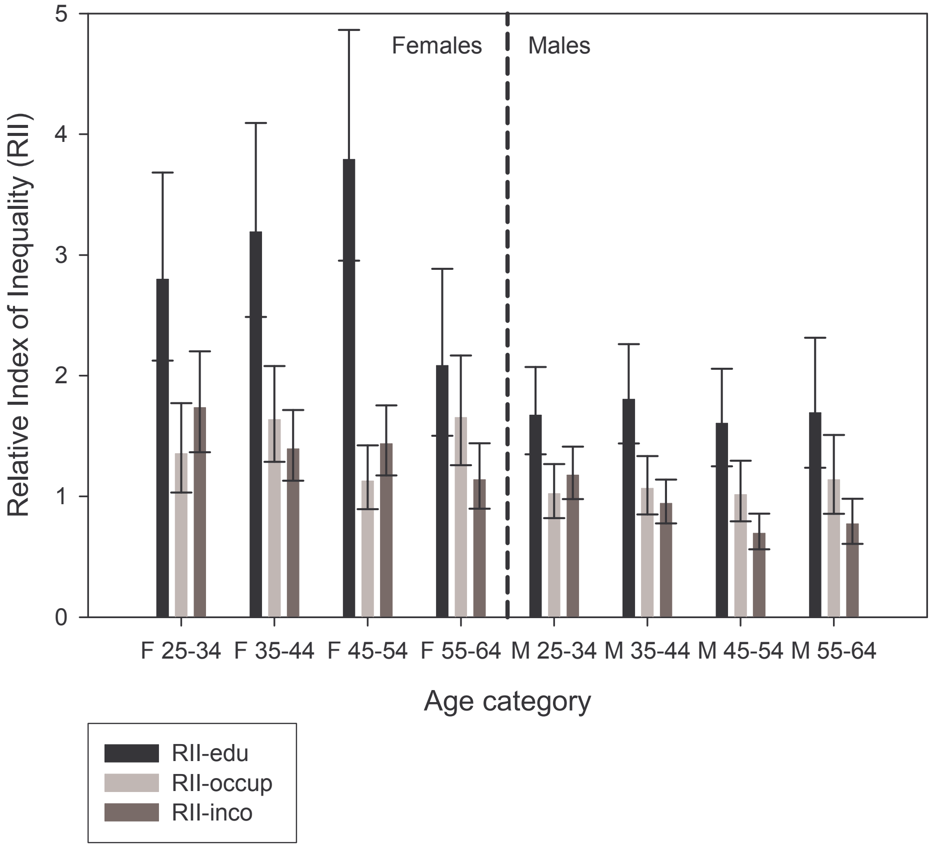
Inequalities in overweight measured using educational (left bar) occupational (middle bar) or income level (right bar).





Error bars indicate the the 95% confidence interval. Histogram bars that do not extend above the horizontal dashed line indicate a positive gradient between SEP and overweight

Figure 2. Country-adjusted inequalities in overweight for females and males of different age categories. Inequalities in overweight measured using educational (left bar) occupational (middle bar) or income level (right bar).



Error bars indicate the the 95% confidence interval. Histogram bars that do not extend above the horizontal dashed line indicate a positive gradient between SEP and overweight

Supplementary Information

Table 4. Prevalence (%) of overweight and by SEP and age group for males and females.

SEP indicator	Age group							
Level	Females				Males			
	25-34	35-44	45-54	55-64	25-34	35-44	45-54	55-64
Education								
Highest	15.4	20.5	30.7	43.6	36.7	48.1	57.9	57.5
Mid	18.4	26.8	39.4	47.0	39.9	55.3	63.0	66.2
Lowest	26.4	39.8	52.3	58.5	46.3	58.6	64.4	65.1
Occupation								
Higher salariat	15.1	23.7	41.1	48.7	38.8	52.4	62.5	66.2
Lower salariat	17.6	24.9	35.3	51.5	38.0	52.7	60.3	58.9
Higher grade white collar	17.0	27.3	44.4	50.1	41.7	54.3	59.3	64.3
Self-employed	19.6	34.1	48.5	55.6	44.3	58.3	67.3	69.0
Farmers	27.8	39.6	56.5	60.7	46.7	56.5	65.5	64.4
Higher grade blue collar	25.9	36.3	49.5	56.7	45.7	55.7	69.4	63.5
Lower grade white collar	23.5	37.5	50.9	58.8	45.7	59.3	64.4	67.6
Skilled workers	28.6	36.9	51.0	62.3	40.2	54.8	63.2	62.7
Routine	24.9	43.2	51.7	61.1	44.2	59.5	60.9	66.5
Income quintile								
Highest	11.9	22.2	37.6	46.2	37.9	53.5	63.3	63.6
P80	17.9	27.5	44.5	56.8	40.7	54.1	66.1	66.3
P60	22.0	31.8	48.8	57.1	43.5	55.5	62.4	66.5
P40	21.9	36.0	49.6	59.3	43.8	57.6	62.2	67.4
Lowest	25.2	36.3	51.3	57.0	42.2	54.7	59.0	59.3
Total	*20.1*	*31.1*	*45.7*	*55.5*	*41.6*	*55.2*	*62.8*	*64.5*

Table 5. Prevalence (%) of overweight (BMI ≥ 25) across various countries (females).

SEP indicator	Country [1]									
	FIN	DEN	BEL	IRE	AUS	ITA	SPA	GRE	POR	*Total*
Education										
Highest	36.1	28.5	22.5	24.7	21.5	17.0	22.8	29.2	26.5	*26.8*
Mid	42.4	34.9	31.8	36.6	33.9	22.3	31.5	38.9	24.5	*32.1*
Lowest	45.7	40.9	43.9	41.0	47.9	36.1	45.1	48.8	47.1	*43.5*
Occupation										
Higher salariat	34.2	23.8	25.4	30.2	31.0	25.2	26.1	41.7	37.3	*30.9*
Lower salariat	38.3	35.8	26.9	34.8	34.5	26.6	29.0	32.2	34.0	*31.3*
Higher grade white collar	40.9	35.1	28.3	39.0	36.7	25.0	34.8	38.7	33.6	*33.4*
Self-employed	48.3	35.3	29.2	40.6	34.4	30.6	40.8	42.9	43.1	*38.4*
Farmers	42.1	25.8	40.6	42.0	44.5	27.9	51.5	45.3	47.3	*45.0*
Higher grade blue collar	41.1	37.3	38.4	40.9	38.2	38.9	47.3	36.7	41.8	*42.0*
Lower grade white collar	45.9	43.1	41.8	39.5	38.6	34.5	45.3	46.2	43.9	*42.2*
Skilled workers	48.9	37.6	51.9	42.5	39.9	32.2	46.1	50.1	51.2	*43.9*
Routine	42.3	39.8	41.8	40.4	51.1	42.7	45.9	46.3	50.2	*44.7*
ESEC unknown	35.7	30.4	43.6	32.9	32.9	32.5	43.3	50.7	51.1	*38.0*
Income quintile										
Highest	38.9	30.9	22.1	29.1	26.7	23.4	26.2	35.4	30.3	*28.3*
P80	38.8	30.4	24.6	39.9	37.4	27.5	38.9	39.5	43.2	*35.2*
P60	42.2	36.5	32.3	38.7	37.8	30.2	41.3	45.3	46.4	*38.9*
P40	45.0	36.9	35.7	37.7	42.8	32.5	42.8	45.7	47.8	*40.7*
Lowest	43.2	35.4	41.8	39.3	39.6	36.8	44.9	48.7	47.5	*42.0*
Total	*40.9*	*32.7*	*30.3*	*36.6*	*37.5*	*29.8*	*35.6*	*44.6*	*44.3*	*36.8*

[1] Finland, Denmark, Belgium, Ireland, Austria, Italy, Spain, Greece, Portugal

Table 6. Prevalence (%) of overweight (BMI ≥ 25) across various countries (males).

SEP indicator	**Country** [1]									
	FIN	DEN	BEL	IRE	AUS	ITA	SPA	GRE	POR	*Total*
Education										
Highest	51.6	39.9	43.9	50.2	40.3	41.0	57.3	61.7	52.2	*50.0*
Mid	57.1	50.5	53.8	57.4	56.1	50.0	64.8	64.8	49.3	*55.6*
Lowest	60.6	58.5	54.9	58.8	61.0	53.9	62.0	65.8	58.3	*59.1*
Occupation										
Higher salariat	53.3	42.4	50.1	55.6	55.2	49.9	56.7	63.9	58.9	*54.4*
Lower salariat	59.1	48.3	47.0	53.4	47.8	46.6	65.6	58.0	51.4	*51.8*
Higher grade white collar	61.6	51.6	57.0	53.8	50.1	44.7	61.4	66.8	55.7	*54.7*
Self-employed	67.2	53.5	43.5	61.5	59.6	54.3	61.5	65.8	59.0	*59.4*
Farmers	51.2	73.0	58.2	57.0	58.5	49.3	64.5	67.2	58.7	*58.6*
Higher grade blue collar	55.5	49.1	50.0	68.6	61.5	55.5	58.3	57.2	72.1	*58.7*
Lower grade white collar	64.4	61.9	46.0	57.8	62.4	54.3	61.6	62.2	59.7	*59.5*
Skilled workers	50.5	48.3	56.3	56.9	59.4	51.0	62.5	64.1	54.8	*55.8*
Routine	53.4	57.1	59.1	53.5	58.5	54.7	63.0	67.1	60.1	*58.4*
ESEC unknown	47.2	45.4	48.1	61.5	48.8	54.9	55.1	64.8	39.3	*52.9*
Income quintile										
Highest	60.7	49.1	47.3	56.0	51.6	47.7	60.5	63.8	55.7	*54.2*
P80	58.4	48.9	52.0	59.0	54.3	50.0	60.8	64.3	59.9	*56.2*
P60	55.6	53.8	50.6	57.3	58.0	51.1	62.9	66.2	58.6	*57.1*
P40	57.4	48.3	51.9	59.2	61.2	53.0	63.2	64.5	57.8	*57.8*
Lowest	55.2	48.3	49.2	52.1	51.9	52.6	58.1	62.7	53.5	*54.4*
Total	*57.1*	*49.0*	*49.2*	*56.1*	*55.8*	*50.1*	*56.3*	*64.6*	*55.8*	*55.0*

[1] Finland, Denmark, Belgium, Ireland, Austria, Italy, Spain, Greece, Portugal

Chapter 25

Socio economic inequalities in leisure time physical activity

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Abstract

Objectives

Evidence on the association between leisure time physical activity and socio-economic status is scarce and non conclusive. In this paper it is aimed to study the patterns and magnitudes of socio-economic inequalities in leisure time physical activities and to investigate whether these patterns differ between the Member States of the European Union.

Methods

Comparable cross-sectional data on subjects aged 16 to 64 years derived from national health interview surveys from 15 European countries were withheld for the analysis. To assess educational inequalities in leisure time physical activity, multivariate logistic regressions were used.

Results

Levels of physical activity during leisure time remain low in the countries considered in this analysis: overall 35,8% of males and 41,8% of females in the age group 16 to 64 years describe their leisure time activity as predominantly of a sedentary nature. Wide variations of sedentary lifestyle during leisure were observed when comparing countries. Northern countries have a distinct profile; although the overall prevalence of sedentariness is relatively low, distinct socio economic differences can be observed. In both Southern and Eastern European countries, large parts of the population do indicate not to perform any leisure time activity. In Southern countries, this phenomenon is more explicitly socio economic determined than in Central European countries.

Conclusions

To reduce socio economic inequalities in leisure time physical activities, different strategies must be applied, depending on the ‘state of the art’ in every country. In Northern countries, the challenge exists to reach a relative small part of the population, predominantly with a low educated profile. The scope of such programs must be enlarged in Southern countries; not only must it be targeted towards a considerable part of the population; it should be especially focused on the socio economic deprived population. The situation in Eastern countries is specific in this sense that a large part of the population indicates not to perform any leisure time physical activity, a phenomenon largely independent of the socio economic position of those involved.

Introduction

Evidence for socio-economic inequalities in physical activities is heterogeneous and at times contradictory. Results of the Health Survey for England (1,2) for example, show that for the total physical activity among males, the higher socio-economic groups have lower levels of physical activity, while females display fewer differences between the socio-economic groupings. If one focuses alone on sports activities, the relation shows the opposite: higher socio-economic groups have higher levels of participation in sport (2). Although the emphasis in physical activity assessment has been on the measurement of leisure-time physical activities (LTPA), it has been acknowledged that measuring LTPA leads to an underestimate of total physical activity, especially for those people with physically demanding jobs (3). It is only in the late nineties that an international group of physical activity assessment experts developed a questionnaire – the International Physical Activity Questionnaire (IPAC) – to measure not only the LTPA, but the total activity level. Recent applications of IPAC in health surveys showed that, in general, there are socio-economic differences, i.e. a person with higher education is more active than a lower educated. In spite of the development and application of instruments to estimate the total activity level, LTPA remains the most widely studied form of physical activity (4).

Restricted to LTPA, the link between physical activity and socio-economic characteristics remains unclear. In the ATTICA study a positive association was observed between (leisure time) physical activity and occupation, but no associations were found between physical activity levels and other social status indices (education level and annual income) (5). Contrasting results were found in the National Fitness Survey in Scotland: while inequalities in all levels of LTPA were less straightforward when examined by occupation, clear differences were evident in relation to education (6). In other research it is concluded that a low level of education is associated with a high level of physical inactivity (7), that both low education and low occupational status were strongly associated with low LTPA (8) and that white-collar employees engaged in vigorous leisure time activities more often than blue-collar workers (9). In analyzing a 10-year trend in physical activity in the eastern Finnish adult population it was found that in this period males and females with low education or income increased LPTA more than those with high education and income. The authors conclude that socio-economic characteristics, such as income and education, appeared to have lost importance as determinants of population-wide (leisure time) physical activity (10)

In a study aimed to determine the prevalence of sedentary lifestyles in 15 Member States of the European Union, it was found that participants belonging to primary level education group were more sedentary than those with higher levels of education, with greater differences among females (11). Although the results show that wide inter-country differences were observed in the prevalence of sedentary lifestyle, with Northern European countries showing lower prevalences of sedentary lifestyle as compared with some Mediterranean countries, no details were presented on the magnitude of the potential association between socio-economic characteristics and physical activities within and between European countries. It remains to be analyzed whether high prevalences of sedentariness implicate more outspoken socio economic inequalities or, inversely, whether countries with relative low prevalences of sedentariness show smoothened or non-existing inequalities. Evidence to support either presumption is scarce and non exclusive. A health survey in the region of Scania (partially part of Sweden and Denmark) e.g. showed relative low percentages of sedentariness in both males and females but significant differences between high and low educated people (12, 13). The Eurothine-project especially aims at studying the patterns and magnitudes of socio-economic inequalities in leisure time physical activities and wants to investigate whether these patterns differ between the Member States of the European Union.

Methods

Data

In the framework of EUROTHINE, Member States were asked to provide national micro-data from their (most recent) national health interview and similar surveys on, among others, leisure time physical activity and a set of socio economic background indicators. 15 countries, listed in table 1, were capable of delivering data that describes the respondent's life in terms of leisure time physical activity. Most of the data is based on information gathered by means of a face to face interview with the sampled respondents. Special attention must be paid to the data collected in the framework of the Finbalt Health Monitor (organized in Finland, Lithuania and Latvia); not only do the totals refer to pooled data derived from several successive surveys, also the mode of data collection – surveys by mail – deviated from the other surveys used in this analysis. The questions used to estimate the leisure time physical activity were to a large extend country-specific, but covered the whole spectrum going form e.g. 'heavy training and competitive sports' (Denmark) or 'intensive physical activity several times per week (Spain), over 'sports for less than 4 hours a week and/or light activities (Belgium) or 'performing leisure time physical activity that make your sweat/out of breath for less than 1 hour' (Norway) to 'read, watch TV or other sedentary occupation' (Denmark) or 'completely sedentary (reading, watching television,…)' (Spain). This heterogeneity was the main reason to dichotomize the indicator into the categories 'non sedentary lifestyle during leisure time' and 'sedentary lifestyle during leisure time', acknowledging that by doing so information on potential different levels (high, moderate, light) in leisure time physical activities is passed by. It should also be stressed that the attention is focussed toward the presence or absence of physical activity during leisure time, ignoring the possible necessity of physical activity during working hours or while performing domestic tasks.

Data on leisure time activities was only collected for subjects aged 16 years and older. Since for 6 out of the 15 countries, no information was available on subjects older than 64 years, the age frame 16 – 64 years, in age groups of 5 years, is used.

The educational level was considered to be the most appropriate indicator to estimate the socio-economic position. This indicator reflects the highest completed level of education. Where appropriate, this level is completed by obtaining a diploma. For those still attending school, the educational level refers to the level of school that is currently being attended. The national categories of the educational level were harmonised on the basis of a simplified version of the International Standard Classification of Education (ISCED), resulting in 4 education categories.

Analyses

Prevalence rates were age-standardised using the direct method. The European Standard population of 1997 was used as a reference. Educational differences in the prevalence of sedentariness were expressed both in absolute and in relative terms. Absolute rate differences were calculated because they address differences between countries in the overall prevalence of sedentariness. They were calculated by subtracting the (age standardized) prevalence rate of sedentariness of the highest educated groups from that of the lowest one. Relative differences were revealed by using the prevalence rate ratio (PRR) that expresses the prevalence of a sedentary lifestyle in the group of interest relative to the prevalence of a sedentary lifestyle in the group with the highest educational level. In calculating the PRR's not the observed educational level is used, but the relative importance of every educational group within each country. In order to be able to do this, a ranking variable was created by quantifying each educational level as the proportion of the population that had a lower position in the educational hierarchy. The magnitude of the association between the educational level and the prevalence of a sedentary lifestyle was estimated by using a generalised linear model for binominal outcomes with a logarithmic function. The use of such a model was dictated by the fact that the prevalence of a sedentary lifestyle in the population is rather high and in this scenario, the log-binomial model has been shown to be the preferred model for logistic regression.

Results

Table 2 shows demographic data and the overall age adjusted prevalence of a sedentary lifestyle. The national sample sizes summed up to N = 246.248 and varied from N = 1481 (Slovakia) to N = 92.944 (Italy) and percentages of missing values amounted 2.2% on average and ranged from 0.2 (Norway) to 14.9 % (The Netherlands).

The overall age adjusted prevalence for a sedentary lifestyle was 35.8% in males (range: 14.5% (Denmark) – 62.8% (Portugal)) and 41.8% in females (range 12.1% (Denmark) – 75.4% (Portugal)). Although the overall prevalence of a sedentary lifestyle is higher in females than in males, some countries show an inverse picture; in Finland, Denmark, Estonia and Slovakia, age adjusted prevalences are higher in males than in females.

Table 3 shows the distribution and the prevalence of the pooled sample, stratified by educational level. The prevalence of a sedentary lifestyle was lowest in the highest educational group (males: 26.8%; females: 33.9%) and highest in the lowest educational group (males: 51.2%; females: 57.1%). The PRR estimates showed a significant decrease with increasing educational level both in males and females. For the lowest educational level, the PRR of a sedentary lifestyle is 1.54 (95 CI: 1.50 – 1.59) in males and 1.35 (95 % CI: 1.32 – 1.38) in females.

Table 4 and Table 5 show for both genders educational inequalities, both in absolute terms and in relative terms, in the prevalence of a sedentary lifestyle across Europe,. The inequalities are expressed as absolute rate differences (highest versus the lowest educational level), and as PRR's, calculated as RII.

In males, the Nordic countries (Finland, Norway, Denmark) show a quite specific profile with relatively low overall prevalences of sedentariness, limited absolute differences between the highest and lowest educated populations, but relatively high PRR's. Although belonging to the Northern part of Europe, Germany shows a different pattern with a high prevalence of sedentariness and high absolute differences between the highest and lowest educated populations. For central and Southern countries, the results are more scattered. Portugal for example has a very high overall level of sedentariness, limited differences between high and low educated males and a rather low PRR. For the Balkan countries, the overall prevalence of sedentariness is (very) high, but the relative differences are sometimes very low (Slovakia, Lithuania) or relatively high (Czech Republic, Estonia). All Balkan countries show to have rather low PRR's in males.

The profile found in the Northern countries (Finland, Norway, Denmark) in males, is partly applicable in females: alike are the low overall levels of sedentariness and the relatively small differences between the highest and the lowest educated. The PRR's for Finnish females is rather low and different from the PRR's for the other Northern countries. The overall level of sedentariness is (very) high for females of the Balkan countries. With exception of the situation in de Czech republic, with rather large absolute differences between the lowest and the highest educated, the absolute differences in the Balkan countries between low and high educated females remains limited. Also common are the low values of PRR in all Balkan countries.

Discussion

The various surveys used in the Eurothine project differ in the means by which they are conducted, in the wording of the questions, the number of response categories in the year the survey was conducted, in population sampling frames, in response rates, and in (even small) differences in definitions of physical activity – all of which may cause differences in the resulting physical activity estimates, hence the (European) comparability of the results is jeopardized. By reducing the number of response categories to two well distinct categories (sedentary versus non sedentary lifestyle), the risk of misclassification in an erroneous category was minimalised. Although this led to a loss of information, it contributed to a better comparability of the results.

Another important shortcoming of the data used in the analysis is that is only highlights physical activity (or the lack of physical activity) during leisure time. It does not reflect the total physical activity performed during the day. Physical activity required by the work content, domestic and transport-related activities,… involve energy expenditures equivalent to moderate-intensity are not considered here. Because many people, such as females and elderly adults tend to spend substantial amounts of time engaged in household chores or gardening activities rather than or as a supplement to leisure time physical activities, prevalence estimates of physical activity in these groups based only on standard measures of leisure time physical activity may be underestimated (1)

Although time spent in (leisure time) physical activity is a behavioral factor which has important long term health consequences, the levels of physical activity remain low in the countries considered in this analysis: overall 35.8% of males and 41.8% of females in the age group 16 to 64 years describe their leisure time activity as predominantly of a sedentary nature. Wide variations of sedentary lifestyle were observed when comparing countries, with at the lower extreme Denmark (14.5% in males, 12.1% in females) and at the upper extreme Portugal (62.8% in males, 75.4% in females). Next to a North – South gradient, with lower levels of sedentariness in the Northern Countries a West – East gradient is apparent with higher levels of sedentariness in the Eastern European countries (10). These findings are in line with results of previous research (11, 14, 15) and are linked to differences in the presence and content of national initiatives to promote physical activity (16), the perception of environmental opportunities for physical activities (17, 18), perceived safety of area of residence (19), lack of time and interest (20) and perception of health benefits of physical activities, with less positive beliefs observed among southern Europeans (21).

To estimate the magnitude of socio economic differences in sedentariness, several distinct elements have to be taken into consideration; the overall, country specific, level of sedentariness, and both the absolute and the relative differences between the lower and higher educated. A distinct profile can be discerned for the Northern countries: the overall figures show that in these countries the prevalence of sedentariness is – in comparison with other European countries – rather low. In combination with the high values of the PRR it can be concluded that in Northern countries sedentariness is rather scarse, yet clearly socio economic determined. An outlier in this context is Germany, with high prevalences of sedentariness in both males and females, high absolute differences, a high PRR in males and a rather low PRR in females. A possible explanation for this phenomenon is the differential historical background of the Western and Eastern part of the country, with the Western part oriented towards the North.

In global terms, the Southern and Eastern European countries have high levels of sedentariness. The absolute differences between the low and high educated people are more pronounced in the Southern than in the Eastern countries. The PRR's are, in general, higher in the Southern than in the Eastern countries. In both Southern and

Eastern countries, large parts of the population do indicate not to perform any leisure time activity. In Southern countries, this phenomenon is more explicitly socio economic determined than in Central European countries.

To reduce socio economic inequalities in leisure time physical activities, different strategies must be applied, depending on the ‘state of the art’ in every country. In Northern countries, with traditionally well developed health promotion programs, the challenge exists to reach a relative small part of the population, predominantly with a low educated profile. The scope of such programs must be enlarged in Southern countries; not only must it be targeted towards a considerable part of the population; it should be especially focused on the socio economic deprived population. The situation in Eastern countries is specific in this sense that a large part of the population indicates not to perform any leisure time physical activity, a phenomenon largely independent of the socio economic position of those involved.

In developing a targeted or ‘blind’ programs aiming to promote leisure time physical activities much thought must be spend on the effectiveness of such programs, especially in less educated groups. Health promoting messages seem be differentially taken up by different social class groups; better off and better educated people are more likely to take up healthy physical activities than poorer and less well educated people (22, 23, 24). Any public health policy aiming to reduce socio economic inequalities in health behavior will be confronted with the dilemma that universal initiatives can result in a selective take up by those who are less at risk, aggravating instead of reducing inequalities. Evaluating the potential impact of possible interventions in terms of reducing (or not) the socio economic gaps is in this perspective a necessity. Interventions to promote physical activity in deprived populations may require different strategies from those targeting at more affluent groups (25).

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Table 1. Overview of the national surveys that were used in this study

Country	*Name of survey*	*Year(s) of survey*
Norway	Norwegian Survey of Living Conditions	2002
Finland	Finbalt Health Monitor	1994/'98/'00/'02/'04
Denmark	Danish Health and Morbidity Survey (DHMS/ SUSY)	2000
Estonia	Health Behavior among Estonian Adult Population	2002/'04
Lithuania	Finbalt Health Monitor	1994/'98/'00/'02/'04
Latvia	Finbalt Health Monitor	1998/'00/'02/'04
Czech Rep	Health Interview Survey	2002
Slovakia	Health Monitor Survey	2002
Netherlands	General social survey (POLS)	2003/'04
Belgium	Health Interview Survey	1997/'01
Germany	German National Health Examination and Interview Survey	1998
Italy	Health and health care utilization	1990/'00
Spain	National Health Survey	2001
Portugal	National Health Survey	1998/'99
Hungary	National Health Interview Survey Hungary	2000

Table 2. Demographic data: absolute sample size, percentages of missing values, and age-adjusted prevalences of a sedentary lifestyle.

Country	N_{total}	Sedentary lifestyle (in %)		Missing (%)
		Males	Females	
Finland	20371	24.0	20.1	1.4
Norway	5683	21.6	28.7	0.2
Denmark	13675	14.5	12.1	0.9
Germany	6114	39.0	42.4	2.4
The Netherlands	12955	16.1	16.2	14.9
Belgium	14582	27.0	33.9	7.9
Spain	16448	40.7	47.9	0.5
Portugal	31117	62.8	75.4	0.7
Italy	92944	33.5	40.5	0.0
Hungary	4450	28.4	35.0	0.5
Slovakia	1481	52.6	51.4	10.3
Czech Republic	2052	54.3	67.1	0.6
Lithuania	11605	41.2	47.0	7.1
Latvia	8395	49.2	56.9	4.3
Estonia	4376	57.6	55.3	3.0
	sum			Mean
Total	246248	*35.8*	*41.8*	*2.2*

Table 3. Sample distribution, age-adjusted prevalence (%) and prevalence rate ratio (RR) of a sedentary lifestyle by educational level.

Educational level	Proportion (%)	Sedentary lifestyle (%)	PRR for a sedentary lifestyle (95 % CI)	
Males				
Lowest	17,6	51.2	1.54	(1.50 – 1.59)
2nd lowest	25,9	43.0	1.39	(1.35 – 1.42)
2nd highest	38,6	31.6	1.21	(1.18 – 1.24)
Highest	17,9	26.8	1	
	Sum	Mean		
Total	*100.0*	*38.1*	-	-
Females				
Lowest	18,4	57.1	1.35	(1.32 – 1.38)
2nd lowest	22,2	48.4	1.30	(1.27 – 1.32)
2nd highest	40,3	37.5	1.14	(1.12 – 1.67)
Highest	19,1	33.9	1	
	Sum	Mean		
Total	*100.0*	*44.2*	-	-

Data were weighted for country size; prop. = column proportion; PRR = prevalence rate ratio; ages: 16-64 years; N_{total} = 239,081

Table 4. Age-adjusted prevalence (%) of a sedentary lifestyle in males by educational level across the studied countries.

	Sedentary lifestyle/education						
	Lowest	2nd lowest	2nd highest	Highest	Abs. dif.	PRR	(95% CI)
Finland	25.2	32.1	23.8	16.4	8.06	1.87	(1.61 – 2.17)
Norway	*	30.4	23.5	14.2	16.4	2.71	(2.04 – 3.58)
Denmark	23.2	16.5	14.2	8.3	8.77	3.18	(2.51 – 4.03)
Germany	55.7	48.4	38.6	19.1	15.71	2.24	(1.93 – 2.61)
The Netherlands	22.6	17.3	17.2	14.3	3.3	2.17	(1.66 – 2.85)
Belgium	48.8	31.3	26.3	19.3	12,9	2.81	(2.42 – 3.28)
Spain	53.3	43.9	33.2	24.7	17.74	2.46	(2.21 – 2.73)
Portugal	68.5	57.9	54.5	50.9	13.86	1.60	(1.50 – 1.69)
Italy	47.6	36.6	28.9	26.0	10.33	1.97	(1.87 – 2.08)
Hungary	35.9	27.8	23.6	26.6	6.32	1.76	(1.34 – 2.32)
Slovakia	50.1	58.0	48.1	49.5	5.87	1.12	(0.85 – 1.47)
Czech Republic	72.0	60.3	48.8	44.6	10.99	1.76	(1.38 – 2.23)
Lithuania	48.4	45.5	37.9	39.8	9.35	1.40	(1.24 – 1.59)
Latvia	56.9	52.7	48.4	42.4	7.73	1.45	(1.28 - 1.64)
Estonia	67.6	56.7	62.8	42.0	2.3	1.35	(1.17 – 1.55)
Total	*51.2*	*43.0*	*31.6*	*26.8*	*24.4*	*1.66*	*(1.61 – 1.70)*

Prevalences are age-standardized using the direct method with the ESP as a reference.
Asterix (*) = empty category
Absolute differences between the lowest and the highest educated males
PRR = relative index of inequality, calculated as RII
PRR = adjusted for age group (all) and country (only total); Totals are weighted for country size.

Table 5 . Age-adjusted prevalence (%) of a sedentary lifestyle in females by educational level across the studied countries.

	Sedentary lifestyle/education					PRR (95% CI)	
	Lowest	2nd lowest	2nd highest	Highest	Abs. dif.		
Finland	26.1	24.6	20.2	17.6	8.5	1.45	(1.23 – 1.71)
Norway	*	40.3	31.0	19.8	20.5	2.56	(2.03 – 3.23)
Denmark	21.9	15.3	10.6	10.1	11.8	3.30	(2.51 – 4.33)
Germany	64.5	51.1	42.0	24.7	39.8	1.20	(1.69 – 2.35)
The Netherlands	23.5	17.7	16.0	12.6	10.9	2.45	(1.89 – 3.18)
Belgium	53.4	42.7	33.0	25.2	28.2	2.55	(2.24 – 2.89)
Spain	59.7	50.5	40.3	34.1	25.6	2.10	(1.90 – 2.32)
Portugal	80.2	75.8	65.8	61.4	18.8	1.37	(1.31 – 1.43)
Italy	53.5	42.0	36.6	33.8	19.7	1.65	(1.57 – 1.73)
Hungary	43.59	37.0	32.2	28.6	14.99	1.50	(1.23 – 1.84)
Slovakia	53.9	63.4	48.1	50.3	3.6	1.34	(1.01 – 1.76)
Czech Republic	80.6	76.1	63.1	62.4	18.2	1.34	(1.13 – 1.59)
Lithuania	53.9	51.5	42.2	47.8	6.1	1.27	(1.14 – 1.41)
Latvia	57.8	59.9	59.5	49.3	8.5	1.27	(1.16 – 1.39)
Estonia	65.5	57.2	56.4	52.0	13.5	1.31	(1.15 – 1.49)
Total	*57.1*	*48.4*	*37.5*	*33.9*	*24.2*	*1.44*	*(1.41 – 1.48)*

Prevalences are age-standardized using the direct method with the ESP as a reference.
Asterix (*) = empty category
Absolute differences between lowest and highest educated females
PRR = relative index of inequality, calculated as RII
PRR = adjusted for age group (all) and country (only total)
Totals are weighted for country size.

Part VI

Health care utilization

Chapter 26

Educational Level and the Utilization of Specialist Care: Results from Nine European Countries

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Abstract

Background

It is well known that the utilization of health care provided by medical specialists often increases with increasing household income, even if need (i.e. health status) is controlled for. The study presented here aims at widening the scope of these analyses, by using the indicator educational level instead of income, by including some Eastern European countries, by applying methods yielding results that are easy to understand (such as odds ratios), and by restricting some analyses to specific morbidity groups.

Methods

The analyses are based on the 'harmonised data set from national surveys' compiled in the Eurothine project. Data are available from six Western European countries (i.e. Belgium, Denmark, France, Germany, Ireland, Norway) and three Eastern European countries (i.e. Estonia, Latvia, Hungary). The following potential confounders are included: age, sex, self assessed health (SAH), chronic disease. In order to better adjust for need, analyses were also conducted for specific morbidity groups (any chronic disease, high blood pressure, diabetes). The multivariate analyses have mostly been carried out by logistic regression, but the relative index of inequality (RII) has been used as well.

Results

The analyses show that the utilization of health care provided by medical specialists increases with increasing educational level of the patient. Thus they are supporting results from previous studies, and they provide some additional information: Similar associations can be seen if socio-economic status is assessed by educational level instead of income. Applying methods used in social epidemiology (e.g. logistic regression, relative index of inequality) yields similar results as methods used in health economy (e.g. concentration indices). Health care inequities are also present in specific morbidity groups, and they can also be found in three Eastern European countries (i.e. Estonia, Latvia and Hungary).

Conclusions

The fact that these health care differentials can also be seen in specific morbidity groups provides strong support for the hypothesis that upper status groups receive more specialist care, as restricting the analysis to specific morbidity groups is an excellent way to adjust for need. Presenting the health care differentials by methods commonly used in social epidemiology could be of some practical importance, as they produce estimates (e.g. odds ratios) that probably have a direct numerical meaning to health policy makers.

Introduction

The objective of this study is to analyse the association between socio-economic status (SES) and utilization of health care provided by medical specialists. A number of studies have already looked at this association [e.g. 1-3]. In these studies, the assessment of SES is usually based on the household income, but sometimes the educational level is used as well. Most studies have been conducted by health economists, mainly in the ECuity project, a large research group with participants from many EU countries, from Norway, Switzerland and the United States. Similar analyses have been conducted for some Asian countries as well [4]. The methods and the main results of the ECuity project are shown in a recent publication by E. van Doorslaer et al. [5]: The aim is to assess horizontal inequity in the use of physician services across different income groups that cannot be explained by differences in the need for health care (i.e. by differences in morbidity). The term 'horizontal inequity' refers to the objective that people with equal need should receive equal health care, irrespective of their socio-economic status, for example. Concerning health care provided by General Practitioners (GPs), only small differences have been found across income groups. Concerning health care provided by medical specialists, though, a significant pro-rich inequality can be seen in most countries, indicating that higher income groups go more often to a medical specialist than low income groups, even after controlling for need.

In the ECuity project, inequality in health care is assessed by a concentration index comparing the distribution of income with the distribution of health care utilization. Two different methods have been applied for taking the need component into account. First, a concentration index is calculated based on an algorithm that assigns the average level of need (i.e. morbidity) in the population to each participant of the study (direct method). Second, the average association between health care utilization and need in the total population is defined as the standard, with deviations from this standards for specific income groups indicating inequity (indirect methods). The results are reported by a concentration index for the utilization of physician care, and by another measure for the horizontal inequity. The practical meaning of the numerical results is not easy to understand [6]. Taking an example from the publication from E. van Doorslaer et al. [5]: The concentration index showing income inequalities in the probability of visiting a medical specialist in Germany is calculated to be +0.0130, with the positive sign indicating an imbalance favouring the rich.

Concerning Eastern European countries, to date little is known about health care inequalities and inequities by socio-economic status. The best information is available from Estonia. In a recently published paper, J. Habicht and A. Kunst [7] analyse data on health care utilization of adults, based on a survey conducted in 1999 (i.e. eight years after a major health care reform). Concerning GPs, the results show that utilization is somewhat lower in the lower SES groups. Concerning medical specialists this association becomes even more clear. Adjusting for age and sex and also for health status, the probability of visiting a specialist is about twice as high in the upper educational group and in the upper income group (as compared with the corresponding lower group). We are not aware of a study comparing these health care inequalities between Eastern and Western European countries.

To summarize, the association between socio-economic status and specialist care has been analysed in some studies before, but some important issues remain to be addressed. First, previous cross-country comparisons have assessed the socio-economic status mostly by income; it should be checked if similar results can be seen if the status is assessed by educational level. Second, Eastern European countries have not been included yet in these cross-country comparisons. Third, previous studies have mostly been conducted by health economists applying their analytical methods (e.g. yielding concentration indices); it would be important to know if similar results can be seen with other methods as well (e.g. yielding odds ratios). Fourth, it is especially interesting to look at health care differentials in specific morbidity groups, as this provides a very good opportunity to adjust for need.

Methods

The analyses are based on the dataset that has been compiled in the Eurothine project (i.e. the harmonised data set from national surveys). Data are available from six Western European countries (i.e. Belgium, Denmark, France, Germany, Ireland, Norway) and from three Eastern European countries (i.e. Estonia, Hungary, Latvia). All surveys have been conducted around the year 2000. The sample sizes are given in table 1, ranging from 4,376 (Estonia) to 16,690 (Denmark). The main dependent variable is 'visit to a medical specialist (excluding dentists)'. In Belgium, the question concerning visits to a specialist refers to a period of 2 months, in Denmark to a period of 3 months, and in all other countries to a period of 12 months. The socio-economic status is assessed by the educational level. We applied a well known system for making the levels comparable across different countries, the 'International Standard Classification of Education (ISCED)', resulting in four groups: no or primary education (ISCED=0/1), lower secondary (ISCED=2), upper secondary (ISCED=3/4), tertiary education (ISCED=5/6).

The following potential confounders are included in the analyses as well: age, sex, self assessed health (SAH), chronic disease. Three groups of SAH are distinguished (good, fair, poor). The prevalence of chronic disease is assessed by a question asking for the presence of at least one of the following nine diseases: allergy, back ache, bronchitis, asthma, diabetes, hypertension, kidney diseases, migraine, osteoporosis. These chronic diseases have been chosen because they are included in the surveys from all countries, except for Ireland. In order to better adjust for need, additional analyses were conducted in three subgroups defined (a) by the presence of any of these chronic diseases, (b) by the presence of high blood pressure, and (c) by the presence of diabetes. These three subgroups have been chosen because they include a sufficient number of participants.

The multivariate analyses have mostly been carried out by logistic regression, starting with a test for multicollinearity. The 'relative index of inequality (RII)' is used as well. For each country individually, it quantifies the relative position of each educational group within the hierarchy of all educational groups, assessing the association with the dependent variable by means of log-binomial regression [8]. The RII results in a ratio that can be interpreted here as the prevalence rate ratio of health care utilization in the highest educational group as compared with the lowest educational group. The advantage of reporting odds ratios is that this method for estimating associations with binary outcomes is very well established, and that the numerical meaning of an odds ratio is easily conveyed to health policy makers. The advantage of reporting the RII is that this estimate is less affected by cross-country differences in the distribution of educational levels. All analyses were conducted with the statistical software package SAS (version 9.13).

Results

Table 1 reveals that there are large differences between the nine countries included in the analyses. Low educational level is quite rare in Germany and Norway, for example, and quite common in Hungary and Ireland. Concerning visits to GPs, the prevalence is low in Denmark and very high in France. Great differences can also be seen concerning visits to specialists: The lowest prevalence is again seen for Denmark (7.8%), and Germany shows the highest prevalence (74.7%). The information on health status (self assessed health, chronic disease) indicates, for example, that the participants from France report better health than those from Germany.

The distribution of visits to specialists by age, sex, educational level and health status is given in table 2. The prevalences usually increase by age, and they are always significantly higher for women than for men. Also, the differences by educational level are statistically significant for all countries except Norway, mostly indicating that utilization is highest in the highest educational group. Some of these differences are quite small, though, and some countries (e.g. Ireland) show a very mixed pattern. Concerning self assessed health (SAH), a statistically significant association is seen for all countries, always indicating that the utilization of specialist care increases with decreasing health. A similar picture is seen concerning the variable 'chronic disease' as well.

The associations between educational level and specialist care are assessed further in multivariate analyses stratified by sex (see table 3). Testing for multicollinearity revealed no problems. Controlling for age and health status (i.e. self assessed health, chronic disease), utilization of specialist care is always higher in the highest educational group (as compared with the lowest educational group). With two exceptions (men in Germany and men in Norway), the level of statistical significance is always reached. Some of these odds ratios are particularly high, e.g. for women in Germany (OR 5.94) and for women in France (OR 4.33). Also, a dose response pattern can be seen for most of these country- and sex-specific analyses. It is interesting to note that the odds ratios for the highest educational level are mostly higher for women than for men. Concerning self assessed health, the picture of increasing specialist care with decreasing health is very clear (the only exception being women in Latvia). These odds ratios are particularly high for Ireland. The association between chronic disease and specialist care is reduced if self assessed health is controlled for additionally (see last two columns of table 3), but it can still be seen that those reporting a chronic disease always report more specialist care.

In order to better adjust for need, further analyses were conducted in three subgroups defined by (a) the presence of any chronic disease, (b) the presence of high blood pressure, and (c) the presence of diabetes. The results show a similar pattern as in table 3: utilization of specialist care is mostly highest in the highest educational group (see table 4). There are very few exceptions, mainly for men in Germany.

In order to simplify the presentation, the odds ratios presented so far did not show the confidence intervals. Table 5 presents some of these intervals for the highest educational level, i.e. for the analyses including the total sample (see table 3) and for the subgroup including respondents with a chronic disease only (see table 4). Some of these confidence intervals do not overlap, indicating that there are significant differences between the countries, and also between men and women. Concerning men from the chronic disease group, for example, the odds ratio for the highest educational level is high for Hungary (OR 3.18) and low for Belgium (OR 1.44), and their confidence intervals do not overlap. Concerning women, a similar comparison can be made between Germany (OR 7.30) and Denmark (OR 1.72).

The analyses based on the relative index of inequality (RII) are shown in table 6, stratified by sex and restricted to two subgroups defined (a) by the presence of any chronic disease and (b) by the presence of diabetes. The table reveals several important results. First, it again stresses that higher educational level is often associated with higher utilization of specialist care. Concerning the subgroup defined by the presence of any chronic disease, 13 out of these 16 associations are statistically significant, and two more are borderline statistically significant (the only major exception is seen for men in Norway). Concerning the subgroup defined by the presence of diabetes, there are only two statistically significant associations (i.e. for women in Belgium and in France), plus a few borderline statistically significant associations (i.e. for men and women in Hungary and for men in France). Second, comparing these RIIs with the odds ratios presented in table 4, it is important to note that the estimates derived from the RIIs are mostly lower than the estimates derived from the odds ratios. Also, RIIs can be calculated in some of those cases where the odds ratios cannot be calculated due to small sample sizes; this additional information derived from RIIs is not very relevant, though, as none of these RIIs is statistically significant.

Third, looking at the RIIs that are clearly or borderline statistically significant, some of the confidence intervals do not overlap: Concerning men from the subgroup defined by the presence of any chronic disease, the RII for Denmark (2.25) is significantly higher than the RII for France (1.31) or for Germany (1.08). Concerning women in this subgroup, the RII for Latvia (1.73) is significantly higher than the RII for Germany (1.12). Concerning women from the subgroup defined by the presence of diabetes, the RII for Belgium (7.56) is significantly higher than the RII for France (1.56) or for Hungary (1.16). Thus, the significant differences between countries seen in table 5 (based on odds ratios) differ from those seen in table 6 (based on RIIs).

Discussion

The results clearly show that patients from higher educational groups usually receive specialist care more often than patients from lower educational groups, even after controlling for self assessed health (SAH) and for the presence of chronic diseases. This association between educational level and specialist care can be seen for women and for men, in Eastern and Western European countries, and it is also present if the analysis is restricted to specific morbidity groups (i.e. any chronic disease, high blood pressure, diabetes).

Comparing the extent of these health care inequalities between the countries included here, the analysis revealed only few significant differences. In the subsample of men defined by the presence of any chronic disease (see table 5), the odds ratio for Hungary (OR 3.18) is significantly larger than the odds ratio for Belgium (OR 1.44), i.e. their confidence intervals do not overlap. Based on the relative index of inequality (RII), though, a different picture emerges (see table 6). Now these health care inequities seem to be larger for men in Denmark (RII 2.25) than for men in France (RII 1.31) or for men in Germany (RII 1.08), for example. We conclude that differences in the extent of these health care inequities between different European countries are hard to grasp, and that the differences strongly depend on the methods being used.

Several shortcomings of the data analysed here have to be taken into account. First, the response rates of the surveys mostly vary between 20 and 35 %. We assume that the potential bias introduced by non-response is non-differential, leading to an under-estimation of the associations reported here. Second, the information on educational level can be misclassified. We applied the ISCED classification system, as this is probably the best way to make national data on educational levels as comparable as possible. It is still possible, though, that this classification system does not fully standardize different educational systems. This potential bias has been reduced, though, by also using the relative index of inequality (RII). Third, the question concerning visits to medical specialists refers to a period of 2 months for Belgium, 3 months for Denmark, and 12 months for the other countries. It would not be appropriate to multiply this information for Belgium by six and for Denmark by four. Conducting this multiplication would raise the period to 12 months, but it can hardly be assumed that zero visits in 2 (resp. 3) months automatically translate into zero visits in 12 months. This is why we have left the reference period for Belgium and Denmark as it is. It is difficult to assess the potential bias introduced by different reference periods, but we assume that the bias will be quite small.

The analyses support the results from previous publications, and they provide some additional information: First, similar associations can be seen if socio-economic status is assessed by educational level instead of income. Second, applying methods used in social epidemiology (e.g. logistic regression, relative index of inequality) provides similar conclusions as methods used in health economy (e.g. concentration indices). This could be of some practical importance, as logistic regressions yield results that probably have more numerical meaning to health policy makers (i.e. odds ratios); and as the relative index of inequality has a clear numerical meaning as well. Third, the health care differentials can also be found in specific morbidity groups (i.e.

any chronic disease, high blood pressure, diabetes). This is a strong support for the hypothesis that upper status groups receive more specialist care even if need is adjusted for, as restricting the analysis to specific morbidity groups is an excellent way to adjust for need. Fourth, similar health care inequities could also be found in three Eastern European countries (i.e. Estonia, Latvia and Hungary).

The fact that these health care inequities are seen for different indicators of socio-economic status (i.e. income, educational level) can be interpreted in the following way: There is a very fundamental association between socio-economic status and utilization of specialist care. Less utilization by low income groups could point to barriers concerning the financial resources of the patient. Less utilization by low educational groups could point to barriers concerning the knowledge of the patient and his ability to communicate with the physician. Educational level and income represent two different aspects of the socio-economic status, and strategies to reduce differentials by education could require different approaches than strategies to reduce differentials by income. We assume that different barriers are acting simultaneously, mutually increasing each other, and that interventions aimed at increasing specialist care utilization by low status groups have to address all of them.

It is important to point out that inequities in the utilization of specialist care have been found for children as well. In a study focussing on the age group age 2-17 years and on the five Nordic countries (i.e. Denmark, Finland, Iceland, Norway and Sweden), two variables describing the health status of the child (i.e. having at least one chronic condition, experiencing at least one moderate or severe symptom) have been included in the models [9]. The results show that the utilization of specialist care decreases with decreasing socio-economic status of the parents. In another analysis of the same dataset, E.K. Groholt et al. [10] look at differences in the utilization of GPs and medical specialist by occupational class of the parents. Concerning the utilization of GPs, the results show no significant differences. Concerning the utilization of a specialist, though, utilization is highest in the highest occupational group, and this association is restricted to the subgroup of children having a chronic health problem. The parents were also asked if they would prefer to go to a medical specialist when they have to go to a doctor with their child. The analyses show that the preference for a medical specialist is highest among low status parents. Thus it can be concluded that the inequalities in specialist care utilization are probably not due to inequalities concerning the wish to see a medical specialist.

Our results point into the same direction. The main message is the strong empirical support for the hypothesis that upper status groups go to a medical specialist more often than low status groups, even in subgroups of the population defined by the presence of specific chronic diseases. Based on the data available here it is not possible to define a 'golden standard' for the utilization of specialist care, i.e. the percentage of patients that should have visited a medical specialist. It can be assumed, though, that patients suffering from a chronic disease should see a medical specialist at least once a year. This would imply that the analyses indicate under-utilization in low status groups (rather than over-utilization in upper status groups).

As pointed out above, the association between socio-economic status and utilization of specialist care is found in the total sample and also in subsamples defined by health status (any chronic disease, high blood pressure, diabetes). This consistency indicates that the association is based on more general, common factors not linked to a specific disease. Probably these include different financial, cultural and regional barriers concerning the access for low status groups. It would be important to understand these barriers in more detail, as they could be relevant for many aspects of health care in addition to the utilization of specialist care [11]. In 2005, the U.S. Department of Health and Human Services published a 'National Healthcare Disparities Report' [12]. It describes inequalities in access to health care by income, educational level and ethnic background. The report is a good example for a broad analysis of these issues. There are many differences between the health care system in the USA and the health care systems in the European countries included here. The inequalities in specialist care point to the fact that similar disparities could exist here too, though. Thus it could be recommended that such a report is published for European countries as well.

The next question has to be, if and how these differences in health care utilization could translate into differences in health care quality, and how this could contribute to the explanation of health inequalities. All European countries have achieved almost universal health care coverage of their population. A number of reasons could be responsible for the fact that social inequities in specialist care utilization still exist. It would be important, for example, to look at the role of gatekeepers, at the system of co-payments, and at the different access to specialist care provided by public and private health insurances.

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Table 1: Basic Description of the Sample

	n	Age [a]	Sex		Educational Level			Visits to Physicians [b]		Self Ass. Health (SAH)			Chronic
			men	1 (low)	2	3	4 (high)	GP	Specialist	good	fair	poor	Disease [c]
		(mean)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Belgium	18,481	46.86	8,959 (48.5)	3,611 (20.3)	3,688 (20.7)	5,345 (30.0)	5,175 (29.0)	8,493 (46.8)	4,160 (22.9)	12,707 (74.3)	3,624 (21.2)	770 (4.5)	8,455 (45.8)
Denmark	16,690	46.50	8,188 (49.1)	3,292 (20.2)	5,080 (31.1)	4,879 (29.9)	3,070 (18.8)	6,603 (39.7)	1,294 (7.8)	12.962 (77.7)	2,686 (16.1)	1,028 (6.2)	6,267 (37.6)
Estonia	4,376	39.83	1,853 (42.3)	866 (19.9)	1,217 (28.0)	1,501 (34.5)	764 (17.6)	1,409 (32.7)	1,918 (44.6)	1,798 (41.5)	2,058 (47.5)	474 (11.0)	1,457 (33.3)
France	17,828	44.69	8,761 (49.1)	2,969 (17.0)	6,396 (36.7)	3,290 (18.9)	4,765 (27.4)	10,189 (98.9)	7,395 (56.9)	9,990 (75.2)	2,806 (21.1)	485 (3.7)	2,921 (16.4)
Germany	7,124	45.72	3,450 (48.4)	202 (2.9)	2,777 (40.1)	2,987 (43.1)	961 (13.9)	4,839 (67.9)	5,314 (74.7)	1,379 (19.8)	4,365 (62.7)	1,222 (17.5)	3,362 (47.2)
Hungary	10,532	46.49	4,697 (44.6)	3,389 (32.3)	2,655 (25.3)	3,043 (29.0)	1,409 (13.4)	7,773 (74.1)	5,432 (51.7)	4,513 (42.9)	4,153 (39.5)	1,857 (17.7)	4,129 (39.2)
Ireland	15,051	43,78	7,455 (49.5)	4,819 (32.1)	3,574 (23.8)	4,470 (29.8)	2,148 (14.3)	4,733 (72.8)	1613 (24.8)	12,218 (81.3)	2,320 (15.5)	482 (3,2)	- [d]
Latvia	8,488	39.48	3,690 (43.5)	2,040 (24.3)	1,680 (20.0)	2,904 (34.6)	1,773 (21.1)	3,656 (44.5)	2,392 (29.1)	3,499 (41.4)	3,918 (46.4)	1,030 (12.2)	1,645 (19.4)
Norway	6,820	45.60	3,407 (50.0)	- [e]	3,161 (47.8)	1,744 (26.3)	1,718 (25.9)	5,066 (74.8)	1,159 (17.0)	5,522 (81.0)	882 (12.9)	411 (6.0)	2,327 (34.1)

a) mean age (in years)
b) reference period for Belgium 'past 2 months, for Denmark 'past 3 months', for the other countries 'past 12 months' (dito in all other tables)
c) participants with at least one chronic disease (see methods for list of diseases)
d) no information on chronic disease in the dataset
e) only three categories for education in the dataset

Table 2: Visits to Specialists (in %)

	Age [a]			Sex		Educational Level				Self Ass. Health (SAH)			Chronic Dis. [b]	
	1	2	3	men	women	1 (low)	2	3	4 (high)	good	fair	poor	no	yes
Belgium	20.5	22.8	27.5*	18.3	27.3*	23.4	22.5	21.0	24.4 *	18.7	33.1	48.6*	17.3	29.5*
Denmark	6.8	8.0	9.3*	6.4	9.1*	7.1	7.7	7.5	9.1*	6.9	11.7	20.6*	5.9*	11.0
Estonia	46.6	43.7	42.9	33.6	52.6*	37.4	44.3	45.3	52.2 *	38.8	46.7	58.0*	39.9	53.8*
France	53.0	59.0	63.3*	44.6	68,6*	54.6	51.8	57.5	65.5*	52.3	70.6	76.2*	53.5	69.5
Germany	72.8	74.4	78.3*	62.6	86.1*	68.3	76.3	77.8	74.7*	68.0	76.5	85.8*	67.6	82.7*
Hungary	47.8	54.9	53.2*	43.7	58.1*	48.6	48.6	53.9	59.9*	42.0	52.8	72.6*	45.0	62.1*
Ireland	20.6	24.0	35.6*	22.5	27.0*	29.0	23.3	21.1	26.2*	18.7	49.0	65.5*	- [(c)]	- [(c)]
Latvia	30.6	28.6	23.0*	19.8	36.2*	22.3	27.8	28.4	39.5*	27.4	29.3	34.1*	25.5	44.1*
Norway	13.7	18.1	21.6*	14.1	20.0*	- [(d)]	17.1	16.2	18.3	15.1	23.9	28.3*	13.9	46.2*

* $p < 0.05$ (chi^2 test)

a) 1: 20-39 years; 2: 40-59 years; 3: 60 years or older
b) participants with at least one chronic disease (see methods for list of diseases)
c) no information on chronic disease in the dataset
d) only three categories for education in the dataset

Table 3: Multivariate Analysis for 'Visits to Specialists'

	Odds Ratios [a]						
	Educational Level [b,c]			Self Assessed Health [c,d]		Chronic Disease [e]	
	2	3	4 (high)	fair	poor	I [f]	II [g]
Belgium							
- men	1.33*	1.22	1.64*	2.13*	4.77*	1.90	1.52*
- women	1.12	1.28*	1.93*	1.80*	3.18*	1.75*	1.53*
Denmark							
- men	1.34*	1.68*	1.95*	2.14*	3.46*	1.93*	1.55*
- women	1.59*	1.68*	2.30*	2.06*	4.27*	1.91*	1.52*
Estonia							
- men	1.17	1.26	2.02*	1.58*	2.89*	2.62	2.26*
- women	1.74*	1.72*	2.24*	1.57*	2.47*	1.77*	1.51*
France							
- men	1.67*	2.06*	2.92*	2.65*	4.21*	1.77*	1.44*
- women	1.63*	2.71*	4.33*	1.80*	2.26*	1.66*	1.48*
Germany							
- men	1.00	1.12	1.14	1.53*	2.70*	1.71*	1.53*
- women	2.76*	4.37*	5.94*	1.20	1.83*	1.94*	1.81*
Hungary							
- men	1.42*	1.63*	2.28*	2.06*	5.00*	2.24*	1.88*
- women	1.46*	1.98*	2.81*	1.61*	4.32*	1.74*	1.47*
Ireland [h]							
- men	1.43*	1.61*	1.84*	3.98*	9.13*	-	-
- women	1.37*	1.36*	1.85*	4.73*	9.05*	-	-
Latvia							
- men	1.58*	1.52*	2.41*	1.40*	2.07*	3.17*	2.78*
- women	1.78*	1.97*	3.22*	0.96	1.05	2.56*	2.53*
Norway							
- men	- [(i)]	1.08	1.23	1.78*	1.83*	1.53*	1.43*
- women	- [(i)]	1.63*	1.48*	1.45*	1.85*	1.81*	1.67*

a) different variables simultaneously in the model (see notes below)
b) comparison group: low educational level
c) variables in the model: age, educational level, self assessed health, chronic disease
d) comparison group: good self assessed health
e) comparison group: no chronic disease
f) variables in the model: age, educational level, chronic disease
g) variables in the model: age, educational level, chronic disease, self assessed health
h) no information on chronic disease in the dataset
i) only three categories for education in the dataset

Table 4: Multivariate Analysis for 'Visits to Specialists': ORs for Morbidity Subgroups

	Odds Ratios [a]								
	Chronic Disease [b] Educational Level [e]			High Blood Pressure [c] Educational Level [e]			Diabetes [d] Educational Level [e]		
	2	3	4	2	3	4	2	3	4
Belgium									
- men	1.15	1.19	1.44	1.61	1.92	2.03	0.71	1.57	2.09
- women	1.14	1.49*	2.07*	1.14	1.52	2.22*	2.55	5.20*	34.51*
Denmark									
- men	1,52*	1.74*	2.41*	2.25*	2.16	2.60*	1.23	0.88	1.53
- women	1.28	1.53*	1.72*	1.44	1.82*	2.27*	2.10	2.99	- (f)
Estonia									
- men	1.34	1.29	2.52*	1.26	1.48	2.57*	0.65	0.73	1.86
- women	1.78*	1.50	2.30*	1.37	1.19	1.91*	1.06	1.36	2.42
France									
- men	1.58*	2.10*	2.85*	1.20	1.95	1.56	1.62*	2.70*	4.30*
- women	1.65*	1.75*	2.75*	1.30	1.75*	2.75*	1.18	1.38	7.61*
Germany									
- men	0.63	0.85	0.74	0.81	0.98	0.85	- (f)	- (f)	- (f)
- women	2.93*	4.82*	7.30*	3.74*	5.97*	21.81*	- (f)	- (f)	- (f)
Hungary									
- men	1.70*	1.87*	3.18*	1.30*	1.47*	2.32*	1.26	1.86	2.21
- women	1.53*	2.04*	2.96*	1.60*	1.92*	3.00*	2.03*	1.68	5.35*
Ireland [g]									
- men	-	-	-	-	-	-	-	-	-
- women	-	-	-	-	-	-	-	-	-
Latvia									
- men	0.93	1.13	2.90*	1.55*	1.51*	2.26*	- (f)	- (f)	- (f)
- women	1.56*	2.07*	2.52*	1.80*	2.02*	3.32*	- (f)	- (f)	- (f)
Norway [h]									
- men	-	0.93	1.06	-	0.65	1.25	-	1.58	0.84
- women	-	1.63*	1.51*	-	2.57*	3.09*	-	2.30	2.77

a) variables in the model: age, educational level, self assessed health
b) subgroup of participants with a chronic disease
c) subgroup of participants with high blood pressure
d) subgroup of participants with diabetes
e) comparison group: low educational level
f) too few cases
g) no information on chronic disease, high blood pressure or diabetes in the dataset
h) only three categories for education in the dataset

Table 5: Multivariate Analysis for 'Visits to Specialists': ORs and Confidence-Intervals

	Odds Ratios	
	Total Sample Educational Level 4 [a,b]	Participants with Chronic Disease Educational Level 4 [c,d]
Belgium		
- men	1.64 (1.23-2.16)	1.44 (0.98-2.12)
- women	1.93 (1.53-2.44)	2.07 (1.52-2.91)
Denmark		
- men	1.95 (1.42-2.69)	2.41 (1.52-3.82)
- women	2.30 (1.76-3.00)	1.72 (1.20-2.46)
Estonia		
- men	2.02 (1.39-2.93)	2.52 (1.38-4.58)
- women	2.24 (1.63-3.08)	2.30 (1.42-3.71)
France		
- men	2.92 (2.37-3.59)	2.85 (1.74-4.67)
- women	4.33 (3.53-5.31)	2.75 (1.83-4.13)
Germany		
- men	1.14 (0.68-1.92)	0.74 (0.28-1.95)
- women	5.94 (3.08-11.46)	7.30 (2.81-18.99)
Hungary		
- men	2.28 (1.84-2.83)	3.18 (2.18-4.64)
- women	2.81 (2.31-3.41)	2.96 (2.16-4.04)
Ireland [e]		
- men	1.84 (1.37-2.64)	-
- women	1.85 (1.40-2.43)	-
Latvia		
- men	2.41 (1.80-3.22)	2.90 (1.54-5.46)
- women	3.22 (2.55-4.07)	2.52 (1.62-3.92)
Norway		
- men	1.23 (0.95-1.59)	1.06 (0.70-1.60)
- women	1.48 (1.18-1.85)	1.51 (1.06-2.14)

a) comparison group: low educational level (same odds ratios as in table 3)
b) variables in the model: age, educational level, self assessed health, chronic disease
c) comparison group: low educational level (same odds ratios as in table 4)
d) variables in the model: age, educational level, self assessed health
e) no information on chronic disease in the dataset
f) only three categories for education in the dataset

Table 6: Multivariate Analysis for 'Visits to Specialists': RII for Morbidity Subgroups

	Relative Index of Inequality (RII) [a]			
	Participants with Chronic Disease		Participants with Diabetes	
	men	women	men	women
Belgium	1.32 (0.97-1.81)	1.88 (1.45-2.44)	1.55 (0.63-3.80)	7.56 (3.34-17.09)
Denmark	2.25 (1.51-3.35)	1.58 (1.16-2.15)	1.03 (0.24-4.39)	1.14 (0.28-4.61)
Estonia	1.60 (1.15-2.21)	1.32 (1.07-1.64)	1.09 (0.44-2.70)	1.16 (0.83-1.63)
France	1.31 (1.15-1.49)	1.34 (1.22-1.47)	1.31 (0.99-1.74)	1.56 (1.15-2.11)
Germany	1.08 (0.97-1.21)	1.12 (1.05-1.20)	1.14 (0.89-1.46)	1.12 (0.74-1.68)
Hungary	1.50 (1.32-1.70)	1.48 (1.34-1.62)	1.20 (0.99-1.45)	1.16 (0.99-1.35)
Ireland [b]	-	-	-	-
Latvia	2.00 (1.24-3.22)	1.73 (1.33-2.25)	0.79 (0.30-2.09)	- [(c)]
Norway	1.09 (0.64-1.85)	1.69 (1.15-2.50)	1.35 (0.39-4.66)	2.53 (0.93-6.91)

a) additional variables in the model: age, self assessed health
b) no information on chronic disease in the dataset; c) too few cases

Chapter 27

Association between access to health care and household income among the elderly in 10 western European countries

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Abstract

Introduction

Some studies have already looked at the association between access to health care and household income. In this paper we focus on 'forgone care', an issue that has not yet attracted very much attention, but that could increase our understanding of the inverse care law. We hypothesize that saying 'I did forgo health care' is more prevalent in low income groups. By including different countries we also try to identify those where the association between forgone care and household income is particularly strong.

Methods

The study is based on the 'Survey of Health, Ageing and Retirement in Europe (SHARE)', focusing on the non-institutionalized population aged 50 years and older from 10 European countries. The dependent variable is assessed by the following question: During the last twelve months, did you forgo any types of care because of the costs you would have to pay, or because this care was not available or not easily accessible? The main independent variable is household income, adjusted for household size. Some potential confounders are included as well (i.e. age, sex, self assessed health, chronic disease).

Results

The results clearly show that low income groups report forgone care much more often than high income groups. This association can also be found in those five countries were sample size allows for country specific analyses (i.e. France, Germany, Greece, Italy and Sweden). It can be confirmed too in the analyses restricted to the subsample of persons who have a chronic disease. The differences between the countries are rather larger, concerning country specific overall levels of forgone care, and also concerning the intra-country association between forgone care and income. Taking the example of Greece, forgone care in the lowest income quintile is about 3.24 times (95% CI: 1.72-6.12) as high as in the highest income quintile.

Discussion

To date, health inequalities are mostly explained by individual behaviours such as smoking. It has often been stressed that other determinants should be included as well. This discussion usually focuses on living and working conditions and on the social environment, though, and not on the health care system. Issues of forgone care could provide an important link between health inequalities and health care provision.

Introduction

The inverse care law has been discussed for many years already [1,2], but the empirical studies have rarely included the explicit statement that some care has been forgone due to financial problems or unavailability. There are only few studies focusing in these issues, and most of them are from the USA [e.g. 3-10]. The conclusion of these papers is rather clear: Forgone care is experienced mostly by children and adults from the low socio-economic status groups (e.g. low income, lack of insurance coverage, ethnic minority). The assessment of 'forgone care' is usually based on self reports, i.e. the respondents are asked if they did not obtain medical care which they believe they had actually needed. To be more specific, the study from Sarmiento et al. [9], for example, included the following question: 'Has there been any time over the past year when you thought you should get medical care, but did not.' Forgone care was then defined by the answer 'yes'.

Even though this is a subjective statement (i.e. not an objective measure of health care need and health care utilization), responding 'yes' clearly indicates an important dissatisfaction with the health care provision, and of course it could also indicate a lost chance to improve the health status. These analyses concerning differences between the need for health care and the actual provision could also be important for improving our understanding of health inequalities. To date, health inequalities are mostly explained by individual behaviours such as smoking. It has often been stressed that other determinants should be included as well [e.g. 11-15]. This discussion usually focuses on living and working conditions and on the social environment, though, and not on the health care system.

We hypothesize that forgone care is more prevalent in low income groups. Analysing this association in more detail could be an important contribution to our understanding of the inverse care law. By including data from 10 Western European countries, it is also possible to compare the existence and the extent of the association between forgone care and household income across different health care systems.

Methods

The study is based on the 'Survey of Health, Ageing and Retirement in Europe (SHARE)', focusing on the non-institutionalized population aged 50 years and older from 10 European countries [16-21] (http://www.share-project.org). The analyses presented here are taken from release 1 of the SHARE dataset (http://www.share-project.org), including data from 20,079 adults from 10 European countries (Austria, Denmark, France, Greece, Germany, Italy, The Netherlands, Spain, Sweden and Switzerland). Based on probability samples in each participating country, data were collected in 2004 using a computer assisted personal interviewing (CAPI) programme (supplemented by a self-completion paper and pencil questionnaire). The country-specific household response rates vary between 37.6 percent in Switzerland and 69.4 percent in France, with eight countries having rates above 50 percent (see table

1). Response analyses revealed only small differences in the patterns of survey participation by gender and age.

The analyses presented below focus on the dependent variable 'forgone care'. The corresponding questions read: (a) During the last twelve months, did you forgo any types of care because of the costs you would have to pay? (yes/no); (b) During the last twelve months, did you forgo any types of care because they were not available or not easily accessible? (yes/no). Both questions were asked in the computer assisted personal interview. Due to small numbers an aggregated variable (forgone care because of costs 'or' because care is unavailable) is used in most analyses.

In our analyses, the independent variable of primary importance is household income. For release 1 of the SHARE dataset, the variable 'gross total annual household income for 2003' has been constructed in the following way: sum of the gross individual income of each household member (income from employment, self-employment, pension, private regular transfers such as alimony, long term care), of capital assets income (income from bank accounts, from bonds, from stocks) and of rent payments received [16]. In order to adjust for household size, we applied a formula that has been used in the Luxembourg income study [22] and that has been proposed for studies on health inequalities [23]: adjusted per capita income = gross annual household income, divided by the number of household members to the power of 0.36 (income/household size$^{*0.36}$). For further analyses, we have split the adjusted per capita income into quintiles, calculating the quintile limits for each country separately.

The following potential confounders are included as well: age, sex, self assessed health, chronic disease. Concerning age, three groups are differentiated, more or less representing tertiles when all countries are combined (50-58 years, 59-67 years, 68 years or older). The information on self assessed health (SAH) comes from the following questions: 'Would you say your health is ...?' (categories: very good, good, fair, bad, very bad). We have combined the first two categories (summarized as 'good') and the two last categories (summarized as 'bad'). The prevalence of chronic disease was assessed by the following question: 'Has a doctor ever told you that you had any of the following conditions?' Fourteen diseases were listed, and we excluded only those two that could indicate minor health problems (i.e. high blood pressure or hypertension, high blood cholesterol). Thus, chronic disease was defined as having at least one of the remaining twelve conditions: heart attack (including myocardial infarction or coronary thrombosis, or any other heart problem including congestive heart failure), stroke or cerebral vascular disease, diabetes or high blood sugar, chronic lung disease (such as chronic bronchitis or emphysema), asthma, arthritis (including osteoarthritis or rheumatism), osteoporosis, cancer or malignant tumour (including leukaemia or lymphoma, but excluding minor skin cancers), stomach or duodenal ulcer or peptic ulcer, Parkinson disease, cataracts, hip fracture or femoral fracture.

For a more detailed analysis, a subsample was defined comprising those participants who had received or who were in need to receive physician care. The survey included the following question: How often have you seen or talked to a medical doctor during the last twelve months? The subsample comprises all those who answered 'at least once', and also those who reported forgone physician care because of costs or unavailability. Logistic regression models were used for these multivariate analyses. In a next step, we addressed the question whether the inter-country differences in forgone care are statistically significant. The data from all countries were pooled into one dataset, and a logistic regression was conducted with one country (i.e. The Netherlands) chosen as the comparison group.

Results

The distribution of the dependent variable 'forgone care' is shown in table 2. Looking first at forgone care because of costs 'or' unavailability, between 2.5% (The Netherlands) and 9.3% (Greece) of the respondents report to have experienced this in the last twelve months. In order to assure that the estimates are not based on too small numbers, the following country-specific analyses are restricted to those countries with at least 90 cases and a prevalence of at least 5% (i.e. to France, Germany, Greece, Italy and Sweden). Just looking at forgone care because of costs (i.e. neglecting forgone care because not available or not easily accessible), the number of respondents is not reduced that much in most countries, clearly indicating that the problem of forgone care is mostly a problem of costs, not of availability. Calculating this percentage of forgone care that can be attributed to costs, great differences can be seen between the countries, ranging from 32.6% in Denmark to 97.4 in Switzerland.

Focusing on the five countries with sufficient sample size for further country specific analyses, the distribution of the main independent variables is shown in table 3. The age and sex distribution is rather similar in all countries, and so is the prevalence of chronic disease. Larger differences can be seen for self assessed health, with poor health being much more prevalent in Germany (26.4%) and Italy (27.7) than in Sweden (12.6%). The quintiles of the adjusted per capita income are calculated for each country separately, and the results show, for example, that the upper limit of the lowest quintile is much lower in Greece (7,287 Euro) than in Sweden (17,064 Euro). Large differences between the five countries can also be seen for the quotient 'upper limit of 1st quintile / lower limit of 5th quintile', indicating different degrees of income inequality. It is much smaller in Sweden (2.68) than in Germany (4.03), for example. The mean and median values of the adjusted per capita income again point to the fact that the level of income is very different in these countries, being particularly low, for example, in Greece. The quotient 'mean/median' gives another hint at the income distribution. A large quotient indicates that there are some households with a very high income, 'pulling away' the mean from the median. Again, Sweden shows a more equal income distribution than the other four countries.

Taken together, the results clearly indicate that there are large differences between these five countries, and that therefore the analyses concerning the association between forgone care and income should be done separately for each country. The results of these analyses are presented in table 4. Controlling for age and sex, forgone care (because of costs 'or' unavailability) is always higher in the lowest as compared with the highest income group. In most cases, a dose response pattern can be seen, and some of these odds ratios are rather large. The most pronounced associations can be seen for Greece, concerning the dose response pattern and the size of the odds ratios. Additionally controlling for self assessed health (see full model) reduces these odds ratios to some extent, but significant odds ratios remain. Concerning Sweden, forgone care in the lowest income group is about 2.05 times as high as in the highest income group. For Germany, this odds ratio reaches 2.4, and for Greece even 3.24. Again, the dose response pattern is apparent in most cases. Concerning age, only few odds ratios reach the level of statistical significance, mainly showing that in France and Sweden being in the lowest age group (i.e. 50-58 years) is associated with a higher risk of forgone care. Also, in three countries (i.e. Greece, Italy and Sweden) this risk is higher for women than for men. Rather strong effects can be seen for self assessed health, indicating that less than good health is often associated with forgone care in a dose response way. In order to simplify the presentation, the odds ratios for age, sex and self assessed health are not shown in the table.

In a further set of analyses, two different subgroups of the participants are defined (see table 5). In the first step, we restricted the analyses to those participants who had received or who were in need to receive physician care (see methods). This subsample is nearly as large as the total sample (i.e. most participants had received physician care or had experienced forgone physician care). Thus, the odds ratios in this subsample are very similar to the odds ratios in the total sample (see table 4, full model). The most important change is seen for Sweden, as the odds ratio for the lowest income group is no longer statistically significant now. In the second step, we further restricted this subsample to those participants with a chronic disease. Now the sample size becomes much smaller, and some odds ratios change considerably. For Germany, no significant odds ratio is left, and for Sweden an opposite association emerges for the two income groups in the middle (i.e. forgone care is less prevalent in these groups as compared with the highest income group). For Greece, though, the pattern seen in the total sample remains largely unchanged, still indicating a strong increase of the risk of forgone care with decreasing income.

In order to simplify the presentation, the odds ratios in tables 4 and 5 do not show the confidence intervals. Table 6 presents these intervals for the two lowest income groups, in order to assess if the increased risk of forgone care in these two income groups differs between the five countries. As the confidence intervals (based on the total sample and the full model, see table 4) widely overlap, it has to be concluded that the increased risk of forgone care does not differ significantly between these countries.

In a next step, a logistic regression was conducted comprising the total sample, including a dummy variable for each country and taking the country with the lowest prevalence of forgone care (i.e. The Netherlands, see table 2) as the comparison group. Controlling for age, sex and self assessed health, the results again indicate that forgone care increases with decreasing income (OR for the lowest as compared with the highest income group: 1.46; 95% CI: 1.19-1.79). All nine countries show a higher risk of forgone care than The Netherlands, and for six countries the level of statistical significance is reached (OR and 95% CI): Greece (3.60; 2.68-4.83), France (3.17; 2.34-4.29), Sweden (2.79; 2.09-3.72), Italy (2.53; 1.89-3.38), Germany (2.37; 1.78-3.16), Switzerland (1.89; 1.25-2.86), Denmark (1.30; 0.89-1.89), Austria (1.26; 0.89-1.80), Spain (1.26; 0.91-1.74). Including interaction terms in this analysis did not reveal any statistically significant interactions.

We conducted a number of additional analyses (results not presented in tables). The SHARE study includes a question concerning the type of forgone care, differentiating between 12 categories: surgery, care from a general practitioner, care from a specialist physician, drugs, dental care, hospital (inpatient) rehabilitation, ambulatory (outpatient) rehabilitation, aids and appliances, care in a nursing home, home care, paid home help, any other care not mentioned on this list. Due to small sample size these specific types of forgone care could not be analysed in any detail. Combining the data from all 10 countries (with new income quintiles based on this combined dataset), we assessed the association between income and the following categories of forgone care: care from a general practitioner, care from a specialist physician, drugs, dental care, home care. The results always indicate that forgone care increases with decreasing income. Small sample size was a matter of concern in some of these analyses of the pooled dataset as well, though.

Discussion

The results point to the fact that low income groups report forgone care much more often than high income groups. This association can be found if the data from all 10 Western European countries included in the study are combined, and also in those 5 countries were sample size allows for country specific analyses. It can also be confirmed in the analyses restricted to the subsample of persons who have a chronic disease. The differences between the 10 countries are rather larger, concerning the country specific overall level of forgone care, and also concerning the intra-country association between forgone care and income. The overall level of forgone care is rather low in The Netherlands and rather high in France and Italy, for example. Taking the example of Greece (and adjusting for age, sex and self assessed health), forgone care in the lowest income quintile is about 3.24 times (95% CI: 1.72-6.12) as high as in the highest income quintile. In Germany this odds ratio is 2.40 (95% CI: 1.38-4.18), in Sweden 2.05 (95% CI: 1.22-3.42), in France 1.78 (95% CI: 0.92-3.45) and in Italy 1.30 (95% CI: 0.79-2.12). Thus the results support the inverse care law [1,2], stating that health care is provided less to those who would mostly need it, i.e. the low income groups.

The SHARE-Study provides a very good basis for assessing the association between household income and forgone care. The data have been raised in different Western European countries by a standard protocol, they refer to a very recent time period (i.e. 2004), and they are already well accepted in the public health community [18-21]. Several potential problems have to be taken into account, though. Sample size was rather low for some countries, restricting the possibility to conduct specific analyses for each country. The overall response rate was about 57%, and in two countries it was below 50%. Thus there is ample room for response bias and it is difficult to assess its potential effects. It can be assumed, for example, that the response rate is particularly low in the low income group and in the group experiencing forgone care, and that this bias could lead to an under-estimation of the association between income and forgone care. Reporting bias could also be a problem, as the analyses are based on self reports only. It is important to point out, though, that subjective statements concerning forgone care are important in their own right.

In a recent paper on 'concepts and principles for tackling social inequities in health', M. Whitehead and G. Dahlgren [24] stress that 'access to health care' could include three different problems: geographic access, economic access, and cultural access. Forgone care could be linked to all three. It would be important to know more about the specific reasons that are behind an answer indicating forgone care, otherwise it will hardly be possible to develop interventions aimed at reducing forgone care. We would also need more research concerning the potential effects of forgone care on health and on health care costs. Issues of forgone care do not yet play a major role in public health research, but they could provide an important link between health inequalities and health care provision.

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Table 1: Sample size and response rates

	Sample Size	Household Response Rate
Austria	1,892	57.3
Denmark	1,589	61.1
France	1,387	69.4
Germany	2,863	60.2
Greece	1,695	60.2
Italy	2,379	54.1
The Netherlands	2,682	61.6
Spain	1,786	50.2
Sweden	2,921	42.1
Switzerland	885	37.6
Total	20,079	57.4

Table 2: Forgone care (because of costs and because care is unavailable) during the last twelve months

	Forgone Care [a]				
	Reasons 1 or 2		Reason 1 only		
	n	%	n	%	column 4/2
Austria	58	3.1	54	2.9	93.5
Denmark	47	4.6	23	1.5	32.6
France	95	7.2	71	5.4	75.0
Germany	169	5.9	151	5.3	89.8
Greece	157	9.3	99	5.9	63.4
Italy	174	7.4	121	5.1	68.9
The Netherlands	65	2.5	55	2.1	84.0
Spain	67	3.8	50	2.9	76.3
Sweden	164	5.7	78	2.7	47.4
Switzerland	33	3.8	32	3.7	97.4

a) reason 1: 'because of costs'
b) reason 2: 'because care is unavailable'

Table 3: Distribution of independent variables

	France	Germany	Greece	Italy	Sweden
Sex (%)					
- men	47.2	46.9	46.3	45.2	47.3
Age (%)					
- 50 - 58	37.9	30.8	36.3	29.7	31.1
- 59 - 67	24.5	34.1	28.6	36.1	31.7
- 68 - 105	37.6	35.1	35.0	34.2	37.1
Self assessed health (%) [a]					
- good	43.7	37.8	49.6	33.7	51.1
- fair	36.8	35.9	31.9	38.6	36.3
- poor	19.6	26.4	18.5	27.7	12.6
Chronic disease (%) [b]					
- yes	50.5	46.8	47.4	55.0	48.1
Income (Euro) [c]					
- 1st (low)	14,846	11,773	7,287	8,667	17,064
- 2nd	22,655	19,616	10,931	14,766	24,824
- 3rd	33,419	29,333	16,499	21,649	33,169
- 4th	52,485	47,496	26,644	32,781	45,649
- 5th (high)	>52,485	>47,496	>26,644	>32,781	>45,649
- 5th / 1st	3.54	4.03	3.66	3.78	2.68
Mean	44,099	37,128	20,197	27,232	37,080
Median	27,224	24,186	13,608	17,547	28,898
Mean / Median	1.6	1.5	1.5	1.6	1.3

a) good: very good or good; bad: bad or very bad
b) at least one disease among a list of 12 doctor diagnosed diseases (see methods)
c) adjusted gross household income per year

Table 4: Multivariate analysis (dependent variable: forgone care because of costs or unavailability)

	Odds Ratios				
	France	Germany	Greece	Italy	Sweden
Income-Quintiles: reduced model [a]					
- 5th (high)	1.00	1.00	1.00	1.00	1.00
- 4th	0.76	1.08	1.86	0.78	0.94
- 3rd	1.25	2.17*	2.06*	0.94	1.29
- 2nd	1.34	1.83*	3.49*	1.49	1.62
- 1st (low)	1.92*	2.91*	3.83*	1.51	2.30*
Income-Quintiles: full model [b]					
- 5th (high)	1.00	1.00	1.00	1.00	1.00
- 4th	0.74	1.03	1.73	0.78	0.91
- 3rd	1.20	1.95*	1.83*	0.87	1.19
- 2nd	1.29	1.57*	2.91*	1.32	1.47
- 1st (low)	1.78	2.40*	3.24*	1.30	2.05*

* $p < 0.05$
a) including: income, age, sex
b) including: income, age, sex, self assessed health

Table 5: Multivariate analysis for different subgroups of participants
(dependent variable: forgone care because of costs or unavailability)

	Odds Ratios for Income-Quintiles [a]				
	France	Germany	Greece	Italy	Sweden
Subgroup of persons who received or were in need to receive physician care [b]					
(n) [c]	(93)	(161)	(149)	(168)	(147)
- 5th (high)	1.00	1.00	1.00	1.00	1.00
- 4th	0.75	0.96	1.52	0.73	0.86
- 3rd	1.21	1.94*	1.58	0.84	0.95
- 2nd	1.26	1.58	2.74*	1.20	1.43
- 1st (low)	1.75	2.52*	3.28*	1.30	1.62
Subgroup of persons with chronic disease who received or were in need to receive physician care [b,d]					
(n) [c]	(61)	(105)	(94)	(132)	(79)
- 5th (high)	1.00	1.00	1.00	1.00	1.00
- 4th	0.78	0.93	1.96	0.74	0.39*
- 3rd	1.11	1.87	2.28	0.85	0.43*
- 2nd	1.10	1.35	4.38*	1.26	0.88
- 1st (low)	1.78	2.00	4.23*	1.25	0.89

a) full model (including the independent variables income, age, sex, self assessed health)
b) persons with physician contact or forgone care
c) number of persons with forgone care (because of costs or unavailability)
d) at least one disease among a list of 12 doctor diagnosed diseases (see methods)

Table 6: Odds Ratios and confidence intervals for the two lowest income quintiles
(total population)

	2nd income quintile		1st income quintile (lowest)	
	OR [a]	95% conf. interval	OR [a]	95% conf. interval
Italy	1.32	(0.81 - 2.16)	1.30	(0.79 - 2.12)
France	1.29	(0.65 - 2.57)	1.78	(0.92 - 3.45)
Sweden	1.47	(0.87 - 2.51)	2.05*	(1.22 - 3.42)
Germany	1.57*	(0.87 - 2.83)	2.40*	(1.38 - 4.18)
Greece	2.91*	(1.52 - 5.61)	3.24*	(1.72 - 6.12)

countries sorted by increasing OR for 1st income quintile
a) full model (including income, age, sex, self assessed health; see table 4)

Chapter 28

Educational inequalities in utilization of preventive services among elderly in Europe

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Abstract

Objective

To document socio-economic inequalities by education in utilization of preventive services among elderly in 11 European countries and to explore whether inequalities in preventives services exist in Europe at large or are characteristic for specific countries only.

Data source

A cross-sectional Survey of Health, Ageing and Retirement in Europe (SHARE) collected in 2004 that comprises individuals aged 50 and older in 11 European countries (Denmark, Sweden, the Netherlands, Belgium, Austria, Germany, Switzerland, France, Spain, Italy, and Greece)

Study Design

We assessed the level of inequalities of 4 types of preventive services: flu vaccination, eye examination, breast and colon cancer screening procedures. For each type of services we estimated utilization prevalence rates and measured both relative (relative index of inequality [RII]) and absolute (slope index of inequality [SII]) level of inequality.

Results

We observed a diverse pattern of inequalities by education in utilization of preventive services. The magnitude of this inequalities differed by type of services and country. For all countries of Europe combined, there were no inequalities present for flu vaccination (RII=0.96 95% CI: 0.86-1.06), but large inequalities were observed for colon cancer screening (RII=0.73 CI: 0.65-0.82) and eye examination (RII=0.75 CI: 0.69-0.81), and slightly smaller inequalities were observed for mammography (RII=0.91 CI: 0.86-0.95). Among all preventive services the largest relative and absolute inequalities were observed in Germany, Greece and Italy, while the smallest inequalities were present in the Netherlands. Significant inequalities in utilization of all preventive services, except flu vaccination, were present in all age groups and both genders.

Conclusions

Inequalities in preventive services are not a generalized phenomenon. Large international variations in the size of inequalities in utilization of preventive services indicate that these inequalities might be rooted at structural and provider levels of individual national healthcare systems.

Background

Preventive services such as influenza vaccination, breast and colon cancer screening tests were shown to be effective to reduce morbidity and mortality especially among the elderly[1-4]. As a result these preventive measures were introduced in the national guidelines for asymptomatic patients above 50 years old in many European countries.

An increasing body of literature continues to reveal unequal utilization of some preventive services by people of different socio-economic status. Most researchers conclude that more disadvantaged people tend to underutilize a variety of preventive services, although, for some services socio-economic variation in utilization was not consistently shown. Mangtani and colleagues reported lower uptake of flu vaccination among older people in deprived areas in Britain[5]. Similarly, Lorant and colleagues found high inequalities favoring the rich for mammography and cervical screening in Belgium[6]. In line with this, lower utilization of mammography among lower educated and lower income women is reported in France[7] and Germany[8]. Underutilization of preventive services by more disadvantaged people contradicts with their increased needs for prevention expressed by the generally poorer health status, higher morbidity and mortality, all largely documented in the literature[9-12]. A better understanding of the patterns of inequalities in preventive services utilization in Europe could help policy makers to prioritize areas where more effective strategies are needed to address existing inequalities in health.

Variation in patterns of preventive services utilization between socio-economic groups can provide valuable clues for the explanation of disparities in health among aged population, yet this knowledge remains fragmentary. Previous studies on inequalities in utilization of preventive services were done in only one country, were focused on limited number of services, and did not consistently take into account age-related needs. Thus, little is know about the overall level of inequalities in utilization of preventive services in Europe among population aged 50 and above. It remains unclear whether inequalities in preventive services are a generalized phenomenon, or whether these inequalities are observed only for some services, countries and demographic groups. Of interest is to reflect whether countries with different health care systems, and especially different ways to deliver preventive health services, may have different degrees of inequalities. This gap in knowledge becomes more evident with an increasing interest in introduction of large-scale national screening programs in many countries.

Effectiveness of flu vaccination in prevention of influenza was extensively shown in the literature (ref). People aged 65 and older and those with chronic diseases are particularly vulnerable for influenza and its consequences and therefore they form the main target group for vaccination in the majority of EU countries (ref). Breast cancer screening and colon cancer screening procedures were consistently shown to be effective in reducing mortality from breast and colon cancers. People aged 50 and above form the target group in most European countries. Based on international and European recommendations many countries set up (or are in the process of setting up) national breast cancer screening programs; contrary colon cancer screening in most countries still takes place opportunistically although some countries are considering implementing colon cancer screening programs on a larger scale. Many people in senior years experience eyesight problems. Almost all people aged 50 and older are developing presbyopia and many are at risk of developing macular degeneration, cataracts, glaucoma, and diabetic retinopathy. Major guidelines recommend periodic comprehensive evaluation of older adults by an eye care professional since age-related eye diseases are easily detectable and treatable[13 14]. Nonetheless, all European countries only practice opportunistic and patient driven eye control for people above 50 years old.

This study is the first to overview and document the magnitude of socio-economic inequalities by education in utilization of preventive services among elderly in 10 European countries. We explore whether inequalities in preventives services exist in Europe at large (with distinction by different types of services) and to what extent these inequalities differ by country. We also investigate whether the extent of inequalities in utilization varies among men and women and different age groups. Our study is based on the Survey of Health, Ageing and Retirement in Europe (SHARE) that provides a unique opportunity for cross-country overviews in utilization of preventive services in a comparable manner. Finally, based on the results, we discuss how structural and system factors of the healthcare system may influence inequalities in utilization of preventive services.

Methods

Data

We used the Survey of Health, Ageing and Retirement in Europe (SHARE) release-2 as our main source of data. SHARE contains individual data for people aged 50 and over. There were 18243 persons in 11 European countries (Denmark, Sweden, the Netherlands, Belgium, Austria, Germany, Switzerland, France, Spain, Italy, and Greece) included in our data. The methodology of SHARE survey is described elsewhere[15]. The national survey questionnaires are based on a common blueprint questionnaire but are adapted to national requirements. Based on probability samples in all participating countries, SHARE represents the non-institutionalized population aged 50 and older. For this study we derived information from the self-administered paper-pencil (so called drop-off) questionnaire and supplemented it by the information from the main questionnaire. Total 18,243 people completed the drop-off questionnaire. The individual response rates of the main sample varied between 73.7% in Spain and 93.3% in France, total weighted average for Europe being 85.3%.

Outcome variables

We studied the utilization of four types of preventive services: flu vaccination, eye examination, mammography, and colon cancer screening. The participants were asked whether they had flu vaccination in the past year, whether they had eye examination performed by an eye care professional (such as an ophthalmologist or optometrist) in the last two years, whether in the past ten years they had a sigmoido- or colonoscopy, or stool blood test examination, and whether in the last 2 years women participants had a mammogram. In addition to the utilization of the preventive services, all participants were asked whether their health care provider in the past 10 years ever recommended sigmoido- or colonoscopy to check for colon cancer.

Socio-economic variables

We used educational level as an indicator of socio-economic status. Individuals were first classified into national education schemes based on the highest level of education reported and then reclassified into three equivalent categories: levels 0-2 (pre-primary, primary and lower secondary education), 3 (upper secondary education) and 4-6 (post-secondary education) of the international standard classification of education (ISCED).

Analysis

We assessed socio-economic disparities in utilization of preventive services by three types of measures: (a) prevalence rates of utilization of preventive services, (b) relative index of inequality (RII) that estimates relative level of inequalities of service utilization among higher and lower educational groups, and (c) slope index of inequality (SII) that estimates absolute level of inequalities of preventive services utilization among higher and lower educational groups.

Prevalence rates were calculated for each type of preventive service by education group and participating country. The prevalence rates were standardized by 5-year age-group and gender to the total SHARE population as representative sample for the standard European population aged 50+.

The RII and the SII are regression-based indices that are used to measure socioeconomic inequalities in health in a comparable way in different countries[16]. RII quantifies the relative position of each educational group within the hierarchy of all educational groups before it is related to health indicators by means of log-binomial regression. RII results in ratio that can be described as the prevalence ratio of preventive services utilization in the very bottom of the educational hierarchy compared to the very top of the hierarchy. SII is the absolute value of RII and represents the difference in utilization level of preventive services between the end points (highest and lowest level) of educational hierarchy. These indices have the advantage that they can be applied in comparable way to all countries provided that the educational classifications are strictly hierarchical. All calculations were done using log-binomial regression analysis in SAS statistical package (version 8.02). We included categorical variables in the regression models, signifying a 5-year age-group, sex, and country (in case of analysis of pooled data) to control demographic and geographic confounders.

The analysis was performed on un-weighted data sample.

Results

Number of people who participated in the study varied between 709 in Switzerland and 2564 in Belgium (Table 1). Participants in all countries were similar by their age (mean around 64.4 years old) and gender (about 46% men) structure. Distribution by education, however, varied significantly between countries with the lowest numbers of people with lower education being in Germany (16%) and Denmark (23%) and the highest numbers of people with lower education being in southern parts of Europe (Spain, 85% and Italy, 75%). Vast majority of interviewed people reported having a general practitioner (about 82%), although this percentage was smaller for Greece and Sweden, where only about 55% of people reported having a general practitioner.

For all countries of Europe combined there were no inequalities present for flu vaccination (RII=0.96 CI: 0.86-1.06, Table 2A), but there were large country variations in utilization of flu vaccination. Significant inequalities favoring higher educated people were present in Denmark, Sweden, Austria and Germany (RII between 0.62 and 0.75). In absolute terms the largest inequalities were present in Denmark and Germany (SII=-0.12). On the contrary, in the Netherlands flu vaccination was reported significantly more often by people with lower education (RII=1.17 CI: 0.99-1.38). The overall prevalence rate) in utilization of flu vaccination was low in all countries of Europe and in all educational groups (around 35% for all countries combined). Utilization prevalence rates were particularly low in Greece (between 15% and 21% for lower and higher educational groups respectively) and were somewhat higher in the Netherlands and Spain (around 42%).

Educational inequalities in utilization of eye examination were consistently present in all countries of Europe (RII for all countries combined=0.75, Table 2B). Only in Denmark and the Netherlands relative index of inequalities did not reach significance level. The largest inequalities favoring better educated were present in Greece (RII=0.51) and the smallest inequalities were in the Netherlands (RII=0.90). Unlike utilization of flu vaccination, prevalence rates of eye examination were higher (around 60% in all countries combined). Prevalence rates were the lowest in the Netherlands among all educational groups (around 42%) and the highest in France (between 68% in the lowest educational group and 80% in the highest educational group).

The pattern of educational inequalities in utilization of mammography screening varied by country As seen from Table 2C, there were no inequalities present in Sweden, the Netherlands, and Switzerland, while significant inequalities favoring better educated women were present in Belgium, Austria, Germany, and Greece (RII between 0.46 and 0.75). Overall there were small but significant inequalities in utilization of mammography in all countries of Europe combined (RII=0.91 CI: 0.86-0.95). In line with relative inequalities were the absolute inequalities in mammography screening utilization with the largest inequalities present in Greece (SII=-0.34). The overall utilization prevalence of mammography screening constituted about 56%. It was exceptionally low in Denmark and Greece among people with lower education (around 28%) and high in the Netherlands and Sweden (around 74% among people with lower education).

Inequalities in colon cancer screening in different European countries are presented in table 2D. People with lower education were consistently less likely to undergo colon cancer screening in most European countries (RII for all countries combined=0.73 CI: 0.65-0.82). Especially large inequalities were in Greece (RII=0.30) followed by France and Italy (RII around 0.62). In other countries inequalities were present but did not reach statistical significance. Similarly to flu vaccination, utilization prevalence rates of colon cancer screening tests were low (around 30% in all countries combined). Utilization prevalence was particularly low in Greece, Spain and the Netherlands (between 7 and 12% in lower educated groups) and relatively larger in Austria and Germany (between 53 and 61%).

We contrasted utilization of sigmoido- colonoscopy with the referral for this procedure (Table 3). We observed that countries that had large inequalities in utilization of sigmoido- colonoscopy had also large inequalities in the referral for sigmoido-colonoscopy. The level of inequalities in utilization of sigmoido- colonoscopy where decreasing proportionally to the inequalities in referral for this procedure. So in Switzerland and Austria inequalities in both the referral and in utilization of sigmoido-colonoscopy were the smallest, while in Greece there were the largest inequalities in both referral and utilization of sigmoido- colonoscopy.

The inequalities in utilization of eye examination, mammogram, and colon cancer screening were consistently lower among lower educated people of all age groups and both genders (Table 4). Inequalities in mammography utilization tended to be larger among women in the oldest 75+ age group (RII=0,66) compared to their inequalities counterparts (RII=0,93). The inequalities in eye examination for lower educated men (RII=0.67 CI: 0.62-0.73) were significantly larger then for lower educated women (RII=0.79 CI: 0.74-0.84). According to guidelines some preventive services are recommended for a restricted age-group. We therefore, conducted additional analysis to estimate the level of inequalities in utilization of flu vaccination among people aged 65 and older and the level of inequalities in utilization of mammography among women aged 50-69. The pattern of inequalities across different countries of Europe in these restricted target groups did not change (results not shown).

Discussion

We observed a diverse pattern of inequalities by education in utilization of preventive services. The magnitude of this inequalities differed by type of services and country. For all countries of Europe combined there were no inequalities present for flu vaccination, but large inequalities were observed for colon cancer screening and eye examination, and slightly lower inequalities were observed for mammography. There were large country variations in the magnitude of socio-economic inequalities in different types of services. Among all preventive services the largest relative and absolute inequalities were observed in Germany, Greece and Italy, while the smallest inequalities were present in the Netherlands. Significant inequalities in utilization of all preventive services, except flu vaccination, were present in all age groups and both genders.

We used education as an indicator of socioeconomic position. Education allows classification of individuals who do not work, which our study population largely consists of, prevents reverse causation, and facilitates international comparisons due to its individual nature. On the other hand, educational level might not accurately indicate older person's current socioeconomic position since it is acquired early in life. A more comprehensive measure of socio-economic position might have provided a better picture of socioeconomic variations in utilization of services. We also observed large differences between countries in the educational distribution. Partly these differences reflect the real situation of educational attainment in different countries of Europe. However, there is a possibility that ISCED classification is not flexible enough to accommodate different national schemes. To cope with the differences in educational classification we used RII and SII, measures that take educational distribution into account. In addition, we conducted a sensitivity analysis using income as a measure of socio-economic status and observed similar pattern of inequalities (data not shown). Therefore, we believe that any changes to the choice for the measure of socio-economic status would probably have a weak influence on the results found here.

SHARE data excludes the institutionalized elderly, which leaves out a group of people with a high burden of morbidity. Our results, therefore, are less generalizable to the entire elderly population. Depending on socio-economic composition of elderly in institutions and preventive services in those institutions, our results might under- or overestimate the true size of socio-economic differences in utilization of preventive services. This problem, however, most likely is limited only to those aged 80 and above.

Because the outcomes of our analysis relied on a person's self-report, recall bias is possible. People tend to underestimate the length of time since their last procedure; this may have resulted in overestimation of screening prevalence[17]. Research generally suggests that the accuracy of self-report is not associated with education or income[18 19], therefore differential misclassification is less likely and would little, if at all, influence our estimates of relative inequalities by education. Another survey characteristic that might bias the results is the non-response bias. To the extent that non-response is associated with lower socio-economic and poorer health status[20], this would result in overestimation of utilization rates and underestimation of inequalities in utilization of preventive services.

Some preventive services (for example, colon cancer screening) can be done not only for preventive, but also for diagnostic purposes. We therefore, additionally adjusted our results for the presence of a specific disease related to each type of preventive services (chronic lung disease for flu vaccination, breast cancer for mammography screening, and cancer of colon or rectum for colon cancer screening). The magnitude of inequalities did not substantially change after adjustment (RII for flu vaccination, mammography screening and colorectal cancer screening in all countries combined constituted respectively 0.95 [CI: 0.86-1.06], 0.96 [CI: 0.92-0.99], and 0.70 [CI: 0.63-0.79]).

Despite these limitations, our study provides useful insights into the magnitude of inequalities in utilization of preventive services among elderly in different countries of Europe. Previously most researchers focused on patient-related factors to explain differential utilization of preventive services among people with different socio-economic status[6 21]. Large diversity in the magnitude of inequalities among different countries suggests that in addition to patient-related factors, structural and system factors of the healthcare system might also contribute to the explanation of inequalities. Below, we will explore the role of some of these factors.

Flu vaccination

Our results show that inequalities favouring the high educated in the uptake of flu vaccination were present in Denmark, Sweden, Austria, and Germany, but the opposite trend was observed in the Netherlands and Spain. Similar pattern of inequalities remained in the target group of people aged 65 and older. Previously it was suggested that various patient factors such as lack of knowledge, low perception of need, or fear of side effects contribute to the lower uptake of vaccination[21-23]. These patient-related factors might be unequally distributed among different socio-economic strata leading to differential uptake of flu vaccination. Yet, differences observed between countries indicate that structural factors are also important in causing socio-economic inequalities.

Although the effectiveness of influenza vaccination is well established, vaccination policies and, especially, their implementation differ considerably across Europe. National flu vaccination studies indicate that countries with proactive invitation systems through health professionals (most often GPs) have higher vaccination rates[24-26]. Financial incentives for both physician (extra income) and patient (vaccination free of charge) seem to increase vaccination rates[24]. Any type of cost sharing negatively impacts on utilization of health services[27 28]. Potentially, similar financial incentives influence differential uptake of flu vaccination between people of different socio-economic level. For example, in Denmark, Austria, and Sweden, the patient is requested to pay for his/her vaccination; this may have contributed to the inequalities observed for these countries.

Eye examination

Although the debate continues, there is some consensus that adults above 50 years of age should receive a routine eye examination about once every 2 years, or more frequently depending on their general and ocular health[29 30]. Several studies showed that the burden of visual impairment affects disproportionately people with lower socio-economic status[31 32]. Most common eye diseases can be corrected with timely and appropriate ophthalmologic interventions. Differences in the use of eye care services may exacerbate the socioeconomic gap in the burden of visual impairment.

In the present study, people with higher education were significantly more likely to have had an eye examination almost in all countries. Our results are similar to those found in other countries[33-35]. This suggests a crucial role of patient or provider based factors, rather than the health care system. People in the higher education groups may find it easier to direct themselves toward a long-term goal, such as prevention of illness, compared with those in lower socioeconomic strata, who may be more oriented towards more immediate needs[34]. Yet, accessibility, affordability and continuity of care, as well as physician's recommendations, possibly contribute to inequalities in receiving vision care[36].

Breast cancer screening

Our results show that in several countries women with lower education are less likely to undergo mammography compared to their more educated counterparts. This also applies to women in target age 50-69. Our results are in line with several national reports on socio-economic inequalities in mammography screening[6 7 37-39]. Several factors were suggested to explain inequitable use of mammography screening, including patient related factors such as differences in beliefs and propensity to seek information or help. Women of lower socio-economic status might perceive less usefulness of asymptomatic screening[6]. At the same time, diversity in the magnitude of inequalities between countries from large inequalities (Belgium, Austria, Germany, Greece) to no inequalities (the Netherlands, Sweden, and Switzerland) indicates that the organization of the healthcare services might play an additional role.

All countries of Europe have developed national policies related to breast cancer screening and most countries have population-based breast cancer screening programs. The coverage and the implementation of these screening programs vary significantly between countries: from well-organized and long-sustained countrywide programs (as in the Netherlands, Sweden, and Switzerland), through recent and/or regional programs (as in France, Italy, Denmark, and Spain) to opportunistic screening (as in Austria, Germany and Greece). Studies that compared mammography utilization in regions with and without organized screening programs indicate higher utilization rates in regions with organized screening programs[7]. Our results also point out that countries with organized countrywide breast cancer screening program do not present socio-economic inequalities in breast cancer screening. It is plausible that organized screening programs have direct impact on inequalities in utilization. Considerably larger inequalities in utilization of mammography in the oldest age group (Table 7) for whom organized screening program is not available, supports this suggestion.

Physicians play a key role in motivating women to undergo mammography screening in many European countries. Yet, some researchers also report lower rates of referral for mammography by health professionals for lower educated and lower income women[40]. Thus, countries that base their program solely (or mostly) on referral by physicians (for example, in case of opportunistic screening) are more likely to encounter socio-economic differences in mammography utilization.

Colorectal cancer screening (CCS)

Colorectal cancer is one of the most common malignancies found in the world. There is compelling evidence to advice regular colon cancer screening beginning at age 50 using fecal occult blood test (FOBT) and/or sigmoido- colonoscopy for asymptomatic patients[41-43]. Despite a wealth of evidence on the effectiveness and feasibility of CCS[44-46], only a few European countries have adopted CCS as public health policy while no country has yet organized a national comprehensive CCS program. Therefore, most CCS still takes place opportunistically. Participation in CCS was found to be consistently lower for lower socioeconomic groups in many countries[47 48].

A number of qualitative studies indicate that public awareness about colorectal cancer is still low[49 50]. Low knowledge about the risks and advantages of CCS create strong barriers for its uptake. In addition, fear and embarrassment associated with the procedure, low self-efficacy, low social encouragement, and high perceived threats of the diagnose were shown as strong psychological barriers for CCS characteristic for lower socio-economic groups[50 51].

Costs associated with screening were also shown to greatly affect the prevalence of CCS, especially among people with lower income level. In the USA, Medicare or HMO covered patients have higher rates of screening compared to those who are privately insured or have fee-for-service scheme[47 52]. Adams et al also showed that expansion of coverage for CCS and reduction of out-of-pocket costs significantly increased the odds of screening among low-income Medicare beneficiaries[52] thus reducing, although not eliminating socio-economic gap. Similar financial barrier potentially confronts patients in European countries as not every basic health insurance covers costs associated with CCS.

In the absence of organized screening programs, medical providers play a crucial role in uptake of CCS. A strong positive association between physician recommendations and CCS was earlier reported in other countries[53 54]. However, it is unknown whether providers play a similar role in inequalities in CCS utilization. We found that inequalities in referral are almost as large as inequalities in use of CRC screening (Table 3), suggesting a strong effect of provider factors. Also notable is a close correlation between the country differences in inequalities in referral, and country differences in inequalities in use. Qualitative data suggest that providers are reluctant to refer for CCS patients if follow-up of abnormal results is not expected due to financial or other reasons or if they anticipate lack of patient cooperation[51], but the literature that would elucidate factors of differential referral is still incomplete.

Conclusion

Our study shows a diverse pattern of inequalities by educational level in the utilization of preventive services. We discussed that these inequalities might be related to patient factors: preventive services mostly rely on a hardly understandable concept of risk, require a proactive approach to information and service seeking, and do not provide immediate benefits. However, large differences in the level of inequalities in utilization of preventive services between countries indicate that these inequalities might be also related to structural characteristics of national healthcare systems. Additional comparative research is needed to assess how delivery mechanisms and incentive structures differ between countries with low and high socio-economic inequalities in preventive services utilization. Some preliminary conclusions can be derived from this study. First, it appears that more centralized preventive programs leave fewer chances for socio-economic inequalities in utilization of preventive services to persist. Second, healthcare providers may be the core and most effective mechanism to reduce socio-economic inequalities in utilization of preventive services. Third, cost-sharing not only negatively impacts the overall utilization of preventive services, but also fosters socio-economic gap in their utilization.

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Tables

Table 1 Background information of the study population by country

Country	Number of people	Mean age (SD*)	Gender (%men)	Education level		% reporting having a general practitioner
				% lowest 0-2	% highest 4-6	
Denmark	1196	64.2 (10.2)	46.4	23.4	32.4	96.9
Sweden	2122	64.9 (9.9)	47.3	51.3	30.5	58.9
The Netherlands	2026	63.6 (9.6)	45.8	56.4	19.4	61.7
Belgium	2564	64.0 (9.9)	47.6	50.0	24.0	89.2
Austria	1661	65.2 (9.6)	42.0	30.9	23.5	94.4
Germany	1884	64.1 (9.3)	47.1	16.2	28.9	94.3
Switzerland	709	65.0 (10.4)	48.2	49.6	26.3	91.2
France	1182	63.8 (10.0)	45.7	50.7	18.4	93.3
Spain	1533	66.2 (10.5)	41.3	85.4	6.4	97.2
Italy	1531	64.3 (8.5)	44.9	75.5	8.4	97.7
Greece	1835	64.5 (10.4)	45.6	64.2	15.5	52.7
Total	18243	64.4 (9.8)	45.7	50.5	21.3	82.2

*SD – standard deviation

Table 2 Inequalities in utilization of preventive services in different countries of Europe by education among men and women combined

A. Inequalities in utilization of flu vaccination

Country	**PR lower education**	**PR middle education**	**PR higher education**	**RII**	**95% Confidence Interval**	**SII**
Denmark	0.30	0.33	0.37	**0.62***	**(0.49-0.78)**	-0.12
Sweden	0.29	0.34	0.34	**0.67**	**(0.55-0.82)**	-0.08
Netherlands	0.49	0.44	0.36	1.17	(0.99-1.38)	0.15
Belgium	0.49	0.48	0.47	1.01	(0.87-1.16)	0.03
Austria	0.27	0.35	0.37	**0.75**	**(0.59-0.97)**	-0.08
Germany	0.24	0.34	0.39	**0.71**	**(0.55-0.90)**	-0.12
Switzerland	0.33	0.30	0.33	0.89	(0.59-1.33)	0.00
France	0.40	0.40	0.38	0.93	(0.72-1.21)	0.01
Spain	0.43	0.35	0.47	1.12	(0.79-1.58)	0.04
Italy	0.40	0.36	0.38	1.06	(0.79-1.42)	0.03
Greece	0.15	0.17	0.22	1.53	(0.85-2.74)	0.05
Europe	0.36	0.36	0.38	*0.96*	*(0.86-1.06)*	*-0.01*

B. Inequalities in utilization of eye examination

Country	**PR lower education**	**PR middle education**	**PR higher education**	**RII**	**95% Confidence Interval**	**SII**
Denmark	0.59	0.62	0.60	0.91	(0.76-1.08)	-0.06
Sweden	0.52	0.51	0.59	**0.77**	**(0.66-0.90)**	-0.15
Netherlands	0.41	0.42	0.42	0.90	(0.73-1.11)	-0.04
Belgium	0.57	0.68	0.68	**0.76**	**(0.68-0.85)**	-0.18
Austria	0.57	0.64	0.66	**0.80**	**(0.70-0.92)**	-0.14
Germany	0.67	0.74	0.77	**0.84**	**(0.75-0.93)**	-0.13
Switzerland	0.63	0.71	0.78	**0.72**	**(0.59-0.87)**	-0.26
France	0.68	0.79	0.80	**0.84**	**(0.73-0.96)**	-0.14
Spain	0.46	0.61	0.70	**0.56**	**(0.44-0.72)**	-0.32
Italy	0.53	0.67	0.74	**0.61**	**(0.51-0.72)**	-0.31
Greece	0.49	0.66	0.73	**0.51**	**(0.43-0.60)**	-0.41
Europe	0.54	0.63	0.65	***0.75***	***(0.69-0.81)***	*-0.18*

C. Inequalities in utilization of mammography (women only)

Country	PR lower education	PR middle education	PR higher education	RII	95% Confidence Interval	SII
Denmark	0.27	0.22	0.18	0.71	(0.37-1.37)	-0.08
Sweden	0.71	0.75	0.71	1.07	(0.82-1.41)	0.04
Netherlands	0.76	0.76	0.72	1.01	(0.76-1.34)	-0.01
Belgium	0.58	0.67	0.71	**0.75**	**(0.58-0.97)**	-0.17
Austria	0.55	0.64	0.71	**0.70**	**(0.51-0.96)**	-0.20
Germany	0.33	0.45	0.43	**0.66**	**(0.45-0.97)**	-0.16
Switzerland	0.50	0.33	0.44	1.29	(0.67-2.48)	0.09
France	0.69	0.76	0.76	0.87	(0.61-1.25)	-0.10
Spain	0.53	0.64	0.57	0.89	(0.52-1.52)	-0.06
Italy	0.53	0.62	0.70	0.70	(0.47-1.04)	-0.23
Greece	0.29	0.43	0.55	**0.46**	**(0.29-0.74)**	-0.34
Europe	0.53	0.59	0.60	***0.91***	***(0.86-0.95)***	*-0.09*

D. Inequalities in utilization of colon cancer screening‡

Country	PR lower education	PR middle education	PR higher education	RII	95% Confidence Interval	SII
Denmark	0.17	0.17	0.21	0.69	(0,43-1,13)	-0.05
Sweden	0.20	0.25	0.25	**0.69**	**(0,50-0,95)**	-0.10
Netherlands	0.12	0.12	0.14	0.75	(0,46-1,21)	-0.04
Belgium	0.20	0.22	0.26	**0.72**	**(0.53-0.96)**	-0.06
Austria	0.61	0.67	0.65	0.92	(0,80-1,05)	-0.05
Germany	0.53	0.60	0.66	**0.73**	**(0,64-0,84)**	-0.19
Switzerland	0.36	0.34	0.43	0.84	(0,58-1,23)	-0.07
France	0.33	0.47	0.45	**0.61**	**(0,47-0,80)**	-0.19
Spain	0.10	0.14	0.13	0.73	(0,32-1,68)	-0.03
Italy	0.22	0.27	0.30	**0.62**	**(0,41-0,92)**	-0.11
Greece	0.07	0.13	0.16	**0.30**	**(0,16-0,55)**	-0.13
Europe	0.26	0.30	0.32	**0.73**	***(0,65-0,82)***	*-0,09*

* Statistically significant inequalities are marked in bold
PR = prevalence rates, age-sex standardized to the total SHARE population;
RII = Relative index of inequalities; adjustment for age, gender and country (Europe combined only)
SII = Slope index of inequalities; adjustment for age, gender, and country (Europe combined only)
‡ Occult fecal blood test and/or sigmoido-/ colono-scopy

Table 3. Relative index of inequality (RII) in referral to and utilization of sigmoido-colonoscopy by education among men and women combined

	Referral for Sigmoido- colonoscopy		Use of sigmoido-colonoscopy	
	RII	95% Confidence Interval	RII	95% Confidence Interval
Denmark	**0.54**	**(0,31-0,94)**	0.67	(0,38-1,19)
Sweden	0.80	(0,52-1,22)	0.70	(0,45-1,10)
The Netherlands	0.84	(0,47-1,50)	0.93	(0,53-1,63)
Belgium	0.89	(0.64-1.23)	**0.69**	**(0.48-0.99)**
Austria	0.93	(0,70-1,23)	0.75	(0,54-1,03)
Germany	**0.69**	**(0,54-0,89)**	**0.65**	**(0,47-0,88)**
Switzerland	0.89	(0,50-1,60)	0.85	(0,47-1,51)
France	**0.60**	**(0,43-0,83)**	**0.49**	**(0,33-0,72)**
Spain	0.49	(0,22-1,11)	0.68	(0,26-1,78)
Italy	**0.56**	**(0,34-0,92)**	0.68	(0,38-1,21)
Greece	**0.39**	**(0,21-0,75)**	**0.19**	**(0,08-0,42)**
Europe	***0,74***	***(0,64-0,85)***	***0,66***	***(0,57-0,77)***

*Statistically significant inequalities are marked in bold
RII = Relative index of inequalities; adjustment for age, gender and country (Europe combined only)

Table 4. Relative index of inequality (RII) for different preventive services by age group and gender for all countries combined

	Flu vaccination		Eye examination		Mammography		Colon Cancer Screening test[α]	
	RII	95% CI	RII	95% CI	RII	95% CI	RII	95% CI
Age 50-64	0,98	(0,90 1,06)	**0,74**[β]	**(0,71-0,78)**	**0,93**	**(0,87-0,99)**	**0,70**	**(0,63-0,77)**
Age 65-74	0,92	(0,82 1,03)	**0,75**	**(0,68-0,83)**	0,95	(0,85-1,06)	**0,67**	**(0,56-0,79)**
Age 75+	0,91	(0,80 1,02)	**0,76**	**(0,68-0,85)**	**0,66**	**(0,44-0,97)**	**0,72**	**(0,56-0,92)**
Men	1,04	(0,93 1,16)	**0,67**	**(0,62-0,73)**	-	-	**0,66**	**(0,57-0,77)**
Women	0,92	(0,82 1,04)	**0,79**	**(0,74-0,84)**	**0,92**	**(0,87-0,97)**	**0,74**	**(0,65-0,84)**

[α]Occult fecal blood test or sigmoido-/ colono-scopy
[β]Statistically significant inequalities are marked in bold
[a] RII = Relative index of inequalities; adjustment for age, gender and country (Europe combined only)

Chapter 29

Inequalities in female cancer screening rates: a review of the impact of interventions promoting participation

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Abstract

Background

Rates of participation in female cancer screening are strongly inversely correlated with socioeconomic status in many countries. The objective of this work was to review the scientific evidence on interventions to promote participation by women in screening programmes, assessing the effectiveness in terms of the impact on the social gradient in breast and cervical screening rates.

Methods

We performed a computerized literature search looking for relevant papers published between January 1996 and October 2006. Papers with the requested level of internal validity were classified into three groups by the type of intervention evaluated: 1) organized screening vs. spontaneous attendance; 2) different strategies of invitation vs. usual care within an organized programme; 3) local interventions vs. spontaneous attendance in disadvantaged populations.

Results

Very few studies evaluated the impact of organized screening in terms of the social gradient in participation rates, but the available evidence supports the hypothesis that population-based programmes may be successful in reducing social inequalities in participation rates. Consistent results also suggest that primary-care physicians may have a key role in promoting breast and cervical cancer screening, and that access could be effectively enhanced through cost-reducing interventions, such as offering free tests and eliminating geographical barriers. Theoretical models of behavioural change are used to develop individually tailored messages that address barriers to screening and could be successfully implemented within ethnic minorities.

Conclusions

The results of this review could apply to the timely recognition, treatment and follow-up of many health conditions, such as hypertension, hyper-cholesterolemia, diabetes and obesity.

Introduction

Breast cancer is the most common cancer among women, representing about 14% of all female cancer deaths in the world [1]. Figures for cervical cancer are lower in developed nations [1], although this cause of death remains a major cause of morbidity and mortality amongst women, especially in Eastern Europe [2].
Breast and cervical cancer mortality is largely preventable, given the availability of effective and internationally accepted screening tests for early diagnosis. However, screening policies and practices among countries are variable, as are coverage and attendance rates [2,3,4]. Two Cochrane reviews [5,6] assessed the effectiveness of different strategies for increasing participation rates in population breast and cervical screening. The authors concluded that active recruitment strategies, such as those implemented in an organized population screening (invitation letters, phone calls, reminders, etc.), are generally better than “opportunistic” recruitment. To date, most European countries have developed population-based screening programmes, both for breast and cervical cancer, although they differ greatly in terms of the type of programme, organizational characteristics, implementation stage, invitation methodology, and percentage of the population covered by formal programme (tables 1-2) [3,4,7,8,9,10,11,12].

Although rates of participation in female cancer screening have generally increased in recent years, particularly in countries with national and long-standing screening programmes, they are still strongly inversely correlated with socioeconomic status in many countries [13,14,15]. This is reflected in the highest mortality from both cancers of women of lower socioeconomic status compared to more advantaged women, that occurs also in spite of their lower risk of developing breast cancer [13,14].

The most common barriers to cancer screening related to low socioeconomic class are economic and cultural barriers [16]. Out-of-pocket costs have been widely reported as an important limitation to screening, although this is a less significant determinant of non-adherence in countries with a National Health System covering expenses for such preventive services. Personal beliefs and attitudes, and poor communication between patients and physicians can also hinder access to screening, because of underestimation of the cancer risk and testing benefits.

The objective of this work was to review the scientific evidence on interventions to promote participation by women in screening programmes, assessing the effectiveness in terms of the impact on the social gradient in breast and cervical screening rates. As previously mentioned, population-based screening programmes have been successful at increasing utilization rates in the general population. Our hypothesis is that they could be particularly successful at promoting screening among non-attenders, thereby contributing to a reduction in the social inequalities in participation rates. Moreover, many evaluation studies assess the effect of local interventions carried out in the absence of a population programme and directed at specific groups of women with historically low attendance rates. Therefore, in this review we distinguish between three main groups of studies, according to the type of intervention under evaluation: studies estimating the impact of the introduction of an organized population programme; studies focusing on the comparison among different strategies of invitation into the programme; and finally, studies evaluating interventions specifically aimed at disadvantaged groups of women (low-income, ethnic minorities, Medicare/Medicaid assisted) to promote screening uptake as opposed to spontaneous participation.

Methods

We performed a computerized literature search in the following databases: MEDLINE, EMBASE, CINAHL and COCHRANE, using various combinations of keywords, including the subject matter (mass screening; cancer screening; breast cancer screening; mammography; cervical cancer screening), the type of study (intervention; evaluation; trial; program; evaluation and quality improvement program; program planning; program development; program implementation; program evaluation; health care quality, access, and evaluation) and the socioeconomic context (social class; social factors; socio-economic factors; equity; inequality). We searched for relevant studies from among papers published between January 1996 and October 2006. Two reviewers independently screened citations and abstracts to identify articles potentially meeting the inclusion criteria. Full text versions were then retrieved and independently examined to determine whether they met the inclusion criteria, in particular, regarding the possibility of describing (or inferring) results in terms of a valid social indicator. Further studies were identified from the references of the selected papers. Two meta-analyses (one for breast cancer [17] and one for cervical cancer [18]) were retrieved and included, without further inclusion of the individual studies analysed.

The selected studies were then classified according to three main axes, corresponding to the study characteristics relevant to our research objective: the type of intervention, the geographic area of interest and the socioeconomic indicator used. This classification allowed a first judgement to be made on the transferability of the results to the European context; we did not perform a proper analysis of transferability, as this requires a deep knowledge of the specific context to which the interventions might be transferred and it was beyond the scope of this review. As described above, we first classified the studies by the type of intervention evaluated: 1) organized screening vs. spontaneous attendance; 2) different strategies of invitation vs. usual care within an organized programme; 3) local interventions vs. spontaneous attendance in disadvantaged populations. Studies belonging to the third group were further classified according to the type of strategy (e.g. in-reach, out-reach, community education, etc.). As European studies were our main focus, the study area was classified in three major categories: Europe, the US and other countries. Concerning the socioeconomic indicator used in the analyses, we realized that most studies from the US would have described results in terms of ethnic groups or Medicare/Medicaid populations, which are conceptual categories less common in most European countries. Therefore, with respect to generalizability, we classified the indicators in five hierarchically ordered categories: income level, education, area deprivation, health insurance and race.

Finally, each study was carefully evaluated using a revised version of the instrument developed by the co-ordinating centre of the Eurothine project (Annex A), in order to exclude studies that did not guarantee a minimum level of internal validity. Two researchers independently conducted the evaluation and rated each study on a scale ranging from 1=”very poor” to 5=”very good”; if the two scores differed by more than one point, the paper was re-assessed by a third reviewer. Each paper was then assigned the mean score, and those obtaining a final score of less than three were excluded from this review.

Results

We found two meta-analyses on the effectiveness of strategies to increase screening uptake that also reported stratified analyses by socioeconomic level. The first one [17] included 38 intervention studies published between 1984 and 2000, focusing on strategies to promote mammography among subgroups of historically underserved women (Blacks, elderly and low-income people). Combined effects were estimated separately for six broad groups of intervention strategies: 1) individual directed, in the health care setting (in-reach strategy); 2) individual directed, in a community setting (out-reach strategy); 3) access enhancing (help with scheduling the appointment, offering transportation, reduced costs, mobile vans); 4) social networks (out-reach strategies involving peer leaders and lay health advisors); 5) community education; and 6) mass media campaigns. Access enhancing interventions and in-reach strategies appeared to be the most effective at increasing participation in screening, with an estimated effect of 18.9% (95%CI: 10.4-27.4) and 17.6% (95%CI: 11.6-24.0), respectively. The effects of the other strategies were all estimated at below 10%, which suggests that the impact of the community component present in these four strategies is generally lower. Owing to the small number of studies, it was not possible to analyse strata formed by the combination of type of intervention and subgroup of the population. The combined effect of all the interventions aimed at low-income women was 12.7% (95%CI: 7.3-18.1), lower than the estimated effect among older women (17.9%, 95%CI: 10.5-25.4). The second meta-analysis [18], covering 10 studies published between 1966 and 2000, assessed the efficacy of patient-directed reminder letters on cervical cancer screening and concluded that, although the cumulative effect was significant (OR=1.64, 95%CI: 1.49-1.80), efficacy was quite poor in lower socioeconomic groups (OR=1.16, 95%CI: 0.99-1.35).

Aside from the studies included in these two meta-analyses, and after excluding studies of low quality and those without a socioeconomic indicator, we gathered a total of 28 studies, 18 of which are on breast cancer screening and 18 on cervical cancer screening. Only five were from Europe, the rest being from the US; six used race as the only socioeconomic indicator in the analysis. The main characteristics of the individual studies are reported in tables 3-5.

Organized screening vs. spontaneous attendance

Five studies evaluated the impact of female cancer screening programmes [19, 20, 21, 22, 23], using a longitudinal observational approach and comparing screening rates attained 3 to 5 years after the start of the programme with different reference groups, varying from baseline attendance rates in the same community to historical comparison groups from the literature (table 3).

We found only two studies that evaluated European programmes also in terms of the socioeconomic characteristics of the covered population: the Malmö Mammographic Service Screening Programme [19] in Sweden and the Turin cervical cancer screening programme [20] in Italy. The population programme in Sweden was introduced in 1990, with the Malmö Mammographic Service Screening Programme (MMSSP), on the basis of the positive results from the Malmö Mammographic Screening Trial (MMST), conducted from 1976 to 1990. The programme strategy, however, differed somewhat from the strategy adopted during the trial: in MMST, women received an invitation letter with a pre-arranged appointment that could be changed; whereas in MMSSP, women first received a letter (and a subsequent reminder) asking if they would be interested in receiving a mammogram and only those who replied affirmatively were contacted again. A comparison of the results from the first three years of the programme with the results from the trial [9] revealed that programme attendance declined over time and non-attendance was associated with various socioeconomic factors. One possible reason reported by the authors was the change in the strategy of invitation. However, the programme resulted in greater awareness even among non-attenders, who had an improvement in the stage at diagnosis and in survival, likely linked to spontaneous attendance fostered by the invitation letter. The Turin programme, one of the oldest in Italy, was introduced in 1992. The results of the evaluation study [20] showed an increase in overall coverage of the population from 61% to 74% after three years. With organized screening, the educational gradient in coverage was less steep compared to the educational distribution of spontaneous attendance, although a statistically significant linear increase in coverage with increasing education was still present. Classifying educational attainment into five groups, the estimated coverage in 1992 ranged from 47% among women without any educational qualification to 75% among those with a university degree; the percentages after the third year of the programme were 61% and 88%, respectively. The maximum gain appeared to be in the middle class (high school diploma), with an estimated 22% increase in coverage attributable to the programme.

All the other studies were conducted in the US, evaluating specific state programmes implemented in the light of national guidelines and federal funds: the CDC National Breast and Cervical Cancer Early Detection Program (NBCCEDP) [21] the ENCORE plus, a health promotion programme delivered through a network of non-profit organizations and involving 30 states [22]; and a multi-component programme in Los Angeles, involving profound changes in the organization of service delivery [23]. The programmes were all directed at low-income women and these studies showed that the programmes succeeded in increasing rates of screening in these groups of historically underserved women, especially in areas where long-standing programmes do exist, as in the case of NBCCEDP. Although not directly measured, it is likely that these programmes, by increasing compliance among the most disadvantaged groups, were also effective in reducing social inequalities in screening rates in the general population.

Different strategies of invitation vs. usual care

In this group of studies, we included six randomized controlled trials [24,25,26,27,28,29] on the evaluation of different strategies implemented specifically within a population programme, in order to increase uptake of screening among non-attenders (table 4).

The first of the European studies was conducted in London in 1995 [24]. The background hypothesis was that general practitioners (GP) could have an influential role in prompting female non-attenders to up-to-date their scheduling of breast cancer screening. Therefore, the intervention was aimed at general practices, with specific training sessions for receptionists who were asked to contact women, either by telephone or by mail, and make appointments for the test. The intervention resulted in a small improvement in attendance (9% in the intervention group vs. 4% in the control group), which was significant particularly among Indian women compared to other ethnic groups of non-attenders, perhaps because most of the practices had Indian staff. Although the impact of the intervention was modest, the authors concluded that staff training in general practices could be an effective low-cost component of multifaceted strategies.

Four different invitation strategies were evaluated in a randomized controlled trial connected with the Turin population screening programme for breast and cervical cancer [25]: the standard care letter signed by a woman's GP, with a pre-arranged appointment; an open-ended invitation signed by the GP, prompting women to contact the screening centre to arrange an appointment; a letter similar to the standard care, but signed by the programme co-ordinator; and lastly, an extended letter signed by the GP, with a pre-arranged appointment and detailed medical information on the risk of cancer. Compared to the standard care group, compliance at 12 months of follow-up was significantly lower in the second and third groups, whereas it was similar in the last group. However, having less than five years of schooling was a significant predictor of non-attendance, suggesting that a letter might not be an effective strategy for women who are likely to be illiterate. Furthermore, the statistical interaction between intervention group and educational level showed that the impact of the extended letter on screening rates was significantly larger among women with the highest educational level. As the overall attendance among women who had received the extended letter was not significantly different than among those who had received the standard letter, the significant interaction suggests that an invitation with detailed medical explanations is likely to increase social inequalities in participation rates without increasing total coverage.

A strategy encompassing three successive interventions was evaluated in Uppsala County, within the framework of the Swedish organized cervical cancer screening [26]. In the first intervention, researchers analysed the impact of a modified letter that included an informative brochure, compared to the standard invitation letter; in the second intervention, female non-attenders were randomly allocated to receive either a reminder letter or nothing; finally, a telephone reminder was tested among women that were still non-compliant after the second letter. The authors found that the modified letter was not significantly better than the standard invitation at increasing attendance rates, whereas both the reminder letter and the phone call had a big effect (respectively, OR=2.9, 95%CI: 2.5-3.3; OR=6.9 95%CI: 5.0-9.4). Stratified analyses also showed that married women and women with an intermediate educational level were more responsive to a reminder letter than were both lower and higher educated women, but there was no difference in the outcome with the phone reminder; both interventions were less effective among women who were on social welfare. Overall, it appeared that the effect of reminders was stronger in higher socioeconomic groups, possibly owing to the greater difficulty in reaching women in lower socioeconomic groups by phone.

As previously mentioned, screening policies in the US are somewhat different from those in European countries: the CDC initiated the NBCCEDP in the early 1990s, to improve access to preventive services specifically for low-income women. In each state, screening programmes are administered according to local priorities, and only rarely are invitation strategies implemented as a population programme with centralized procedures. In this section, we included three studies in which the standard care was some form of invitation, as opposed to those studies in which various invitation strategies were compared to spontaneous attendance (summarized in the next section). In all these studies, interventions were directed at women overdue for either one of the recommended screening tests, and the main objective was to evaluate the relative impact of different forms of reminders. The results confirmed the importance of the involvement of primary care physicians, and also suggested a greater effectiveness of in-person contact and model-based tailored messages. In the first study conducted in the early 1990s [27], an extremely low-income population, who received breast and cervical screening free of charge, greatly benefited from an intensive strategy, consisting of both a letter from their physician and a subsequent phone call. The second study [28] conducted at two sites, concluded that a mailed letter of any form had no additional effectiveness on increasing rates of mammography use, compared with the control group where only a physician-directed reminder was placed in their medical records. Independently of the intervention, screening rates at the end of follow-up were higher at the site that had a lower proportion of women with insurance coverage. Finally, a comparison of six intervention strategies to promote breast cancer screening, which involved physician recommendations, in-person and telephone counselling [29], showed that the combination of tailored in-person counselling with a physician letter was the most effective approach (OR=3.53, 95%CI: 1.98-6.32 vs. the standard reminder postcard), followed by in-person contact alone (OR=2.45, 95%CI: 1.37-4.38). The study was based on the Transtheoretical (or Stage of Change) Model (TTM), which assumes that behaviour change is a continuous process, along which individuals can be classified into five stages: pre-contemplation (change is not even contemplated), contemplation (thinking of a change), preparation (taking the first steps towards change), action (starting the change) and maintenance (carrying on with the change) [30,31]. The results showed that among women who were in the contemplation stage according to the TTM none of the strategies significantly increased adherence to mammography; whereas the effectiveness of tailored messages was particularly evident among pre-contemplators (OR=5.19, 95%CI: 2.29-11.80 for the combination of in-person counselling and physician letter).

Interventions vs. spontaneous attendance in disadvantaged population

The majority of the retrieved papers (17 out of 28) were studies that evaluated interventions to promote screening uptake and compared them with spontaneous participation (table 5); 11 of them reported results for mammography and 11 for pap-test. Similar to the classification used in the meta-analysis on mammography described above [17], we categorized these studies on the basis of the strategy adopted. However, all the studies in the present review were aimed at low-income women who were covered by benefits that offered free screening tests. Therefore, the category of “access enhancing” intervention, strongly influenced by the “reduced cost” component, was not applicable to our studies. Furthermore, given that the target, in general, were underserved subgroups of the population, none of the selected interventions was based purely on community education and only one was a media-led campaign [32], which proved to be effective only on declared intentions to perform both screening tests, but not in the practice of any of them. Consequently, we created four sub-groups: a. in-reach strategies, including interventions directed at health care providers; b. out-reach strategies, involving only mailed information and/or telephone calls; c. interventions led by lay health workers, including community education components; d. mixed strategies.

a. in-reach strategies

There were four interventions using an in-reach strategy [33,34,35,36] that involved contacting women attending the health care centre for primary care; and two directly aimed at the health system [37,38]. All of them were essentially based on reminders either to the patient, by mail or telephone, or to the physician, through automated systems that produced appropriate stickers in the patients' medical records. Although the study designs largely differed, it was possible to identify some consistencies in the results. Firstly, both studies evaluating interventions that were directed only at providers failed to demonstrate a long-lasting effect of the intervention, nor could they explain any of the discrepancies between breast and cervical screening rates.

Secondly, interventions including also individually tailored telephone counselling [33,34,36] were more effective than the intervention providing only educational messages [35], even if culturally sensitive and specifically targeted at ethnic minorities. In particular, one intervention [34] developed individual messages on the basis of two theoretical models, the TTM and the Health Belief Model (HBM), stating that the important determinants of preventive health services use are perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy [39]. The intervention consisted of three progressively intensive stages: the first stage included only physician education; mailing educational materials to women was added in the second stage; and telephone counselling in the last stage. Overall, the results were only marginally significant in favour of the second stage of the intervention (an estimated differential increase of 4.4%), whereas the other components appeared ineffective. However, when the sample was stratified with regard to various indicators of disadvantage (older than 80 years of age, less than nine years of education, Black and without private insurance), the intervention appeared to be much more effective among women who could be identified by at least one of these indicators: the estimated effect was 13.2% attributable to the first two stages of the intervention, without any additional effect of the telephone counselling.

b. outreach strategies with mailed information or telephone counselling

Three studies evaluated outreach strategies, involving mailed information and reminders, and telephone counselling [40,41,42]. All of them used theoretical models in developing individually tailored messages, intended to address barriers to screening, to increase self-efficacy and to assist women in the process of behavioural change. In general, women were recruited using available population databases and sampling from households in low-income and minority neighbourhoods. When comparing different types of letters, the results suggest that an extended letter with detailed information on the woman's health status and cancer risk may be a deterrent rather than an incentive to correct screening behaviours [42], as already remarked [25,26]. At the end of follow-up, in fact, 23.7% of women randomized to such a letter had received a pap-test compared to 43.9% of those randomized to a generic letter promoting screening tests; the percentages for mammography were 13.0% and 30.5%, respectively. The two consecutive studies by Crane[40,41] also suggested that an intervention based on multiple telephone calls offering personal counselling can be more effective than a single call or a combined intervention (advance letter + phone call): among non-adherents at baseline, the OR of having a mammogram compared to spontaneous attendance for these interventions were 2.58 (95%CI: 1.45-4.60), 1.45 (95%CI: 0.80-2.62), 1.38 (95%CI: 0.76-2.50), respectively.

c. interventions led by lay health workers
Four outreach interventions used lay health advisors to approach women and conduct both community activities and one-on-one education and counselling sessions [43, 44, 45, 46]. Each of them was specifically aimed at one ethnic minority group with historically low rates of attendance for cancer screening: Vietnamese, Latinas, Chinese and Afro-American. They all demonstrated the necessity of involving trained lay health advisors from the same ethnic community in rather intensive intervention activities, to increase screening adherence among these women. However, none of them addressed the sustainability, long-term effects or cost-effectiveness of such programmes.

d. mixed strategies
Finally, there were two interventions involving mixed strategies [47,48,49]. One of these was the Forsyth County Cancer Screening (FoCaS) Project, funded by the National Cancer Institute in the US, within a comprehensive initiative to promote cancer screening among low-income women. The project involved in-reach and out-reach strategies: educational sessions and visual reminders to physicians, community activities led by lay health workers, individually tailored counselling and mass-media techniques. Two studies evaluated the impact of this programme using different approaches. The first [47] used a cross-sectional design, with two independent surveys conducted at baseline and three years after the intervention; the intervention and control communities were located in two different cities in North Carolina with similar socio-demographic characteristics. The second study [48] analysed, using a time-series design, weekly reports of all mammograms performed in a 4-year period at the main Health Center in the intervention community. The pre-post design estimated statistically significant increases of 18% in mammography rates and 21% in Pap smear rates, without any differential effect of race or educational level. The time-series analysis confirmed the effectiveness of the intervention, and found a differential effect by age, with an immediate impact for younger women (40-49 years) and a delayed effect for older women. The last intervention [49] was an in-reach strategy that used lay health advisors to recruit women and offer screening appointments. The intervention was associated with increased rates of breast and cervical cancer screening, with similar effects across strata of insurance coverage (private, Medicare, Medicaid). A differential effect was observed by race, with greater improvements among Native Americans and Southeast Asians and no effect for White women.

Discussion

Some of our findings are noteworthy and add new knowledge compared to previous reviews largely based on US studies [17,18]. First, although we could not find many

European studies evaluating the impact of different screening strategies in terms of the social gradient in participation rates, the available evidence supports the hypothesis that organized population-based programmes may be successful in reducing social inequalities in participation rates, which is consistent with the results from a European comparative study [15].

We also found consistent results, from both US and European studies, suggesting that primary-care physicians may have a key role in promoting breast and cervical cancer and that they should be explicitly involved in this process.

The generalizability and transferability of results is not always easy to assess because of large differences in the contexts in which interventions were implemented. One strong conclusion based on the previous meta-analysis [17], for example, was that access could be effectively enhanced through cost-reducing interventions, such as offering free tests to the relevant population and eliminating geographical barriers. Although free tests are already available through most European health systems (tables 1-2), suggestions regarding strategies aimed at facilitating appointments and transportation may be applied in Europe for specific groups of non-adherent women.

Another consistent finding was that invitation letters including detailed medical explanations were likely to attract more women from higher social classes and to discourage those from lower classes; therefore, they tend to increase social disparities in attendance rates without increasing total coverage, and should be avoided as the standard practice in population programmes.

Finally, we found that the most effective strategies, particularly in the US, were based on theoretical models of behavioural change: the Health Belief Model and the Transtheoretical Model have been widely used to develop individually tailored messages that address barriers to screening and support the empowerment of women [30]. These strategies require previous knowledge of a woman's beliefs and attitudes, and are difficult to implement on a large scale; however, they could be successfully implemented in hard-to-reach populations, such as ethnic minorities. Unfortunately these interventions, as well as similar intensive approaches, such as those led by lay health workers or those involving a community component, have rarely addressed problems of sustainability, cost-effectiveness and long-term effects.

The health care system and health professionals should take responsibility for contrasting observed health inequalities. Much can be done to address those mechanisms that generate inequalities within the health system, such as financial, geographical or cultural barriers to access, and poor quality care. Each of these mechanisms could be tackled by a specific policy and intervention, for example: progressive systems of financing to reduce financial barriers, positive discrimination in the provision and allocation of resources to reduce geographical barriers (facilities, technologies and professionals), pro-active (as opposed to opportunistic) approaches to address cultural barriers, and equity audits to monitor the quality of health care.

This review lends support to the hypothesis that pro-active strategies are more effective at reducing social inequalities in participation rates for breast and cervical cancer screening, and suggests some requirements that would make an intervention more sensitive to vulnerable groups. We chose cancer screening as a paradigm of health care strategies that may influence relevant health outcomes, with a large impact on health inequalities. This reasoning could apply to the timely recognition, treatment and follow-up of many health conditions, such as hypertension, hyper-cholesterolemia, diabetes, obesity, caries, immunization, etc. Therefore, the results of this review are likely generalizable to other policies on early diagnosis with similar targets and with health outcomes perceived to be similar in severity, impact and preventability. In conclusion, pro-active approaches to the timely recognition of unfavourable health outcomes can be expected to have an impact on reducing health inequalities, proportional to the extent that health inequalities are attributable to the outcome.

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Table 1. Breast cancer screening programmes in 28 European countries

Country	Type of programme	Year of implementation of organized programmes*	% target population covered by organized programmes	Type of system*,#
Austria	Opportunistic screening (voluntary testing free of charge once a year). Organized screening is being developed	NA	NA	NA
Belgium	Organized national programme in the three Communities of Wallonia, Flanders, Brussels	2001-02	100%	DC
Bulgaria	Opportunistic screening	NA	NA	NA
Cyprus	Organized national pilot programme. Personal letter sent by the Ministry of Health	MI	MI	MI
Czech Republic	Organized national programme. Women called by their GPs or gynaecologists.	MI	100%	C
Denmark	Organized programme in two of the 14 county councils. Women invited by personal letter	1992	20%	PC
Estonia	Organized national programme financed and administered by the Estonian Health Insurance Fund. Invitation based on the EHIF national database	MI	100%	C
Finland	Organized national programme. Personal invitation letter. The Finnish municipalities are responsible for organizing and financing this screening	1989	100%	PC
France	Organized national programme. Personal invitation letter	2004	100%	DC
Germany	Organized national programme for Social Health insured women, regularly invited. Opportunistic screening paid for by private health insurance	MI	91%	MI
Greece	Two regional pilot programmes	1989-91	25%	DC
Hungary	Organized national programme. Personal invitation letter	2000	100%	C
Iceland	Organized national programme	1987	100%	C
Ireland	Organized regional programmes. National coverage expected by the end of 2007	2000	MI	DC
Italy	Organized regional programmes. Personal invitation letter.	1990	72%	DC
Latvia	Opportunistic screening (voluntary testing free of charge once every two years)	NA	NA	NA
Lithuania	Organized national programme for women covered by the Compulsory Health Insurance Fund	2005	MI	MI
Luxembourg	Organized national programme	1992	98%	C
Malta	Opportunistic screening (testing free-of-charge offered to women at risk referred from primary care)	NA	NA	NA
Netherlands	Organized national programme. Payment is based on AWBZ (universal social health insurance scheme). Personal invitation letter.	1989	100%	PC
Norway	Organized regional screening	1995	40%	DC
Portugal	Mainly opportunistic. Organized programme only in one region	1990	20%	DC
Romania	Opportunistic screening	NA	NA	NA
Slovakia	Opportunistic screening paid for by health insurance companies	NA	NA	NA
Slovenia	Opportunistic screening	NA	NA	NA
Spain	Organized programme implemented in all Autonomous Communities	1990	100%	DC
Sweden	Organized national programme	1986	100%	PC
United Kingdom	Organized national programme	1988	100%	PC

* NA = not applicable; MI = missing information

C = centralized; PC = partially centralized; DC = decentralized

Table 2. Cervical cancer screening programmes in 28 European countries

Country	Type of programme	Year of implementation of organized programmes*	% target population covered by organized programmes	Type of system*,#
Austria	Opportunistic screening (voluntary testing free-of-charge once a year), except in one county (personal letter invitation)	1970	4%	NA
Belgium	Organized programme in the Flemish Community. Personal letter invitation	1994	MI	DC
Bulgaria	Opportunistic screening	NA	NA	NA
Cyprus	Organized national programme	MI	100%	C
Czech Republic	Organized national programme. Women called by their GPs or gynaecologists.	1966	MI	C
Denmark	Organized regional programme with nationwide coverage. Call and recall system (personal invitation letter signed by GP + reminder letter)	1967	100%	DC
Estonia	Organized national programme financed and administered by the Estonian Health Insurance Fund. Invitation based on the EHIF national database	MI	100%	C
Finland	Organized national programme. Personal invitation letter. The Finnish municipalities are responsible for organizing and financing this screening	1963	100%	PC
France	Organized regional programmes. Personal invitation letter. Partial contribution to payment or reimbursement	1990-94	MI	DC
Germany	Opportunistic screening (voluntary testing free of charge once a year for Social Health insured women)	NA	NA	NA
Greece	Organized regional programme (two regions). Personal invitation letter	1991	MI	DC
Hungary	Organized national programme. Personal invitation letter.	2003	100%	C
Iceland	Organized national programme. Personal invitation letter. Partial contribution to payment	1964	100%	C
Ireland	Organized national pilot programme. Personal invitation letter.	2000	MI	MI
Italy	Organized regional programmes. Personal invitation letter.	1982-92	67%	DC
Latvia	Opportunistic screening (voluntary testing free of charge once a year)	NA	NA	NA
Lithuania	Organized national programme for women covered by the Compulsory Health Insurance Fund	2004	MI	MI
Luxembourg	Opportunistic screening (voluntary testing free of charge once a year).	NA	NA	NA
Malta	Opportunistic screening (testing free-of-charge in the public sector)	NA	NA	NA
Netherlands	Organized national programme. Payment is based on AWBZ (universal social health insurance scheme). Personal invitation letter.	1980	100%	PC
Norway	Organized national programme. Personal invitation letter. Partial contribution to payment	1995	100%	C
Portugal	Organized regional programmes. Personal invitation letter.	1990	51%	DC
Romania	Opportunistic screening paid for by national funds	NA	NA	NA
Slovakia	Opportunistic screening paid for by health insurance companies	NA	NA	NA
Slovenia	Organized national programme. Personal invitation letter. Partial contribution to payment	2003	31%	C
Spain	Organized regional programmes. Personal invitation letter	1986	41%	DC
Sweden	Organized regional programmes. Personal invitation letter. Complete contribution to payment in most counties	1967-73	100%	DC
United Kingdom	Organized national programme. Personal invitation letter.	1960s	100%	PC

* NA = not applicable; MI = missing information

C = centralized; PC = partially centralized; DC = decentralized

Table 3. Characteristics of the studies in group 1 *(Organized screening vs. spontaneous attendance)*

KEY PAPER	TYPE OF INTERVENTION	STUDY DESIGN	GEOGRAPHIC AREA AND PERIOD	SOCIAL INDICATOR	RESULTS BREAST	CERVIX
Zackrisson, 2004	a. Organized programme (personal letter asking for a declaration of interest and subsequent letter with modifiable appointment) b. previous trial (personal letter with information and a preset appointment)	Observational	Sweden 1990-93	education, marital status, income, housing conditions	a. 65% b. 74% (p<0.01)	
Ronco, 1997	Organized programme (personal letter signed by the GP with a preset appointment) vs. spontaneous	Observational (longitudinal cohort study with pre-post evaluation)	Turin 1992-94	education		from 57% to 74%
Adams, 2003	Organized programme (with subsidies for low-income women) vs. spontaneous	Observational longitudinal study	USA 1996-00	income, health insurance, race	from 52.7% to 56.7% in 10 years	from 63.2% to 66.2% in 10 years
Fernandez, 1999	Organized programme (ecologic multistrategy programme involving out-reach components, education and support services such appointment scheduling, paperwork, childcare, transportation) spontaneous	Observational longitudinal cohort study	USA (30 states) 1995-96	race, income, education	a. 87.7% b. from 31 to 66%	a. 62.2% b. 25.9%
Bastani, 2002	a. Organized programme (multicomponent programme, involving health care system, providers, and women) b. spontaneous	Observational longitudinal non-equivalent control study	Los Angeles 1990-96	race	At the Hospital level a. + 10.6% b. + 1.9%. At the Comprehensive Health Centers level a. + 8.6% b. - 6.6%. No effect at Public Health Centers level	

Table 4. Characteristics of the studies in group 2 *(Different strategies of invitation vs. usual care)*

KEY PAPER	TYPE OF INTERVENTION	STUDY DESIGN	GEOGRAPHIC AREA AND PERIOD	SOCIAL INDICATOR	RESULTS BREAST	CERVIX
Atri , 1997	a. training programme to general practice receptionist staff + invitation by phone call or letter signed by GP b. usual care (no training or advice)	RCT by general practice	London, 1995	race	among non-adherent: a. 9% b. 4% OR 2.3 (95% CI, 1.1-5.3)	
Segnan, 1998	a. invitation letter, signed by the GP, prompting women to contact the screening centre and set an appointment b. letter signed by the programme coordinator, with a preset appointment c. personal extended letter (highlighting the benefits of early cancer detection) signed by the GP, with a preset appointment d. usual care (personal letter signed by the GP with a preset appointment)	RCT	Turin, 1993	marital status, birthplace, education	a. 33.9%, RR 0.72 (95%CI: 0.67-0.78) b. 41.5%, RR 0.88 (95% CI, 0.83-0.95) c. 47.7%, RR 1.02 (95% CI, 0.95-1.10) d. 46.9%, RR 1	a. 22.7%, RR 0.63 (95% CI, 0.57-0.69) b. 30.9%, RR 0.85 (95% CI, 0.78-0.93) c. 36.7%, RR 1.02 (95% CI, 0.94-1.10) d. 36.1%, RR 1 Interaction of extended letter and university degree: RR 1.73 (95% CI, 1.01-2.95)
Eaker, 2004	Three-stage programme: a. modified invitation letter vs. standard invitation letter b. reminder letter to non-attenders after a. vs. no reminder letter c. personal phone reminder to non-attenders after b. vs. no phone reminder	RCT	Sweden, 2001	education, marital status, income, birthplace, citizenship		Difference in attendance a. 1.3% (95% CI, -0.3 to 2.9) OR 1.0 (95% CI, 0.9-1.1) b. 9.2% (95% CI, 7.9 to 10.5) OR 2.9 (95% CI, 2.5-3.3) c. 31.4% (95% CI, 26.9 to 35.9) OR 6.9 (95% CI, 5.0-9.4)
Lantz, 1995	a. personal letter signed by GP or programme coordinator + phone call (women without a telephone received a second letter) b. usual care	RCT	Wisconsin, not indicated	income		a. 21.7% b. b. 3.8% OR 6.9 (95% CI, 1.9-25.6)
Simon, 2001	a. physician referral letter+ physician targeted medical record reminder b. direct access letter + physician targeted medical record reminder c. usual care (no letter + physician targeted medical record reminder)	RCT	Detroit, 1992-93	area deprivation	No effect of either letter reminder intervention	
Champion, 2003	a. tailored telephone counselling b. tailored in-person counselling c. non-tailored recommendation letter signed by GP d. tailored telephone counselling + non-tailored physician recommendation letter e. tailored in-person counselling + non-tailored physician recommendation letter f. usual care (general postcard reminder to schedule a mammogram)	RCT	USA, 1996-2000	race, income	a. 40.7%, OR 1.99 (95% CI, 1.16-3.43) b. 50.8%, OR 3.00 (95% CI, 1.78-5.06) c. 39.8%, OR 1.93 (95% CI, 1.14-3.26) d. 49.2%, OR 2.83 (95% CI, 1.68-4.74) e. 55.0%, OR 3.55 (95% CI, 2.11-5.98) f. 25.6%, OR 1.00 (p<0.001)	

Table 5. Characteristics of the studies in group 3 *(Interventions vs. spontaneous attendance in disadvantaged population)*

KEY PAPER	TYPE OF INTERVENTION	STUDY DESIGN	GEOGRAPHIC AREA AND PERIOD	SOCIAL INDICATOR	RESULTS BREAST	RESULTS CERVIX
	IN-REACH STRATEGIES					
Dietrich, 2006	a. series of telephone support calls vs. b. spontaneous (single phone call to answer questions about preventive care)	RCT	New York City, 2001-2004	race, health insurance	a. from 58% to 68% b. from 60% to 58% Difference in the change between groups: 0.12 (95% CI, 0.06-0.19)	a. from 71% to 78% b. from 70% to 70% Difference in the change between groups: 0.07 (95% CI, 0.01-0.12)
Michielutte, 2005	a. Three-stage educational and counselling programme progressively more intensive: a1 provider education with information on issues in mammography for older women, a2 simply written educational mailed to women, a3 brief phone counselling session b. spontaneous Transtheoretical model - Health Belief Model	RCT	North Carolina, 1999-2002	composite indicator (age, education, race, health insurance)	among overdue underserved a. 33%, b. 19.8% 13.2% point difference split: 6.6% point difference in a1, 5.9% points in a2 and less than 1% point in a3	
Schneider, 2001	a. gain-framed multicultural video b. loss-framed multicultural video c. gain-framed targeted (Latinas) video d. loss-framed targeted (Latinas) video	Community trial without a control group	USA, not indicated	race, income, education	Loss-framed messages were best at persuading low-income women to obtain mammograms 6 months after the intervention, particularly among Anglos and Latinas, but only for the multicultural videos. The relative advantage faded by the 12 month follow-up	
Rimer, 1999	a. provider prompting + tailored print communications b. provider prompting + tailored print communications + telephone counselling c. spontaneous (provider prompting intervention) Transtheoretical model	RCT	North Carolina, 1992-96	race		a. 64% b. 52% c. 56% (p=0.05)
Manfredi, 1998	a. Health system directed intervention (chart reminder system + chart sticker + a patient health maintenance card) b. spontaneous (only letter announcing the new emphasis on cancer control with a supply of flow sheets)	Cluster RCT	Chicago, 1992	health insurance	HMO patients: a. from 38.5% to 24.6%, -13.9% difference b. from 29.6% to 28.7%, 1.0% difference Non-HMO patients: a. from 33.8% to 25.9%, -7.9% difference b. from 26.0% to 8.8%, -17.3% difference	HMO patients: a. from 55.7% to 59.7%, 4.0% difference b. from 56.1% to 48.2%, -7.9% difference Non-HMO patients: a. from 40.2% to 33.0%, -7.1% difference b. from 35.2% to 25.2%, -10.0% difference

KEY PAPER	TYPE OF INTERVENTION	STUDY DESIGN	GEOGRAPHIC AREA AND PERIOD	SOCIAL INDICATOR	RESULTS BREAST	CERVIX
Roetzheim, 2004	a. Health system directed intervention (checklist with chart stickers) b. spontaneous	Cluster RCT	Florida, not indicated	health insurance	a. from 71.4% to 67.0% b. from 75.9% to 64.5% OR 1.26 (95% CI, 1.02-1.55)	a. from 61.9% to 47.3% b. from 57.6% to 45.3% OR 0.88 (95% CI, 0.68-1.15)
	OUT-REACH STRATEGIES					
Crane, 1998	a. single outcall b. advance card + single outcall c. spontaneous (health questionnaire only) Transtheoretical model	RCT	Colorado, 1994-97	area deprivation	At 6 months among overdue no effect. At 2 years among adherent: a. 89.4% b. 92.2% c. 85.9% (p<0.01) At 6 months intentions to have a mammogram were significantly stronger in the intervention groups compared with the control group, particularly among those in pre-contemplation	
Crane, 2000	a. multiple outcall b. single outcall c. advance card + single outcall d. spontaneous (health questionnaire only) Transtheoretical model	Quasi-experimental trial	Colorado, 1994-96	area deprivation	among non-adherent: a. 27% b. from previous study: 11-16% (p<0.001) OR 2.58 (95% CI, 1.45-4.60) Women who received multiple outcall intervention had higher stage of change, from pre-contemplation to contemplation	
Jibaja-Weiss, 2003	a. personalized form letter with generic cancer information b. personalized tailored letter with minimally tailored individualized risk factor information based on medical records data c. spontaneous (no letter) Health Belief Model	RCT	Texas, not indicated	race, area deprivation	a. 30.5% b. 13% c. 20.7% (p=0.002)	a. 43.9% b. 23.7% c. 39.9% (p=0.002)
	MEDIA-LED CAMPAIGN					
Jenkins, 1999	a. Community education (media-led information and educational campaign) b. spontaneous Precede-proceed model	Non randomised community trial with pre-post evaluation	California, 1992-96	race, income, education, health insurance	no effect on attendance OR for planning to have a mammogram: 3.0 (95% CI, 1.5-5.9)	no effect on attendance OR for having heard Pap test: 5.0 (95% CI, 3.5-7.2) OR for planning to have a Pap test: 1.9 (95% CI, 1.3-2.7)

KEY PAPER	TYPE OF INTERVENTION	STUDY DESIGN	GEOGRAPHIC AREA AND PERIOD	SOCIAL INDICATOR	RESULTS BREAST	RESULTS CERVIX
	LAY HEALTH WORKERS					
Bird, 1998	a. small-group educational sessions led by trained indigenous lay health workers, educational material distribution and promotional events b. spontaneous Precede-proceed model.	Community trial with pre-post evaluation	California, 1992-96	race		a. from 26% to 45% (p=0.001) b. from 25% to 22% (p=ns) OR 2.4 (95% CI, 1.6-3.6)
Navarro, 1998	a. lay health community workers ("consejeras") trained to conduct educational group sessions) b. spontaneous (consejeras participated in an equally engaging programme) Social Learning Theory	Community trial with pre-post evaluation	California, not indicated	race		Pre-test - post-test changes: a. 23.1% b. 16.2%
Taylor, 2002	a. "high intensity" out-reach intervention with materials + tailored counselling + logistic assistance during home visits b. "low intensity" direct mail c. spontaneous	RCT	North America, 1999-2000	race (only Chinese)		a. 39%, OR 3.5 (95% CI, 1.9-6.6) b. 25%, OR 2.0 (95% CI, 1.1-3.7) c. 15%, OR 1.0 Planning pap testing in next 2 years: a. 72%, b. 59%, c. 48%
Earp, 2002	a. one-to-one conversations led by lay health advisors + informational/motivational material b. spontaneous Transtheoretical model - Health Belief Model - Precede-proceed model	Non randomised community trial with pre-post evaluation	North Carolina, 1993-97	income	Low income: difference between groups in rates variation: 0.11 (95% CI, 0.02 to 0.21). High income: difference between groups in rates variation: -0.06 (95% CI, -0,18 to 0,07)	
	MIXED STRATEGIES					
Paskett, 1999	a. Mixed health clinic in-reach (chart reminders, in-service meetings, patient-directed literature) and community out-reach intervention (educational sessions, literature distribution, community events, media and church programmes) b. spontaneous Health Belief Model - Social learning theory - Precede-proceed model	Community trial with pre-post evaluation	North Carolina, 1992-96	area deprivation		a. from 73% to 87% (p=0.03) b. from 67% to 60% (p=ns) OR 3.8 (95% CI, 1.6-9.2)

KEY PAPER	TYPE OF INTERVENTION	STUDY DESIGN	GEOGRAPHIC AREA AND PERIOD	SOCIAL INDICATOR	RESULTS BREAST	CERVIX
Michielutte, 2000	c. Mixed health clinic in-reach (chart reminders, in-service meetings, patient-directed literature) and community out-reach intervention (educational sessions, literature distribution, community events, media and church programmes) d. spontaneous Health Belief Model - Social learning theory - Precede-proceed model	Interrupted time-series design	North Carolina, 1992-95	area deprivation	40-49 years: early effect (rates increased from 6.2 per 100 visits to 8.8 in the first year), with maintenance but no further increase of effects in the second programme period 50 or older: delayed effect (rates increased only in the second programme period from 7.7 per 100 visits to 10.1%)	
Margolis, 1998	a. lay health advisers offered an appointment with a female nurse practitioner + reminder b. spontaneous	CT with systematic assignment to study arms	Minneapolis, 1992-1995	race, health insurance		among overdue: a. 63% b. 50% (p=0.02) OR 1.64 (95% CI, 1.16-2.34)

Criteria for assessment of effectiveness of policies and interventions to reduce health inequalities

1. Key documents and other sources of information

- Key document
  ……………………………………………………………………………………………………
  ……………………………………………………………………………………………………

- Other documents on the intervention
  ……………………………………………………………………………………………………
  ……………………………………………………………………………………………………
  ……………………………………………………………………………………………………

About the Intervention

2. Intervention method

- What is the general strategy of the intervention?
  ……………………………………………………………………………………………………
  ……………………………………………………………………………………………………
- What are the key elements of the intervention?
  ……………………………………………………………………………………………………
  ……………………………………………………………………………………………………
- Ultimate, health related objective of the intervention
  ……………………………………………………………………………………………………
  ……………………………………………………………………………………………………
- The target population, place and period of the intervention
  ……………………………………………………………………………………………………
  ……………………………………………………………………………………………………
- The intervention products (e.g. information, personal advise and care…)
  ……………………………………………………………………………………………………
  ……………………………………………………………………………………………………

3. Theoretical foundations of the intervention

- Has the target of the intervention be chosen in accordance with existing knowledge about how these particular health inequalities are generated?

yes	no

- Have state-of-the-art intervention methods been chosen, which have (perhaps in other contexts) been shown to be at least potentially effective?

yes	no

About the evaluation study

4. Internal validity of effect estimates

"Internal validity" is defined as "absence of bias in measuring effect". An assessment of internal validity therefore requires a careful evaluation of possible sources of bias which may have affected the measure of effectiveness reported by the investigators. We propose to base this assessment on a series of criteria which are scored on a scale from 1 to 5, and then summarized in a final score for each evaluation study (e.g. from 'very poor' to 'very good').

Ex.

1 very poor	2	3	4	5 very good

- What is the general design of the study?
  ………
  ……………………………………………………………………………………

- Appropriateness of the study design (e.g. experimental, quasi-experimental, observational) i.e. *is the design sufficiently strong for the evaluation of the effectiveness of the intervention?*
  ………
  ………
- Quality of study execution

  Recruitment of representative subjects *(selection bias)*
  ……………………………………………………………………………………………………
  ……………………………………………………………………………

  Quality of data collection *(information bias)*
  ……………………………………………………………………………………………………
  ……………………………………………………………………………

  Control for relevant confounders in the analysis *(confounding)*
  ……………………………………………………………………………………………………
  ……………………………………………………………………………

  Are there other problems with the evaluation study that could have affected the internal validity of the results (tick and explain below)

  O implementation of the study is poor
  O statistical analysis is poor
  Ostatistical power is low
  O reporting is incomplete
  O other

  ……………………………………………………………………………………………………

Internal validity's final score

1	2	3	4	5

5. Potential for reducing health inequalities

- What is the estimated effect of the intervention or policy on the specific health inequalities targeted by the intervention or policy? e.*g. what are the outcome measures (including control groups) to be used to assess the effectiveness of the intervention?*
  ………
  ………
  ………
- To what extent will 'total' health inequalities (e.g. differences in health expectancy between socioeconomic groups) be reduced when the intervention or policy is fully implemented?

  Effectiveness of the intervention among lower SES groups
  ……………………………………………………………………………………………………
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  Effectiveness of the intervention among high SES groups
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  The intervention is at least as effective among lower as among higher SES groups?
  ……………………………………………………………………………………………………
  …………………………………………………………………………………………

Chapter 30

The effects of health care reforms on health inequalities: a review and analysis of the European evidence base

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Abstract

Background

Across Europe, studies show that poor health is often related to disadvantaged socio-economic conditions and that it also increases the probability of falling into poverty. The majority of socio-economic health inequalities are socially determined. Health care is widely considered as an important social determinant of health. However, within the context of the developed welfare states of Western Europe, in which health care services are mostly universalistic and egalitarian, it is not fully understood what role (if any) health care policies and interventions play in determining health inequalities, and generally, the proportion of health inequalities explained by inadequate care has been evaluated as low. However, in recent years, the health care systems of Western Europe have experienced significant reforms in the face of the pressures of economic globalisation. Similarly, in Eastern Europe rapid health care reforms have been undertaken in response to the demands of the new market economy. These changes suggest that the importance of health care as a determinant of health inequality may be of increasing importance across all of Europe.

Objectives

This paper has three objectives: firstly to build a theoretical framework that identifies both the mechanisms through which health care may affect health inequalities, whilst also highlighting the entry points through which the main policies that are on the health care services reform agenda around Europe may interfere with such mechanisms. Secondly, the paper uses the theoretical framework to inform a review of recent primary research and reviews on health care policies and their impact on health inequalities. Finally, the paper will assess the evidence available from the literature about the impact on health inequalities of the related policies, helping both to identify recommendations for the policies, where the evidence is adequate, and to suggest priorities for research where the evidence is lacking.

Methods

A narrative review of the effects on health inequalities (health status, access to services, or income distribution) of European health care reforms was conducted. Following the theoretical framework, particular reference was paid to interventions in the fields of financing and pooling, allocation, purchasing, and provision of services. Studies of the macro-economic and political context were also included. Medline, CINAHL, Embase, Econlit, PsychInfo, as well as grey literature sources were searched. We selected all studies in English, Italian, French, and Spanish, published since 1990. All study designs that contained a formal observation related to a clearly identifiable intervention/ decision were included.

Results

27 studies were found. The majority (21) were from Western Europe and the outcomes most often examined were access to services or income distribution. Three of the located studies were interrupted time series, five were international

comparisons, and the remaining nineteen studies utilized a case-study design. The five macro level studies focused on decentralisation and political commitment and suggest a strong role of both politics and policy on inequalities in health and in access to care. In terms of financing and pooling we located eleven studies which in general show that universal coverage is able to reduce the impact of ill health on income distribution and that multiple coverage (private and public insurance) can increase inequalities in access to care. The eleven studies of service provision (of which 6 were from Eastern Europe) implied that if some services are not regularly provided by the national health system, the out of pocket mode of payment imposed on citizens increases inequalities in access to care and impoverishment. In terms of allocation and purchasing interventions, only one study was found for each.

Discussion

The results of the review give some support to the hypotheses identified by the theoretical framework. It is possible to follow the economic and organizational flow of events in a health system, emphasizing its equity related aspects and functioning, and to pay attention to the more appropriate entry points for policy interventions. However, overall the quality of research located by the review was poor confirming that there is a clear need to develop an appropriate impact assessment methodology, provide scientific support to the countries of Eastern Europe, and facilitate better interaction amongst European scientific communities and between scientists and policy makers at all decisional levels, if we are to be better able to ascertain, and thereby mitigate, the effects of health care reforms in European countries on inequalities in health.

Introduction

Health is considered an intrinsic human right independent of socio-economic status, gender, nationality and ethnic origin. However, many descriptive studies across Europe show that poor health is often related to disadvantaged socio-economic conditions and that it also increases the probability of falling into poverty. The majority of socio-economic health inequalities are socially determined (1). In the well-known Dahlgren and Whitehead 'rainbow' model of the social determinants of health, health care is identified alongside housing, income and so forth, as an important social determinant (2). However, within the context of the developed welfare states of Western Europe, in which health care services are mostly universalistic and egalitarian, it is not fully understood what role (if any) health care policies and interventions play in determining health inequalities, and generally, the proportion of health inequalities explained by inadequate care has been evaluated as low (3).

However in spite of the fact that population health indicators have incredibly improved in the last few decades across Western Europe, in part because of improvements in the effectiveness of health care, the direction and the size of socio-economic health inequalities, particularly mortality, remained unchanged. This suggests that the benefits of improvements in health care (and other social determinants of health) may not have been distributed evenly across the population and that therefore, they have not been able to redistribute the burden of mortality.

The political and economic evolution of the European continent has been dramatic since the end of the Cold War. Since 1989, the Eastern European countries have experienced extensive political, social and economic upheaval. The welfare and health care systems have also been rapidly reformed in order to adapt to the new liberal economic system. Moreover in the same period, all over Europe, welfare states have faced the difficult challenge of reforming their health care systems in the face of the pressures of economic globalisation whilst still trying to balance increasing demand with declining budget. These changes suggest that the importance of health care as a determinant of health inequality may be of increasing importance across all of Europe.

Concerns about the new global macroeconomic order is forcing European health care systems to reform and change, but the traditional attention paid in Europe to human rights means that it is still considered to be extremely important that such reforms are implemented without decreasing equity. It is therefore the duty of public health researchers to pursue knowledge about effective interventions to inform decision making so as to avoid worsening inequalities in health. Even if, very often, the direction of reform depends on the amount of public resources available and not on population health needs or income distribution, most of these reforms remain firmly within the parameters of a universalistic and egalitarian health care system. Newly introduced policies tend to change the way in which the system is financed and services are provided. It is therefore particularly important to ascertain which of the main elements of health care systems need to be safe-guarded during the implantation of reforms if equity is to be ensured.

Therefore, as part of the EU wide EUROTHINE project on inequalities in health (http://mgzlx4.erasmusmc.nl/eurothine/), the purpose of this paper is firstly to build a theoretical framework that identifies both the mechanisms through which health care may affect health inequalities, whilst also highlighting the entry points through which the main policies that are on the health care services reform agenda around Europe may interfere with such mechanisms. Secondly, the paper will use the theoretical framework to inform a review of recent primary research and reviews on health care policies and their impact on health inequalities. This will build upon previous evidence reviews, which are mainly focused on equity oriented processes of care (4, 5). Finally for each mechanism and entry point of the framework, the paper will assess the evidence available from the literature about the impact on health inequalities of the related policies, helping both to identify recommendations for the policies, where the evidence is adequate, and to suggest priorities for research where the evidence is lacking.

The theoretical framework

To fulfil the first objective of this study, we developed a conceptual framework which represents the potential pathways and the related interventions through which health care may contribute to socio-economic health inequalities (Figure 1); each step of the pathway is accompanied by the key questions that should be asked in order to understand how inequalities in health care are generated.

In fact the supply and demand of health care may create socio-economic inequalities in access to, or in outcomes of, effective and appropriate health care. It may also push individuals and families into poverty. The framework describes the main mechanisms through which the supply side of health care may influence socio-economic inequalities in health care utilization and outcomes.

The first two inner rings describe how inequalities in health outcomes are influenced by inequalities in access to prevention/diagnosis/treatment. The third ring identifies the factors in health care that may affect utilization: accessibility, affordability and quality/acceptability. The forth ring describes the features of a health care system that may modify its' accessibility, affordability and quality. The fifth ring selects four main areas of interventions that can push the health care system to avoid or to buffer inequalities in the previous causal chain. The sixth ring finally takes into account that this pathway takes place in a context where the prevailing welfare regime of a country, and its eventual variations in the decentralization at the regional level, may influence how the health care system is designed and managed.

In the framework, factors that shape the propensity of the health care system to affect socio-economic inequalities concern the funding of the system (creating barriers to health care or facilitating impoverishment); strategies of regulation of the offer through allocation of resources (if not related to needs); the ways demand for care is controlled and managed if not sensitive to needs; and the appropriateness and continuity of care provided by the organization and the professionals.

Each of these mechanisms that may generate inequalities in health care is a potential entry point for a policy or intervention to tackle such inequalities. In terms of funding, a more progressive system may facilitate redistribution of resources and remove barriers to health care. In regulation of the offer, a socially selective allocation formula may address the investment and allocation of money, technologies, facilities, and professionals where the need is greatest. Similarly, positive discrimination to the advantage of the poor in how demand is regulated may limit the socially unequal impact of waiting lists and co-payments. Finally, the provision of health care could be managed in a way that makes it more explicitly equity-oriented in each process of health care, both through problem finding (equity audit of appropriateness and continuity of care), and problem solving (pro-active approaches which take the initiative with groups likely to have the most health need, rather than merely waiting for and responding to demand). Adopting these four strategies should make a health care system more accessible, more affordable, of higher quality in each phase of the process of care (prevention, identification of need and diagnosis, treatment and quality of care) and finally, should lead to more equality of outcomes both in terms of intermediate outcomes of utilization as well as longer term health outcomes.

This review assesses the ability of these kinds of policies to tackle socio-economic inequalities in access to, and outcomes of, health care.

Methods

Inclusion criteria

In this narrative review, studies have been included only if they are relevant to framework presented in figure 1: “policies and interventions which tackle inequalities in health care on the supply side” namely “positive discrimination in funding, allocating, rationing and processing care” interventions; and only if they have been implemented in the geographical borders of Europe (both in EU or non EU countries). We also included international comparative studies as long as they included at least one European country.

Studies which examined the impact of macro-level economic and political contexts and upstream interventions on health care provision and inequalities were also included. In terms of study design, we searched for all studies that included a formal observation related to a clearly identifiable intervention/ decision**.** We included both previous reviews as well as primary studies. In the literature search we considered an “intervention” as any act of planning within the health care system, classified according to the factors shaping the health care system 1) Financing and pooling, 2) Allocation, 3) Purchasing, 4) Provision of services (6). As far as the interventions of positive discrimination in processes of care were concerned, we limited our searches to the health care processes that are more sensitive to health inequalities through pro-active approaches, like “Hypertension” (not “cardiovascular”), “Primary Care”, “Mental Health”, “Immunization”, “Diabetes”, and cancer screening. We were only interested in those studies which measured equity in terms of: 1) Health status, 2) Access to services, or 3) Income distribution.

Search strategy

The combination of the intervention terms together with equity and health care terms provided the keywords for the search. The most frequently used keywords have been adopted following this Boolean combination: (Health OR health services OR health care OR health system) AND (Equity OR socioeconomic factors) AND (Funding OR financing OR progressivity OR regressivity OR Kakwani OR Pooling OR insurance OR provision Or supply).

The following electronic databases were searched: Medline, CINAHL, Embase, Econlit, PsychInfo. We selected all studies in English, Italian, French, and Spanish, since 1990. In addition, we searched the internet for grey literature. However, no hand searching was performed.

Critical appraisal

Although, studies on the health situation and access to health care services of any socio-economic strata were included, those studies which provided stratified analyses and comparisons of stratum were treated as being of higher quality. No other criteria of exclusion were adopted.

Results

Description of studies

In terms of funding and regulation of offer and demand, we found 27 primary studies. Eleven other studies were excluded because the intervention was not clearly identifiable. We excluded a further five non-empirical policy analyses. Three of the located studies were interrupted time series, five were international comparisons, and the remaining nineteen studies utilized a case-study design (table 1). The majority of the studies were from Western Europe (21), with only a few from the East (6).

In terms of specific processes of care (the way provision of service is rendered) we found five studies about hypertension, one recent review about primary care, 17 studies about mental health, 15 studies about Immunization and 13 studies and one review about Diabetes, and 28 studies and two reviews about cancer screening [*Spadea T in Eurothine*] that could not be covered in just one review, due to the specificity of each process of care and of its determinants of inequalities in health care. So this paper will not provide a literature review on the intervention of positive discrimination in processes of care.

Synthesis

Due to the heterogeneity of data within the studies, meta-analysis and full data extraction was not deemed appropriate. For the same reason we were unable to adopt any instrument to rank the internal and external validity of the studies. The variety of the European health systems requires a specific activity to evaluate the external validity of each research, which lies outside of the aims of this review. The review has therefore identified the design of the studies and classified them according to Campbell (7). The same criterion was adopted by Stronks (8) in a review in which they divided studies into observational, quasi-experimental, and experimental. A narrative synthesis was conducted with the studies described according to the area of policy/intervention of the framework to which they relate starting with macro-level studies which examine the impact of the social and political context. The characteristics of the studies are outlined in Table 1.

The social and political context

The review located four studies which provided information about two main aspects of the context: the role of the political ideology and commitment, and the impact of decentralization.

An analysis about the role played by political ideologies in Europe in the period of full development of capitalism (1945-1980) on the social distribution of benefits in health care and health is provided by Navarro et al (9). The results of this study indicate that political traditions more committed to redistributive policies were generally more successful in improving health of population (infant mortality) having the highest coverage (total public medical care over population), the highest public health expenditure, and the lowest poverty rates. No information was available on the impact of political traditions on health inequalities.

The devolution of power, and other political options which shape the distribution and exercise of power (among central government and regions, between parliaments and governments, between politics and bureaucracy), within a country potentially produces heterogeneity in welfare and health care provision. The study of Costa-I Font (10) analysed the situation in Spain after the decentralization of the National Health Service which started in 1981 and was completed in 2002. According to his results, devolution in health care doesn’t seem to lead to inter-regional inequalities in health. However, in regions where the private sector plays a dominant role, higher social inequalities in health care can be identified. Interestingly, the health concentration index, following the procedure used by Kakwani et al (11), reveals that Catalonia, followed by the INSALUD (the centralized network of health services) regions, exhibits a mean concentration index that is above some other Spanish regions (such as Navarre, Andalusia and the Basque Country) where the primary care reform (which integrated primary care services into the public network from the end of the 1980s) was rapidly applied and the role of the private sector is significantly lower (than in the still under INSALUD administration in 1997 and in Catalonia) and the devolution includes fiscal accountability and higher expenditure (Navarre and Basque Country).

The findings of Lopez-Casasnovas (12) support the view that Spain has decentralized the health system without significantly weakening social cohesion, at least if considering inter-regional inequalities. Studies estimating intra-regional disparities are still scarce even if geographic patterns of mortality highlight some spatial distribution of mortality linked to the variation in social and environmental features. Health interview surveys from 1987 to 1997 show an increasing social equality in utilization of health care.

The Finnish reforms described by the review of Hakkinen (13) have increased the autonomy of municipalities. Now the Finnish health system is the most decentralized in the world. The State and the 432 municipalities impose different taxes and allocate the money to the National Health Insurance fund (state) and to the services (municipalities). This two tier financing system gives rise to an increase in health care expenses for households (the share paid by the household increases from 13 to 20%) and as a result, the Finnish health care system has become slightly more regressive. The increase in user charges to patients and raised unemployment levels could also have increased inequalities in access to care: the degree of inequity for visits to a doctor shows that about 3-4% of the total number of visits need to be redistributed from the richer part of the population to the poorer one in order to achieve equity (outpatient visits to health centres still follow a pro-poor distribution, public specialists' visits are in line with need as between income groups, while private doctors' services and occupational care were concentrated among high income group).

Taken together, these three studies suggest that decentralization challenges equity in health care and that it may provide an opportunity to study in more depth the impact of welfare systems on inequalities in health care through regional comparisons. At this stage, the comparative studies at national level do not provide definitive evidence.

Funding system

In comparison to other types of intervention, in this field the research on equity is quite extensive. Our searches located eleven studies. Here, we consider only those interventions which affect those aspects of health care financing which is prepaid by the population (individuals and corporate units).

In 1997, Wagstaff analysed the financing arrangements of the Dutch Health System (direct and indirect taxes, social insurance, private insurance and direct payments) (14). Progressivity, re-ranking and horizontal equity were considered as financial outcomes. The study showed that the Dutch health care financing system was at that time regressive. This was mainly due to the duality of insurance payments (income related payments for the lower half of the income distribution and non-income related premiums for the higher income groups).

The health system of Netherlands has also been described by Mackenbach (15). He paid special attention to equality in access to care and his study confirmed that a regressive financing system results in a situation of unfairness. In the Dutch system, the more vulnerable people are those who are on a lower income and are chronically sick; mainly due to out-of-pocket payments, the more severe the chronic disease, the greater the financial disadvantage.

The international comparative study by Wagstaff (16) analyses the financial arrangements of some European Health Systems and their impact on income redistribution. He concluded that direct taxes are a progressive means of raising revenue, though local income tax can reduce the progressivity of the system (e.g. in the Scandinavian countries). Indirect taxes are regressive as is social insurance in some countries (when the high earners are not involved or not completely). Private insurance is regressive where it is relied upon by the bulk of the population. Out of pocket payments are a highly regressive means of revenue.

According to the findings of van Doorslaer (17), public finance sources on health care tend to have small positive redistributive effects and result in less differential treatment, while private financing sources generally have larger negative redistributive effects.

The international survey by Schoen (18) of five Commonwealth countries (UK, USA, Australia, Canada, New Zealand) measures various health care outcomes: access difficulties, waiting times, cost related access problems, ratings of physicians and quality of care. The study demonstrates that some health systems, the ones based on public financing through taxes, are better able to minimize financial barriers to access and quality of care among low income adults. The only European country included in the analysis, the UK, showed the best situation in terms of equality in access to care. Disparities in USA by income were much more pronounced than in any other country. Australia, Canada and New Zealand were between these two extremes in terms of both income related access differences and the extent to which having private supplemental insurance is associated with more positive access experiences.

The situation in France was described by Bellanger (19). This study reported on the statement of the “Haute Comité de la Santé Publique”. The authors acknowledge that the topic of health inequality has been less documented in France than in other countries, in part due to the greater importance attached to the health system’s performance as a way of gaining egalitarianism. In spite of this health care focus, between 1980 and 2003 the public share in health care spending decreased from 79.4% to 75.5% and, concomitantly, the role of complementary private health insurance has increased to 12.3% and the contribution of user’s charges to 10.9% (a proportion which is much higher than in most other European countries). The study suggested that there is now evidence that social and spatial inequalities in health are relatively more pronounced in terms of prevention than in access to care. Some indicators of equity have worsened, especially in the field of perinatal health and HIV infection.

A big interest is shown by countries other than those of European origin. In fact health care reform is the subject of debate in Japan mainly due to the ageing of its population. The experience and the economic methods of evaluation utilized in Europe have been adopted in an unpublished study (20). It compares Germany, the UK, and the USA with Japan. The outcomes considered in its analysis are the expenditure ratio (medical related expenditure/ pre-tax income) and the Kakwani Index. The author classified the countries analyzed into three groups: those with high expenditure ratio and high Kakwani index (e.g. Germany), those with high expenditure ratio and low Kakwani index (e.g. United States), those with low expenditure ratio and high Kakwani index (e.g. United Kingdom), and countries like Japan with a low expenditure ratio and a low Kakwani index. Countries with compulsory universal insurance system have low expenditure ratios (e.g. UK). Germany has a high expenditure ratio because high income earners are allowed to opt out of public health insurance. Here, as in the UK where middle to high income groups can take out private medical insurance that allow them to receive services outside the National Health Service (NHS), private medical insurance is a luxury good and insurance premium expenditures are progressive (i.e. the Kakwani index is positive).

In the paper by Lopez and Casasnovas (12), about the progressivity of the funding system of Spain, around a quarter of total financing refers to indirect taxation (regressive) and the remaining financed through direct taxes. The combination of both sources shows that the financing system has become less progressive.

The study of Oliveira (21) analyses the content and the impact of policies designed to reform the Portuguese health system between 1979 and 2002. It shows that the trend of health is improved but the reform didn't affect equity and access and an increased expenditure is put in evidence. There are still inequalities in urban/rural coverage and high/low income. The allowance of multiple coverage (public and private), has created a two tiered structure and implies inequalities in access and outcomes.

In Greece, the 1983 reform aimed to increase equity in financing through the expansion of the role of the public sector. However, the rigid application of certain measures, the failure to design and implement measures which directly sought to change health care financing mechanisms, as well as growing dissatisfaction with public services, have all combined to increase the private share of health care financing (22). The greatest portion of this increase involved out of pocket payments, which are the most regressive form of financing. The growing share of private insurance financing has also contributed to reducing equity. Low income families seem to devote a larger share of their total expenditure to health than do middle or high income families. Private payments were considered to be an increasingly inequitable form of financing, hitting low income families especially hard in 1993/1994, probably because of the considerable burden of co-payments in pharmaceutical care.

We found only one study which examined pooling. Pooling refers to the accumulation of prepaid health care revenues on behalf of a population. In France, a study by Buchmueller (23) described the findings of a national survey. It investigated the role of supplemental insurance on economic efficiency and equity. Supplemental insurance, which is very common in France but unequally distributed, can increase demand for health care and it can reduce the ability of cost sharing to control utilization. In fact there is a statistically significant difference between French adults with and without supplementary insurance in the probability of seeing a physician in a one-month period. The study data preclude the analyses between access to general practitioner and to specialist care. Findings of this study are strong enough to conclude that, because the public system covers the majority of the cost of outpatient care, the moral hazard effect of private insurance leads to higher public expenditures for medical care in general and in favour of higher income groups.

Allocation / socially selective allocation

Allocation of funding means the transfer of money from one level to the next. In an attempt to improve equity in the distribution of public funds several countries changed the basis for determining the size of their budgets so that resource flow more closely reflects population needs rather than historical patterns of utilization or infrastructure development. The evidence base in this area is very small. Our search identified only one study by O'Laughlin (24). It examined whether the Irish allocation method in which historical expenses are considered as the basis for calculation, is unfair in terms of equity. The study surveyed expert opinion (by means of Delphy method). Panellists provided several reasons why the current method of resource allocation in Ireland is inequitable. The main suggestion centred around the development of a needs based resource allocation formula. Potential obstacles identified included methodological difficulties, insufficient resources and resistance from potential losers. We found no other studies which looked at the impact on inequalities in health care of different rules of allocation of funds, manpower, facilities and technologies.

Purchasing / socially selective rationing

The terms "purchasing" and "provider payment" refer to contracting rules which can generate financial incentives for service providers to behave in certain ways (for instance, increasing or decreasing waiting lists). Again there are few studies of this type of reform. We found only one Norwegian study which examined the type of contract in place between public insurance and private services. The study, by Iversen (25), found that after reforms to the rules governing the public purchase of private services, accessibility and socio-economic variables played a more considerable role in determining the probability and number of visits to a private specialist (paid by out of pocket modality or by private insurance). For example, the study found that having a university degree increased the probability of at least one private visit by 11 percentage points. The study also found that household income had a positive impact on the use of private specialists, although not on the use of hospital services. However, a link was found between the ratio of public general practitioners per resident and the probability of the use of private services: the better the ratio, the lower the probability of a visit and the number private visits. This was not the case for hospital outpatient department visits though.

Provision of services / socially selective rationing

The provision of services needs to be analysed by taking into consideration the market structure (whether provision is on a competitive or a monopolistic basis), the autonomy of managers, and the geographical distribution of services. In this sub-set of interventions, we also consider the mechanism of implicit or explicit rationing of the supply of services operationalized by varying the amount of direct payment requests to patients when accessing services (e.g. out of pocket, formal and informal co-payments). These forms of cost sharing are a source of funding health care but, following the criterion of Kutzin (that includes in the funding function prepaid and pooled resources only), we analyzed the literature available mainly as a way of controlling the demand and rationing the provision of services.

Six of the eleven included papers in this area were from Eastern European countries. They focus mainly on the impact of out of pocket payments (formal and informal). A study by Voncina (26) describes developments in the Croatian health care financing system from 1999 to 2002. It suggests an overly strong bias to private spending and an increase in its proportion of health care expenditure. Using data from 2003, the study found that retired people spent, on average, substantially more on services than workers and farmers, disability pension recipients spent about the same as active contributors and workers, whilst the unemployed spent by far the least amount (yearly expenditure per insured person by the Croatian Institute for Health Insurance). This might indicate a certain degree of regressivity in the contribution of health care services.

The inequity of the Croatian system is also suggested in a study by Mastilica (27) which shows that the new legislation on delivering and financing of health care services in Croatia adopted in 1993 increased the out of pocket payments for private care and co-payments for public care services. The study shows that distribution of out of pocket payments in Croatia is highly regressive, with a greater burden falling on lower income people: lower income groups were significantly more likely to report having out of pocket expenses for drugs, private medical care, private dentist, and for traditional drugs. They were also significantly more likely to report incurring expenses for gifts and gratuities for health care providers. This group was also more likely to receive a reduction in salary because of sickness absence.

In Hungary the informal payment system operates within the national health care service. A study by Szende (28) found that the Kakwani progressivity index for Hungary has a negative value for all informal payments indicating that is a highly regressive feature of the system. The index was similar for the access to general practitioners, outpatient and inpatient care, so that individuals with a lower income paid proportionally more in informal payments at all levels of public health care. Some evidence was found that price discrimination may occur across age groups, favouring the elderly, who typically belong to the middle rather than the lower income groups.

In Bulgaria, Delcheva et al (29) measured informal payments and the willingness of people to pay: they found a popular willingness to pay that could be converted into formal co-payments. What was interesting to note in this study was that people who tended to be advantaged by a situation of inequity due to the high impact of informal payments in Eastern Europe, that’s to say older people, as well as those on lower incomes and sick people, are those least likely to want to change the system: in the whole population, 65% stated that they were in favour of the introduction of official user fees for health service; this view was significantly less common among those over 65, among those with low household incomes and among those describing their health as poor or bad.

In Estonia, Habicht (30) analysed the trend in out-of-pocket expenditure, the distribution of out-of-pocket payments across income groups and the household financial burden of out-of-pocket payments after the social health insurance system was introduced in 1991. From 1995 to 2002, households spending more than 20% of their budget on health care increased from 3.4% to 7.4%; the lower the income the more frequently households spent more than 20%. Over the same period, more households were pushed under the poverty line after paying for health services. In 1995, 1% of the population fell below the poverty line as a result of health care payments, this increased to 1.3% and 1.4% by 2001 and 2002 respectively. The population most at risk was low income elderly patients as they spent high amounts of money on medicines.

Studying the provision of drugs in different administrative areas of Bosnia-Herzegovina, Petrova (31) found inequality in regulation, pricing, manufacturing, accessibility and availability of drugs between the two areas analyzed (Federation of Bosnia Herzegovina and Republika Srpska). The author suggested that this inequality could be due to how licenses are issued to private pharmacies despite the fact that there the country is experiencing a lack of pharmacists and subsequently, a lower amount of correct information disseminated to patients about the correct use of drugs. In addition, government coverage of drug expenditures per capita is different in the two areas, increasing geographic inequity in the country.

Keskimaki (32) studied the impact of health system reforms and of the contemporary economic recession (which slashed over 10% of GDP and resulted in a 12% decrease in national health expenditure) on socio-economic equity in the use of general hospital care in Finland from the late 1980s and the mid 1990s. Analysing the provision of services per income stratum, the study found that the tendency in the late 1980s for high income groups to receive more surgical care than the worse-off with poorer health status seemed to have become more systematic and pronounced after the reforms, despite the considerable increase in the supply of surgical procedures. The author suggested that some of the socio-economic discrepancies in access to surgical care could be due to certain features of the Finnish health care system, namely the high profile of the private sector in specialized ambulatory care and in the supply of some elective procedures.

The experience of market oriented health care reform in Sweden was studied by Burstrom (33). This study analysed the change of funding (increased user fees), and jurisdiction and provision of care (cuts in numbers of hospital beds, shorter hospital stays). The absolute and relatives measures of distribution of utilization of health care across income groups showed slight differences over time. The access to emergency care was higher in lower income groups in 1996/97 compared to 1988/89. Furthermore, for the indicator “having need but not sought medical care” in the last three months, the analysis also showed a change over time: in 1996/7 persons in the lowest income quintiles reported to a greater extent than in 1988/89 that they had needed but not sought medical care in the last three months.

An unpublished study by Donia (34) found that an increase in the amount of co-payments and out of pocket payments for private services in Italy during the 2000s, lead to the impoverishment of 1.3% of Italian households. This study also identified that this trend was likely to increase in the future. The impact on income distribution was caused mainly by pharmaceutical expenses, as well as specialist and dental care.

We found two other studies which reported the experience of a SWOT analysis (strengths, weakness, opportunities and threats) of the Danish health systems (35, 36). They concluded that all steps in financing and planning of health care showed a good level of equity although there were some concerns about the provision of hospital services because of waiting lists and the quality of relationships between patients and providers.

Discussion

The theoretical framework presented in this paper is intended to clarify the pathways of organization and financing arrangements followed by the European health systems while supplying services to people, and the impact of these arrangements on equity in health care. The proposed framework tries to connect previous efforts that have been done in this sense on the epidemiologic and public health side: by the Donabedian (37) triangle which evaluated the components of health care (structure, process and outcome) and the wider version recently proposed by De Maeseneer (38); by the World Health Organization in 2000 with its report dedicated to health systems (39); and on the economic side, by Kutzin (6), disaggregating the components of health care in financing sources, resource allocation mechanisms and associated organizational and institutional arrangements.

Our framework is particularly designed to emphasize the equity related aspects of health systems and functioning, and to pay attention to the more appropriate entry points for policy interventions. The framework makes the hypothesis that, in order to tackle health inequalities generating in the context of health care systems in Europe, the systems should introduce positive discrimination in favour of the more disadvantaged in four main areas: funding health care, allocating resources, controlling demand, processing care. All these interventions may be influenced by the political and welfare context. The review gives some support to the hypotheses identified by the theoretical framework.

At the political level, the review highlights the potential risks of decentralization processes. Some political and institutional reforms happened at the end of the 20th century and the beginning of the 21st, in which the devolution was thought of as a way to shorten the distance between citizens and policy makers: when decentralization is not limited by national warrants to save equity the risk of increasing inequalities among citizen should be considered. Recently this topic has gained the attention of the WHO (40).

As far as policies concerning the design, organization and management of health care, most of the studies included in this review deal with aspects of funding. They tend to identify the characteristics of the financing models that produce or reduce inequalities in income distribution and access to care even if it is difficult to correlate these exactly with effects on the equity of health outcomes. The funding studies show that universal coverage is able to reduce the impact of ill health on income distribution and that multiple coverage (private and public insurance) can increase inequalities in access to care.

The studies of service provision show that if some services are not regularly provided by the national health system (e.g dental care and some pharmaceuticals) the out of pocket mode of payment imposed on citizens increases inequalities in access to care and contributes to impoverishment.

Our review has revealed that studies which focus on the allocation of resources and control of demand are very scarce. Those that we did find were not substantive enough to be informative in policy development. Further research needs to be carried out in these areas before we can determine the appropriateness of the theoretical framework or the full implications for health inequalities of such interventions.

As for interventions that aim to introduce equity audit in any specific process of care or to replace or integrate opportunistic approaches with pro-active approaches to reach the “hard-to-reach” (screening, active follow up etc), the review has been interrupted, because it is impossible to evaluate such interventions out of the specific literature of the disease that the process of care is addressed to. So, it has been concluded that a review specific for any disease with the higher attributable risk to social inequalities was needed, and, in the context of the Eurothine project, a review on the effectiveness of interventions to tackle inequalities in access to female cancer screening has been done.

Research implications

In general the existing knowledge in this field seems fragmentary and often lacking in scientific validity. This confirms the diagram of De Maeseneer (38), showing the progressive reduction of quality and quantity when passing from the medical evidence, through the contextual evidence, to the policy evidence. In fact many studies describe health systems in a generic manner choosing indicators of effect which are non specific and not directly related to the interventions analysed, and at the best focused on the utilization of health care, disregarding the impact on health outcomes. Health equity impact assessment of policies is scanty. We found equity oriented planning acts of governments and local authorities but seldom were they evaluated by a suitable research design. In fact, only three studies among those included in this review, provide analysis of historical trends (interrupted time series).

Lack of research could also be explained by a strong publication bias, which is likely to be stronger in this field of research than in others: often economic and organizational arrangements are considered a local matter of interest and studies are published in national scientific journals, in languages other than English, or even not indexed by international databases.

Considering the quality of the research available we had to “force” each study into the Campbell classification system and to form opinions about their internal validity. This lack of methodological rigour is perhaps not that surprising though considering the barriers faced by those trying to conduct research into the effects of political and economic decisions. Moreover the research is particularly poor in those countries where the political interest is low and very often the difficulty in designing a more appropriate impact evaluation study seems related to a poor interaction with decision makers. Proper strategies and methods to exchange knowledge and experience between policy arena and academia should be considered a must.

Furthermore, as highlighted by Judge et al. (41), the quality of research in this field is poor and the impact on health equity evaluation using experimental, quasi-experimental or even natural experiments is still uncommon. Moreover few countries have been studied and very few have been studied properly and in a comprehensive way. For example, there is little research about health equity in the former Eastern bloc countries. We found no comparisons between them and Western countries (though it is possible that hand searching techniques may increase the likelihood of finding such studies). Similarly, the impact of being part of the European Union on health equity hasn't yet been investigated and mostly unknown is the situation of the health system of the satellite countries of the former Eastern bloc countries. For example, the only studies from Eastern Europe identified in this review related to out of pocket payments. The findings of this review will be useful considering the importance of the introduction of the market in these countries, and the correspondingly high risk of inequalities in access to health care and in health status. All these elements confirm the need to develop an appropriate impact assessment methodology, the importance of providing scientific support to the countries of Eastern Europe, and of facilitating a better interaction amongst European scientific communities and between scientists and policy makers at all decisional levels, if we are to be better able to ascertain, and thereby mitigate, the effects of health care reforms in European countries on inequalities in health.

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Studies	Design (X)	Intervention (O)	outcome
Bellanger MM	XO	Funding arrangements	1. Inequalities in access to prevention services 2. Inequalities in health outcomes
Buchmueller TC 2004	XO	Pooling arrangements	Access to care
Burstrom B 2002	OOXOO	Provision (direct payments)	Access to care
Costa I Font 2005	XO	Political configuration (decentralization)	Inequalities in self perceived health in different areas
Delcheva 1997	XO	Provision (direct payments)	Willingness to pay per income stratum
Donia Soflo 2006	XO	Provision (direct payments)	financial burden of health expenditures
Van Doorslaer 1999*	X_1O X_2O X_nO	Financing arrangements	Income distribution (progressivity, horizontal inequity and reranking)
Habicht 2006	XOOO	Provision (direct payments)	financial burden of health expenditures
Hakkinen 2005	OOXOO	Political configuration (decentralization)	Structural changes, user charges, inequalities in mortality
Hisao Endo 2001	X_1O X_2O X_nO	Financing arrangements	1) expenditure ratio (medical related expenditure / pretax income) 2) kakwani index (progressivity or regressivity of out of pocket burden)
Iversen 2005	XO	Purchasing (contracting rules)	Access to care
Keskimaki 2003	OOXOO	Funding resources	Provision of services per income stratum
Liaropoulos 1998	XO	Provision (direct payments)	financial burden of health expenditures
Lopez-casasnovas	XO	Political configuration (decentralization)	1. Interregional equity in service provision 2. Interregional equity in health outcomes
Mackenbach 2003	XO	Financing arrangements	Access to care
Mastilica 1999		Provision (direct payments)	financial burden of health expenditure
Mooney 2002	XO	Financing and planning arrangements	Access to care

Hurst 2002	XO	Financing and planning arrangements	Access to care (equity)
Navarro 2001	XO	Political configuration (regimen)	1. welfare expenditures 2. health outcome 3. poverty
Oliveira 2005	XO	Provision (direct payments)	Access to care
O'Loughlin 2004*	XO	Resource allocation	Access to care
Petrova 2002	XO	Provision	Equity among administrative areas
Schoen C 2004	X_1O X_2O X_nO	financing and organization of the health system	1) self reported income status, 2) self reported health status, 3) insurance status, 4) race/ethnicity and education, 5) access to health care, 6) financial burden, 7) quality of care rating
Szende A 2006	XO	financial burden of health expenditure	financial burden of health expenditure
Voncina L	XO	financial burden of health expenditure	financial burden of health expenditure
Wagstaff A 1997		all health care financing arrangements	income distribution
Wagstaff A 1999	X_1O X_2O X_nO	health care financing arrangements	income distribution

table n. 1 Characteristics of included studies

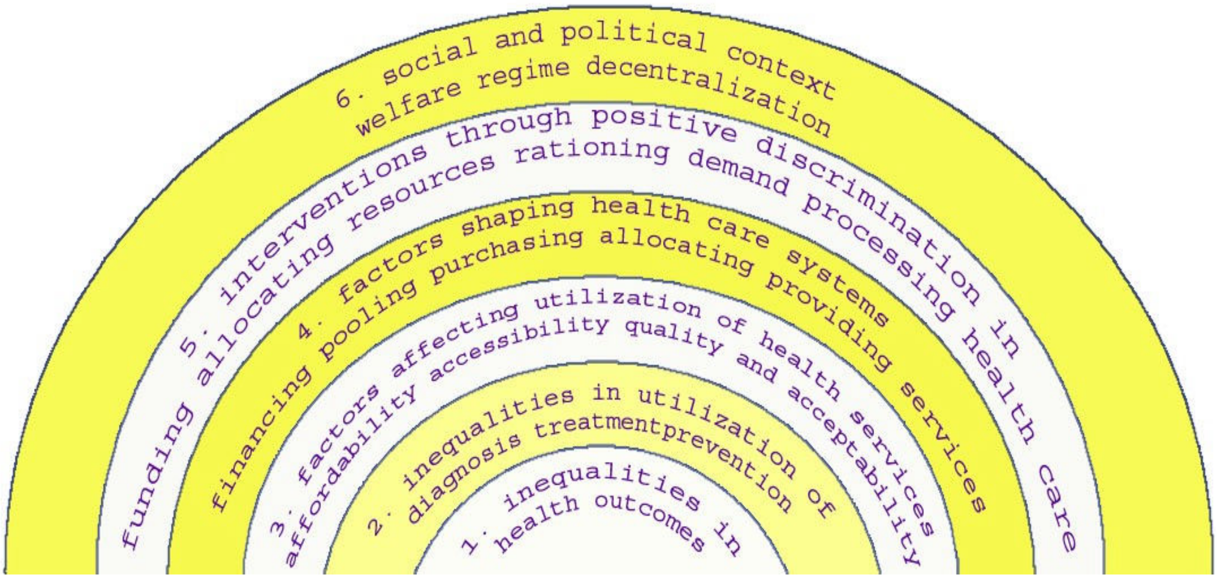
X=intervention, O=observation.
OOXOO interrupted time series

$$\left.\begin{matrix} X_1O \\ X_2O \\ X_nO \end{matrix}\right\}\quad \text{international comparison}$$

XO case study

* study with a strong methodological component

Figure 1 Explanatory framework for mechanisms of health inequalities within the health care system



Notes to Figure 1.
Questions relevant for explaining and tackling health inequalities related to health care

1. inequalities in health outcomes are related to…
2. inequalities in health care utilization:
    a. prevention (reception and efficacy of health education/promotion messages, preventive attitude of GP, uptake of7access to preventive intervention)
    b. identification of need and diagnosis (delay or inaccuracy of diagnosis, unrecognition or denial of symptoms and need, ability to "jump the queue")
    c. treatment and continuity of care (cultural sensitivity of pattern of care, failure to empower patients/families, access to appropriate/inappropriate care, lack of comprehensive social and health care networks)
3. that occur because of differential distribution of health care factors that affect utilization of health care:
    a. affordability (due to the cost of the service and the purchasing power of the individual)
    b. accessibility (due to barriers: geographic, architectural, legal, information, communication)
    c. quality and acceptability (due to professional training and practice, patient-professional interaction, compliance, continuity and apprpriateness in supply organization)
4. that is caused by the way the health care system is designed and managed (financing and pooling, allocation, purchasing, provision of services)
5. that may be more oriented to equity through positive social discrimination in
    a. funding
    b. allocating resources (money, facilities, professional, technologies)
    c. controlling demand (co-payment, waiting lists, scores of clinical severity)
    d. design and management of processes of care (equity audit in each process, pro-active approaches in looking after the hard to reach)
6. that may be influenced by welfare regime and by decentralization of the health systems.

Part VII

Health equity targets

Chapter 31

Quantitative targets to reduce social health inequalities and tools to monitor progress in Europe

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Abstract

Background and objectives

Quantitative targets are an important instrument in the formulation of policies and interventions aimed at reducing inequalities in health. However, practices differ widely between European countries, with up to now little or no exchange of experiences. The general aim was to evaluate the contents of health equity targets that have been formulated in the past years in European countries and to describe target-oriented monitoring practices.

Methods

Through contacts with national representatives, descriptions were made of health target formulation and related policy processes in England, Finland, the Republic of Ireland, Latvia, Lithuania, the Netherlands, and Scotland. Quantitative targets of health inequalities in these countries were analyzed according to the SMART criteria.

Results

Ambitious, inspirational targets were applied especially in countries that had a low but increasing awareness of inequalities in health. These countries have been less considerate about feasibility and attainability of targets. However, the translation of inspirational targets into indicators to be monitored did improve the specificity and measurability of most of the targets. Realistic, operational targets were applied especially in the British Isles, where some governments had started comprehensive policies to tackle health inequalities. The formulation of realistic targets was based on country-specific empirical evidence on health inequalities, including trends in the past and possible scenarios for the future. Monitoring of health inequalities is carried out to some extent in most countries. The monitoring system was more closely related to health equity policies in countries that invested time and resources in the formulation of quantitative equity targets.

Conclusions

Health equity targets may be useful to stimulate and facilitate the development of policies to reduce health inequalities. Realistic targets will only make a difference if they were based on scientific evidence, translated into policies and action plans to reduce health inequalities, and supported by continuous monitoring systems.

Introduction

Quantitative targets are an important instrument in the formulation of policies and interventions aimed at reducing inequalities in health. The need to set realistic targets stimulates thinking about the precise extent to which specific measures can contribute to reducing health inequalities. In addition, targets can guide monitoring of future trends in health inequalities, by identifying the health indicators and measures judged to be most relevant for the evaluation of future policies.

One of the earliest and most influential examples of health equity targets are the targets formulated by the WHO Regional Office for Europe (*see box at next page*). Since the formulation of the Health For All (HFA) targets, increasingly more EU member states have formulated national targets on health inequalities, and developed monitoring systems to measure progress towards these targets. However, practices differ widely between countries, with up to now little or no exchange of experiences. A comparative appraisal of practices in different countries can stimulate mutual learning, and the development of monitoring methods for use on a wider European scale.

The general aim of our work is to evaluate the contents of health equity targets that have been formulated in the past years in European countries and to describe target-oriented monitoring practices. Based on this, we developed recommendations for the formulation of the targets in the future.

In the first part, we focus on the description of quantitative targets to reduce social health inequalities that were put into use in selected European countries, i.e. England, Finland, the Republic of Ireland, Latvia, Lithuania, the Netherlands, and Scotland. The policy process around the formulation and monitoring of targets in these countries will be integrated in this description. Therefore, the discussions that preceded the abolishment of quantitative targets to reduce inequity in Sweden will be considered as well.

The second part evaluates the quantitative targets adopted in the above mentioned countries. Additionally, in the third part, monitoring practices are described. Quantitative targets can be formulated with different goals in mind. These targets can therefore vary from being completely inspirational to operational. The targets will be evaluated according to their value in operational terms. Therefore, these targets will be analyzed according to the SMART criteria. This means that goals have to be specific, measurable, attainable, realistic and time-based.

Health 21 – health for all in the 21st century

"The member states of the World Health Organisation (WHO) are committed to the ethical concepts of equity, solidarity and social justice and to the incorporation of a gender perspective into their strategies. The members emphasize the importance of reducing social and economic inequities in improving the health of the whole population. The policy for 'Health for all in the twenty-first century' adopted by the world community in May 1998 aims to realize the vision of health for all – a vision born in the World Health Assembly in 1977 and launched at the Alma-Ata conference in 1978. It sets out global priorities and ten targets that will create the conditions for people worldwide to reach and maintain the highest attainable level of health throughout their lives.

Quantitative targets have been set using projections based on historical trends and analysis of the current situation, subject to the availability and quality of data. The feasibility of projected target levels was checked against present achievements in countries.

The second target of Health21 concerns closing the gap within countries: By the year 2020, the health gap between socioeconomic groups within countries should be reduced by at least one fourth in all member states, by substantially improving the level of health of disadvantaged groups. In particular:

- the gap in life expectancy between socioeconomic groups should be reduced by at least 25%,
- the values for major indicators of morbidity, disability and mortality in groups across the socioeconomic gradient should be more equitably distributed,
- socioeconomic conditions that produce adverse health effects, notably differences in income, educational achievement and access to the labor markets, should be substantially improved,
- the proportion of the population living in poverty should be greatly reduced,
- people having special needs as a result of their health, social or economic circumstances should be protected form exclusion and given easy access to appropriate care."

The last target of the Health21 policy states the necessity to regularly monitor and evaluate the progress towards the achievement of policy objectives, targets, and strategies to achieve them that have been formulated.

(Cited from the World Health Declaration).

Quantitative targets in use

Defining targets to reduce health inequalities has been identified as one of the key requirements for effective policy in this area (Dahlgren & Whitehead, 2007). In most countries, setting equity targets underlined the general belief that the health inequalities present at that time were unacceptable. The articulation of this belief through the formulation of targets was an important first step in the process leading to actual change.

Below, we will briefly describe the targets adopted by England, Finland, the Republic of Ireland, Latvia, Lithuania, the Netherlands and Scotland and the political climate and process in which these were developed. We will further reflect on Sweden's decision to abolish quantitative targets in their health inequalities policy.

Most countries formulated targets with regards to closing the health gap between people at the bottom and higher positions of the socioeconomic hierarchy. In the Netherlands, Scotland and Ireland, some targets focused on the amelioration of the situation of the poorest. No country has yet focused their health inequalities targets on reducing the slope of the gradient as a whole (Graham, 2006).

England

Two 'headline' targets were announced in February 2001. Since then, various technical changes have been made such that the targets are now expressed as: "To reduce by at least 10% the gap in life expectancy between the most disadvantaged 'spearhead' group of areas with the lowest life expectancy at birth and the population as a whole by 2010." And "To reduce by at least 10% the gap in infant mortality between routine and manual groups and the population as a whole by 2010."

England has adopted these targets in negotiation with the Treasury as part of a package of public service agreements that commit the whole of government and not just the Department of Health to reducing health inequalities. Alongside the headline targets, twelve national health inequalities indicators have been adopted – which cover mortality from specific diseases, access to health care, health behaviour and the wider social determinants of health – to provide a wider context for assessing progress. The headline targets related to life expectancy and infant mortality are, however, the principal focus of policy attention.

When New Labour came to power in 1997 they were very keen on delivering change in the United Kingdom. They immediately put this desire into practice by setting targets for every aspect of public policy, resulting in lots of targets dealing with all different aspects of injustice or inequality. In 1998, the Acheson committee that was installed by the New Labour government recommended to set targets to reduce health inequalities as well, but nevertheless the government was quite slow to do that.

In 2003, a cross-government action plan was produced, incorporating commitments in many policy areas to take action to improve the social determinants of health inequalities. These include:

- Expanding Sure Start services for young children living in disadvantaged areas;
- Improving educational attainment amongst the poorest groups of children;
- Developing Health Living Centres clustered around areas of deprivation;
- Reducing child poverty;
- Improving the quality of social housing and reducing fuel poverty

- Focusing interventions to reduce smoking, and to promote health eating and physical activity on the most at risk groups in the most disadvantaged areas.

Key features of the action plan were further the commitment made to monitoring changes as well as the process of implementation. Furthermore the results of the monitoring are published on a regular basis.

Finland

In spring 2001, the Finnish government adopted a new intersectoral Health 2015 Public Health Programme, stating that: “Mortality differences between women and men, as well as those between education groups and occupational classes, will reduce by one fifth in 2015. Furthermore the achievement in the health milestones is to be based on marked progress in all subgroups of the population but among the most underprivileged groups the development will be the most favourable.”

The main purpose of the targets is to create commitment and effective action among various actors in and outside the health sector. Therefore, hundreds of people have participated in the planning process of the new health programme and the development of the quantitative targets. Extensive discussion of the steps to be taken in order to achieve the desired outcomes has taken place.

The Finnish Health For All strategy document of 1987 aimed, among others, to reduce health disparities and included 15 quantitative targets concerning, for example life expectancy, mortality, dental health, and health behavior. In 1991, an evaluation group advised that the difficult task of reducing health inequities might be facilitated by setting more exact targets and defining explicitly the measures needed to achieve them.

In 1993, the government approved a revised national strategy. Reducing health inequalities was one of the seven fields in which new efforts were thought necessary. The major challenges to do so were identified and a number of more or less explicit measures were defined. For each of these measures one organization was made responsible.

The revised strategy did, however, not include a single quantitative health target. After thorough consideration it was agreed to focus targets on action rather than on numbers. In the years preceding this decision most targets of the original Finnish Health For All strategy had been achieved. Also significant progress had been made with many major public health problems for which no quantitative targets were set.

The international growing attention on health targeting has put pressure on the architects of the Finnish health policy to reconsider the role of targets in Finland. As a result the Finnish government adopted a new intersectoral health program in spring 2001.

The Republic of Ireland

In ‘Building an Inclusive society – the Government’s review of National Anti-Poverty Strategy (NAPS)’, published in 2002, both a broad objective and a number of quantitative targets in relation to health inequalities were set out. The overall stated aim is “to reduce the inequalities in the health of the population, to be achieved by making health and health inequalities central to public policy, by acting on the social factors influencing health, by improving access to health and personal social services for those who are poor or socially excluded, and by improving the information and research base in respect of the health status and service access for the poor and socially excluded.” The following quantitative targets, set in 2001 and to be met by 2007, were adopted:

- To reduce the gap in premature mortality between the lowest and highest socio-economic groups by at least 10 per cent for circulatory diseases, for cancers and for injuries and poisoning.
- To reduce the gap in low birth weight rates between children from the lowest and highest socio-economic group by 10 per cent from the current level.
- To reduce the gap in life expectancy between the Traveller community and the whole population by at least 10 per cent.

More recently, in Breastfeeding in Ireland – A Strategic Action Plan the following quantitative targets relating to reduction of socio-economic inequalities in breastfeeding is proposed. This is a particular issue for Ireland where overall breastfeeding rates are the lowest in Europe and inequalities are starkly demonstrated.

- The national breastfeeding initiation rate should increase by at least 2% per year and by 4% per year for socio-economic groups 5 and 6. This target applies nationally as well as at individual maternity unit level.
- The national breastfeeding duration rate to increase by at least 2% per year and by 4% per year for socio-economic groups 5 and 6. This target to be measured at 3 to 4 months of age, at 6 months of age at one year and is to apply nationally and at HSE Local Health Office level.

The Department of Health and Children has recently committed to develop further health inequality targets arising from ‘A Strategy for Cancer Control in Ireland’, which will be reflected in the National Action Plan For Social Inclusion 2007-2016. This action plan undertakes to develop health inequality targets that relate to cancer only which are area-based targets instead of individual based targets.

A conference in December 2006 reviewed the learning from the first set of health inequality targets in Ireland. A report of the conference proceedings concluded that:

- Quantitative targets can play an important role in directing public policy and mobilizing a multi-sectoral response;
- Future targets should be framed at different levels – long-term health outcome targets combined with shorter-term and intermediate outcomes and goals;
- Targets should be better linked with policies aimed at attaining these goals with roles and responsibilities from central to local level clearly set out;
- Systems to monitor and review performance need to be put in place together with a supporting research programme
- Key stakeholders from national to local level, including those in communities most affected and those delivering key services, need to be engaged.

Latvia

The second target of the Public Health Strategy of Latvia that was adopted on March 6, 2001 relates to equity and solidarity in health: “By the year 2010 the gaps among health indices between socioeconomic groups in Latvia should be reduced by at least a quarter by substantially improving the level of health of disadvantaged groups.” In particular:

- the values for major indicators of morbidity, disability and mortality should be more equitably distributed across socioeconomic groups;
- people having special needs as a result of their health, social or economic circumstances should be protected from exclusion and given easier access to educational, health, social and other necessary services;
- the proportion of poor people should be significantly reduced.

The Constitution of the Republic of Latvia prescribes that the state protects the health of people. Successive Latvian Governments have been and remain committed to the right of every Latvian to enjoy the highest attainable standard of health. The health status of the Latvian population is among the poorest of Europe. This is largely due to social and economic inequality, long-term unemployment, poverty, and social exclusion.

The equity target adopted was included in a general political document on public health. In Latvia there is no political document explicitly referring to equity. The Public Health Strategy of Latvia was modelled on the WHO European regional strategy Health for All in the 21st century. Latvia played an active part in the preparation of Health 21.

The development of the Public Health Strategy became increasingly relevant, because Latvia was negotiating accession to the European Union, which considers sustained, economic and social development necessary for good health, and good health necessary for sustainable economic and social development. Care was taken to tune the Public Health Strategy to the transposition of the directives of the European Union.

Lithuania

In July 1998 the Lithuanian parliament in the Lithuanian Health Program 1997-2010 adopted the policy target: “By the year 2010 to reduce differences in health and health care between various socio-economic groups of population by 25%.”

The National Board of Health is a health policy formulating body that reports on burning health issues in Lithuania to the government yearly. Their first report was dedicated to a situation analysis on health inequalities in Lithuania in 1998. In reaction to this report the parliament adopted a resolution on the Lithuanian principles of health policy, emphasizing equity in 1998. Until now the yearly report of the National Board of Health has included inequalities. For example, the report presented in 2006 reported on urban-rural and educational health differences.

The National Board of Health initiated a meeting of all ministers to talk about the effect of their policies on health and health inequalities, such as social affairs, education and environment. The meeting created awareness on the many aspects of life that are related to and influence inequity and the shared responsibility for the improvement of health. In 2006, the intersectoral character of inequity was again stressed on a national policy conference on health care and health.

The Netherlands

The Dutch cabinet in November 2001 adopted the policy goal: “To increase the healthy life expectancy of the lowest socioeconomic group in 2020 by at least 25% of the socioeconomic differences in healthy life expectancy at that time, i.e. 3 years. This would mean an increase of the 53 years healthy life expectancy of the lowest socioeconomic groups early 21st century to 56 years by 2020.”

In 2001, a government advisory committee developed a comprehensive and integrated strategy that intends to reduce socioeconomic inequalities in health. The advice comprised the adoption of an inspirational target to try to reduce socioeconomic differences in healthy life expectancy by 25% by 2020 as stated by the WHO in 1999 and redefined for the Dutch situation. This inspirational target was translated into a number of quantitative targets focussing on determinants of inequity, believing these can help in plotting a clear policy and function as milestones for the monitoring of the strategy. The advice was based upon the results of two research programs.

The official government reaction presented to parliament in November 2001 was positive. The cabinet approved of the quantitative target set by the committee, but rephrased it. They did however not adopt the more specific targets. The government stressed that an integrated and comprehensive approach seems necessary to tackle such a complex and intertwined problem as socioeconomic health differences, especially on the local level. They acknowledged the existence of a diverse and wide range of policies and interventions that contribute to the reduction of socioeconomic inequalities. The stand furthermore acknowledged the need for monitoring the development of health inequalities to enable the evaluation of policies and interventions.

In 2003, however, The Netherlands Court of Audit concluded in its report on ‘Preventive Health Care’ that the government failed to come up with the promised plan to tackle socioeconomic inequalities. Accordingly, no policy instruments have been established to achieve the policy goal adopted in 2001 and no planning of the implementation of such instruments has been determined.

In reaction to the Auditor’s criticism, the Minister of Public Health stressed that the reduction of health arrears was delegated to the local level and integrated in the Urban Policy for the period 2005 till 2009 with the aim to enable 31 cities to tackle health arrears integrally by addressing all possible determinants, such as lifestyles, living environments or access to health care in combination.

Scotland

In ‘Building a Better Scotland. Spending proposals 2005-2008: Enterprise, opportunity, fairness’ the Scottish Executive adopted the following target in

September 2004: “To reduce health inequalities by increasing the rate of improvement across a range of indicators for the most deprived communities by 15% by 2008. The chosen range of indicators were mortality rates from coronary heart disease and cancer among adults younger than 75, smoking among 16-64 year olds, smoking during pregnancy at 3 months stage, teenage pregnancy among 13-15 year olds and suicide among 10-24 year olds.”

In Scotland health inequalities are part of a more general policy to promote social justice intended to close the gap between the rich and poor in terms of housing, employment, health, etc. The Scottish Executive intends to build a better Scotland focussing on growing the economy, delivering excellent public services, supporting stronger, safer communities, and developing a confident, democratic Scotland. Closing the opportunity gap and promoting equality are two of the Executives key cross-cutting priorities.

In 1999, the white paper on health ‘Towards a healthier Scotland’ presented by the Scottish Office agreed to no longer tolerate inequalities in health. There was a notion that health was the missing piece in the social justice network. The white paper intended to tackle inequalities by improving life circumstances, lifestyle, and prevention. As a focus for preventive action the Government proposed a range of quantified targets to help guide both national and local activity, emphasising coronary heart disease, cancer, smoking, alcohol, unwanted teenage pregnancy and dental health. These health targets closely resemble the components of the equity target adopted in 2004.

The Government stressed the need for integrated working and an inclusive approach to arrive at a healthier Scotland, involving central and local government, the NHS, business, trades unions, voluntary and other organisations that can all influence health. Especially at the local level, where most decisions regarding the issues mentioned are taken, a close liaison between health boards, councils and other organisations is imperative.

In November 2003, the ‘Measuring inequalities in health working group’ including researchers and officials, basing itself on the history and experience in England, proposed 23 different indicators of health were to be monitored. They added that these indicators should strictly be used to monitor trends and developments and not translated into quantitative targets.

The working group acknowledged that adopting explicit targets would serve to raise the profile of health inequalities and provides measurable goals to influence management as well as clear objectives against which progress can be assessed. However, there is no obvious basis on which to select one or two areas for target setting, while there are many areas of health where there are significant inequalities. Setting explicit targets for a small number of health areas prompts the focus of activities and budget on those areas at the expense of other areas. Furthermore, the group felt that the choice of a particular target reduction and timescale for achieving this reduction would be quite arbitrary.

Most of recommendations of the working group were adopted by the Scottish Executive in ‘Building a better Scotland. Spending proposals 2005-2008’. However, two of the recommendations on health targets were not accepted. First, while the work group recommended not setting targets but more to monitor indicators, the Executive did set quantitative targets to reduce health inequalities. Second, while the working group recommended focussing on reductions in the relative gap between the top and bottom quintiles, the Executive decided to formulate targets that focussed on improvements in absolute levels in health of the most disadvantaged groups.

Sweden

Sweden decided not to quantify their policy aim to create social conditions for good health on equal terms for the entire Swedish population.

The main reason to abolish quantitative targets is political. The Swedish government is careful to implement quantitative targets, because of bad experiences with quantitative targets in other policy fields, such as unemployment of traffic injuries. In addition, the government considered quantitative public health targets rather meaningless, because public health is influenced by many other policy fields, while the public health sector is not the most powerful player in the political arena. The determinants of the public health targets might even be well beyond the influence of the government and so would be the fulfilment of the targets.

In 1997, a national Public Health Committee was installed, made up of members from all the parliamentary parties, a large number of experts from the research community and a number of important interest groups. The Committee aimed to ensure equal opportunities to develop in important regards for all, based on the humanistic history of Swedish social and health policy. The committee proposed 18 national public health objectives to which appurtenant targets and in many cases quantifiable indicators were attached. Also strategies as to how these goals should be achieved were included. The 18 goals proposed by the Committee were all-embracing in their nature and deal with the social capital of society, the conditions under which children and young people grow up, working conditions, the physical environment, different lifestyles and the infrastructures required to promote public health.

In December 2002, the Government submitted a proposal covering 11 general objectives for public health work. These 11 objectives broadly cover the same contents compared with the 18 recommended goals, but omitted the more structural or process objectives. These 11 public health objectives were adopted by the Riksdag in April 2003 in the Public Health Objectives Bill. The most important aim of the bill is to make public health a fundamental part of social policy. In this way this Committee for Public Health founded the current Swedish public health policy.

The Swedish objection to the WHO equity targets was that they did not relate to determinants of health (inequalities), but only to health outcomes. However, health is influenced by many factors and policy sectors and little is known about the importance of each or how to control their development. The Committee has chosen to formulate aims concerning the causes of ill health and not individual illnesses. One and the same exposure to a risk factor often contributes to several different diseases and also injury. It is thus easier to focus on causes than on individual diseases. It is easier to monitor the effects on determinants since the latency period is much shorter than the time – sometimes several decades – which elapses before an illness or other affliction manifests itself. In addition, many determining factors are important not only to reduce the risk of healthy people becoming ill, but also to prevent that people suffering from disease and reduced functions will have their condition exacerbated.

Formulating pubic health objectives in terms of health determinants requires public health work to be very much knowledge-based, because it is important to clarify how a determinant impacts health. Furthermore, focussing on determinants stresses that several social sectors ‘possess’ the causes of illness. Most of the factors that impact health are to be found outside the spheres of medical competence and knowledge. Another benefit of focussing on determinants is that they are accessible for political decisions and can be influenced by certain types of societal measures.

Quantitative targets evaluated

In what ways can health equity targets be made more useful? This evaluation of the contents of the health equity targets that have been formulated in the past intends to facilitate the formulation of targets that are (even) more useful in the future. The specific objective is to evaluate the extent to which health equity targets in selected European countries have been sufficiently specific, measurable, attainable, realistic and time-based.

Specific and measurable equity targets clearly define socioeconomic status and the health outcome. Attainable targets should be based on a sound conceptual model about the development of health inequalities. Attainability is further increased by the consideration of the magnitude of and past trends in inequalities in health as well as its determinants and exploration of possible future trends in health disparities. Realistic targets are based on an inventory of possible policies and interventions and their effectiveness.

Specific and measurable targets

Most countries have adopted well specified and measurable quantitative equity targets of some sort or another. The countries that applied the WHO target seem to have given least thought to the choice of indicators. Furthermore, adoption of the targets was often the first step in the process to tackle health inequalities and was followed by the translation of these targets into action plans and monitoring systems. In this situation, the choice of indicators was often delegated to research or other institutes involved.

Most countries focus on individuals, with the exception of England and Scotland that target communities or areas. This is a practical approach, because most information on health is available at post code sector areas as opposed to the individual level. There are a few challenges in targeting health inequalities according to fairly large geographical unit and areas. The Scottish areas considered are based on postcode sectors of which there are almost 1000 in Scotland with an average population of around 5000. The postcode sectors generally do not have populations which are socially and economically homogeneous. Many postcode sectors will contain a mix of relatively deprived and relatively affluent households. Inevitably, health inequalities will tend to be underestimated. Hence area-based health inequalities complement but do not replace the need for individual-based analyses. Furthermore, strategies to reduce health inequalities might be more effective targeting individuals, instead of areas or communities.

When focussing on the poorest, the achievement of the targets does not automatically mean that the gap between the poor and rich will have diminished as well. The better-off might have improved at an even faster rate on their own account. In Scotland, the Working Group on Measuring Inequalities in Health advised it to be most appropriate to focus on relative difference in health status of deprived and affluent groups, since this would reflect the focus of debate and concern.

When focussing on the gap, the magnitude of health inequalities is sensitive to changes in the size as well as the composition of the socioeconomic groups considered in the course of time. The choice for a certain indicator of socioeconomic status should be based on the smallest possible changes to be expected in the future. For example Finland, ensured that their socioeconomic classification included relatively large groups, so that the observed inequalities can be well compared over time.

The case of the Republic of Ireland

Socioeconomic status is generally indicated by the classification system used by the Central Statistics Office in Census 2001 which is based on occupation. The classification distinguished four socio-economic groups, from group A (higher and lower professionals) to D (unskilled manual workers). In terms of the target on low birth weight, the occupation of the father and mother are recorded by the National Perinatal Reporting System and from this a socio-economic group of the family is derived.

A number of challenges have been identified in terms of the measurability of the targets, these include:

- a mismatch in the coding systems for socioeconomic group between the Census and Vital Statistics data in Ireland in 1996, distorting the analysis of inequalities in mortality;
- large numbers of persons with unknown occupation on death certificates;
- poor quality of occupational data on women and older people;
- difficulties in coding for low birth weight babies born to mothers who are classified as ‘home duties’ etc.

The health outcomes considered are clearly defined and specified, i.e. mortality from circulatory diseases, cancers, and injuries and poisoning, life expectancy and low birth weight. As Ireland is a relatively small population, low birth weight was considered a more appropriate indicator than perinatal or infant mortality where numbers are small.

Attainable targets

Countries that have adopted (and adapted) the WHO Health21 target have been less considerate about feasibility and attainability. Countries that have more closely scrutinized the feasibility and attainability have decided not to adopt the WHO target, but develop their own, e.g. Scotland, or abolish quantitative targets, like in Sweden.

Finland, Ireland, Latvia, Lithuania and the Netherlands did not base their target on the scrutiny of recent data on the magnitude of health inequalities or historic trends in socioeconomic differences in health as well as its determinants. These countries use the quantitative target to inspire action, but without great emphasis on concrete and detailed action plans. Often the adoption of challenging targets was considered a means to convince actors that action is indispensable. In Finland, this wish for targets to be challenging and inspirational has led to the adoption of the target to reduce inequity, instead of a more feasible target to steady the ever growing inequalities, which was also considered and discussed. One has, however, to bear in mind that setting unachievable targets is even more discouraging.

In some countries, like Latvia or Lithuania, past or future trends in health inequalities were not taken into account in the formulation of the target, because at that time knowledge on the severity and persistence of the problem of socioeconomic health inequalities was lacking.

The case of Scotland

The Scottish targets differ from that of other countries in the sense that they aim to increase the rate of improvement in one of the chosen health indicators among the poorest areas. They take into account the history of change instead of focusing on the prevalence of unhealthiness at a certain point in time. The starting point was clearly defined and illustrated with information on the past trend in health between the beginning of the 1990s and 2003 in the most deprived quintile of Scottish communities.

The aim to increase the improvement rate with 15% was inspired by the political wish to set challenging, but realistic targets, taking into account the historic evidence on the development of the selected health indicators. This rate of improvement was decided upon by officials and politicians of the Scottish Executive and based on their political judgment on the attainability of the targets.

Politicians considered what was known about effectiveness of policies that were already implemented or were already intended to be carried out. They based themselves on Scottish information and relevance in this regard and did not consider other country experiences, not even England’s.

The quantification of the desired reduction in inequalities was often prescribed by political processes instead of careful consideration of evidence on the effectiveness of possible policies and interventions to be implemented. The Finnish circumvent such scrutiny cleverly by quantifying their targets reflecting the level of health inequalities in the early 1970s. Since then, the differences in mortality have increased by about one fifth. Hence, history proves that the target must be attainable, since it reflects the situation three decades ago when health inequalities were at the now desired level. The Irish Working Group on National Anti-Poverty Strategy (NAPS) and Health dealt with the limited time and resources that precluded the analyses of most recent data on the magnitude of health inequalities and historic trends by using theoretical considerations, examples from abroad, etc.

Realistic targets

Some governments utilized information about effective policies and interventions to formulate their quantitative health inequality targets, like Ireland, Lithuania, and Scotland. For example, in Ireland, the targets set were based on examples and best practices from other countries, though there was no consideration of possible Irish policies and interventions and their presumed effectiveness. In contrast, the 2007 review of the health inequalities infant mortality PSA target in England only then concluded that the evidence about the effectiveness of interventions to reduce infant mortality is weak. Particularly little evidence is available about activities that will narrow the gap between the routine and manual occupations and the population as a whole. Only during this review, several years after the targets were adopted, modelling exercises were performed that illustrated the impact on the gap of reasonably feasible changes in a risk factor, the achievement of other targets, or the effect of specific interventions, such as reducing teenage pregnancy or targeted interventions to reduce sudden infant death, smoking and obesity among routine and manual labourers.

Most governments did not translate the equity targets into action plans that set out the tasks, responsibilities and budgets necessary. Sometimes for a good reason; at the time of the adoption of the Finnish target, the development of the necessary process targets and action plans was delegated to the various actors in the different sectors, since it was thought that they themselves are best qualified to develop action.

The Lithuanian national Health Program stated, together with the inequality target, that actions should be directed towards the reduction of income disparities, unemployment, the improvement of education and qualifications, unhealthy living and occupational conditions, the promotion of healthy lifestyles, and to ensure accessibility, acceptability and appropriateness of health care. Time has learned that some of the actions and strategies mentioned, however, turned out to be more practical and achievable than others. When action plans are developed it is therefore essential that their feasibility and attainability is secured as well.

In Latvia, the Public Health Strategy was followed up by an Action Programme for Implementation of the Public Health Strategy, but the only action related to the health inequality target was the assignment of the responsibility to regularly study socioeconomic inequalities to the Central Bureau of Statistics. The Latvian government presumes that the Strategy on Poverty Reduction and Social exclusion to reduce the proportion of poor people and protect people with poor health or socioeconomic circumstances from social exclusion, together with all other efforts and programs directed towards the poorest-off, will contribute to the reduction of inequalities. The achievements and results of these actions will be monitored.

Another way to make sure that the developed targets are realistic is to consult the experts. In Finland, hundreds of people have been involved in the development of the latest Health 2015 Public Health program, to increase their support and to develop more realistic targets. The Irish Working Group on NAPS and Health facilitated a public consultation in 2001 which elicited the views of key stakeholders from the statutory, community, and voluntary sectors. In Scotland, for each of the health outcomes there have been established responsible teams or policy groups within the Scottish Executive, for example the Cancer policy group. They closely monitor what is happening and work closely together with local boards and governments.

Time frames of the adopted targets were often prescribed by political processes instead of careful consideration of the period of time necessary to achieve the desired and quantified change. Furthermore, most governments failed to base their targets on evidence on the effectiveness of possible policies and interventions to be implemented. For example, Latvia and Lithuania, both copied the 25% reduction in inequalities of the general WHO target, but shortened the time frame to achieve this ambitious goal considerably to match the timeline of the national health strategy and periods in government. Adaptation of time line of targets to the political time frame is inevitable, but this should be reflected in the quantified, desired reduction as well. In Scotland, for example, the time frame from 2003 till 2008 was chosen to relate to parliamentary time table and the quantification of their targets related to past trends in inequalities.

The case of Finland

The main purpose of setting quantitative targets was to create commitment and effective activity among the various actors in and outside the health sector. The development of the necessary process targets and action plans has been delegated to the various actors in the different sectors and has not been part of the development of the Health 2015 strategy, but will take place during the implementation process.

The early evaluation of Finnish HFA2000 criticized the development of the policy by a very small group, mainly consisting of persons within the Ministry of Social Affairs and Health. Such a top-down approach was not considered very realistic and inspirational. It was felt that policy makers had produced their own program without being in touch with the actors supposed to implement the policy in practice. Therefore, hundreds of people have now been involved in the development of the latest Health 2015 Public Health program and the targets included in it, to increase their support.

The Health 2015 program was intended to be a short and comprehensible inspiration to actors to develop concrete activities and to modify structures to achieve change. The 36 resulting lines of action that are related to the targets present lines of policy which are expected to help in achieving the targets, but the relations are qualitative. At the time of the adoption of the target, no specific action plans were defined, since it was thought that the actors themselves are best qualified to develop action.

Within the Finnish Government, the group of ministers responsible for social policy issues has delegated the preparation of the action plan to the Ministry of Social Affairs and Health. The preparation is the responsibility of the Advisory Board for Public Health, consisting of representatives from several administrative sectors, local government, the health service system, NGOs and professional organisations, and health research institutes. The national plan of action will be finalised during 2007.

Monitoring of health inequalities

The formulation of quantitative targets relies on the availability of accurate information on health inequalities. Once quantitative targets have been adopted and action plans are implemented, monitoring allows for learning from experience to make the necessary adjustments and revisions.

Monitoring of health inequalities is carried out somehow or other in all countries. An exception is Ireland, where a formal research and evaluation program has not yet been established. The Department of Health and Children published a national Health Information Strategy in 2004, incorporating and monitoring health inequalities on an individual basis. Only in 2007, the Health Information Quality Authority was set up, being delayed by the major re-organization of the health service in Ireland.

The monitoring system seems to be a more intrinsic part of and closely related to the equity policy in those countries that experienced extensive debate about the adoption and formulation of quantitative equity targets. In these cases, detailed monitoring of inequalities has both been the basis as well as the outcome of the policy process. In other words, the available monitoring information has guided the development of the targets, and these targets in return have further shaped the data collection.

In counties with less detailed quantitative equity targets, the development of a monitoring system has often put flesh on the targets, because of inevitable decisions on what health and socio-economic indicators to measure. Often, the specification and measurability of the targets was delegated to the research institutions involved. During this process, the availability of data might possibly have played a disproportionately large role in the choice of indicators. In Finland, the monitoring and evaluation system for the Health 2015 program was proposed in September 2003, two years after the adoption of the quantitative equity target. Proposed indicators were based on scientific evidence on known important determinants from both Finnish and international research. In the proposal, key and complementary indicators are distinguished. Key indicators provide a good description of time trends in the health outcomes defined in the targets of the program. Supplementary indicators are not defined in the target but important for the achievement.

In most countries, the main source of data includes national registers on mortality, morbidity, use of services, etc. In the Netherlands, this resulted in the absence of information on the equity target, i.e. socioeconomic differences in healthy life expectancy, because there was no recurrent, national information system available that gathers data on life expectancy by socioeconomic class.

The case of England

The English commitment to monitoring changes, not only in relation to health outcomes, but also social determinants is one of the key features of their action plan. Furthermore the results of the monitoring are published on a regular basis. Alongside data about the headline targets, information from a wider basket of indicators about social, behaviour and health care related determinants, such as child poverty, smoking and access to general practitioners, are also published.

Close attention is paid to the monitoring of the process of implementation. Partly as a result of the level of political commitment and the exposure to public scrutiny there have been cross-government investigations of why progress to date in achieving the targets has been modest. A review of the infant mortality target, for example, shows how greater attention to processes of implementation and performance management combined with better guidance about evidence-based policy options could stimulate much faster progress in the future.

Conclusions

Health equity targets may be useful to stimulate and facilitate the development of policies to reduce health inequalities. The type of health targets needs to be tailored to the country in which they are issued: ambitious, aspiration targets (such as the WHO HFA target) may be the best choice in countries that have a low but increasing awareness of inequalities in health. Realistic, operational targets may be more useful in countries that already have started policies to tackle health inequalities, for example the UK.

In the latter case, realistic targets will only make a difference when they are operationalised into action plans. Such plans describe specific actions aim to achieve the formulated targets. Although quantitative targets can be a means to provoke action to tackle health inequalities, they are not sufficient to make a true difference. Realistic targets therefore need to be complemented with a comprehensive strategy to reduce health inequalities.

Inequalities in health are too complex, multifaceted phenomena to be captured into a few quantitative targets. The use of broad health oriented targets are probably less useful for steering policy and action than targets that relate to the more immediate effects of policies and interventions, e.g. health determinants or indicators of policy implementation (Mackenbach & Bakker, 2003).

The formulation of realistic targets would greatly improve from the use of country-specific empirical evidence on health inequalities. Realistic targets need to be based on historic trends in health inequalities, evidence on the specific socioeconomic groups at greatest risk, and the type of health outcomes that vary most between different socioeconomic groups. Information on the effectiveness of possible policies and interventions is a prerequisite. The current lack of evidence on the effectiveness of interventions to reduce inequalities in health is clearly an obstacle to the identification of the most effective policies (Exworthy et al., 2006; Stronks, 2002). To accommodate the current shortage of evidence on the effectiveness of interventions, mathematical modelling exercises that estimate possible future trends in health inequalities under different policy scenarios.

For targets to be realistic and influential, it is also important that they are related to monitoring information on trends in health inequalities in the past and in the future. Ideally, quantitative equity targets are preceded as well as followed by monitoring of health inequalities. Reliable information on the magnitude of health inequalities and past trends are a prerequisite for the formulation of feasible and measurable targets. The targets set should be translated in operational targets and related indicators, as the example of Finland illustrates. Monitoring may be done within or outside the policy department that is primarily responsible for reaching the targets – both alternatives have advantages and disadvantages. One should be aware of perverse incentives, e.g. actors may not truly change their policies and actions, but be mainly concerned with influencing (the registry of) the target indicators.

Countries that have adopted the WHO Health21 target have been less considerate about feasibility and attainability. The feasibility and reality of the targets adopted, e.g. the time frame considered and the extent of the desired reduction in inequalities was mostly the result of a political process and discussion, based on many other considerations but the scientific facts. The translation of these inspirational targets into indicators to be monitored did improve the specificity and measurability of most of the targets considerably.

This summary of international experiences reminds of the conclusion of Smith (2007), who argued that it is ideas, rather than research evidence, which have travelled from research into policy in England and Scotland. Not a single interviewee in this study claimed that policies aimed at addressing health inequalities had been significantly based on research evidence. A stronger link with research and monitoring may possibly result in policies that aim to be based on realistic targets for the reduction of health inequalities.

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Chapter 32

Off target: a critical review of setting goals for reducing health inequalities in the UK

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Abstract

Health policy in the UK is devolved to the four home countries. Despite the potential for differences in policy development that this creates, England, Wales, Scotland and Northern Ireland share a common commitment to reducing health inequalities and have set explicit targets in areas such as life expectancy, cancer mortality, long standing illness and smoking prevalence. However, many of the targets leave much to be desired in terms of their limited conceptual scope and their selection of methods and approaches. At one level this might be regarded as relatively unimportant. The mere fact of having health inequalities targets is laudable. But because the UK has been in the vanguard of research and policy development to reduce health inequalities, a critical appraisal of the strengths and weaknesses of the approaches adopted in the different home countries is timely.

This paper sets out to do number of things. First, it describes the UK policy context and contrasts and compares the approaches to setting health inequalities targets in the four home countries. Next, it uses England and Scotland as examples of contrasting approaches to target setting and describes progress towards meeting targets in each. The paper then outlines key emerging issues in relation to developing targets and measuring progress, including conceptual dilemmas, biased reporting, statistical fallacy and implementation failure. It concludes with a discussion of how these issues should be considered in order to win greater public confidence in the process of setting targets for reducing health inequalities.

Introduction

Health Inequalities are an important public health issue. Increasing concern about the poor health status of specific populations has resulted in an array of public policies designed to tackle the problem. But while there is a large degree of rhetorical convergence on the concept there are notable policy divergences around strategies for reducing health inequalities and methods of collecting data and interpreting indicators related to inequality.

For policy makers attempting to reduce inequalities, there are several broadly defined paths available. These include attempting to reduce the health inequalities ‘gap’ between rich and poor, focusing policies for health improvement on the poorest groups or areas, or attempting to reduce the slope of the inequalities gradient [1]. In some countries, the focus is on particular populations, such as ethnic minorities [2].

All approaches are based on the common assumption that the poorest populations – however these are defined - have the lowest health status. And in all cases the policy assumption is that poor health is strongly associated with specific socio-economic and other deprivations including, for example, living and working environments. In effect, the policy aims between countries employing different strategies are largely similar. In some cases policies are a mixture of several strategies as too is the rhetoric.

The European wide concern with poor health and the commonalities in health inequality debates were emphasised in an independent review commissioned by the UK Presidency of the EU [2]. This report also discussed the differences between preferred policy initiatives to alleviate the problem. It suggested that the strength of policy commitment can be categorized, albeit rather crudely, and at the highest level involves the specification and use of quantitative targets.

The EU report graded the range of European countries’ policy responses for reducing health inequalities from expressions of concern and specific legislative commitment (eg Greece and Germany) to those with general goals including Denmark, France, Hungary, Italy, Norway, Poland, the Slovak Republic and Sweden. The European countries with more advanced plans for reducing health inequalities - defined by the authors as including the development of quantitative targets - were placed in three categories as follows. Group 1 countries with less advanced targets (eg Czech Republic), group two countries with more advanced targets (eg Netherlands and Finland) and group 3 countries with the most advanced targets (eg England and Scotland) [2]. More recently, in their review of European strategies for tackling social inequities in health, Dahlgren and Whitehead [3] also identify targets as one of the key requirements for effective policy in this area.

It is clear that the degree of development of health inequality targets is widely seen as a major factor in European health improvement policies. And, moreover, that of all the EU countries, the UK is the most advanced in terms of collecting data and in setting targets that describe the extent of inequality. In short, the UK has the most sophisticated targets in Europe. Setting even advanced level targets may be, however, not entirely unproblematic for policy makers in the UK.

UK Policy Context

Health Policy in the UK is a devolved issue. Differences are therefore emerging between England, Scotland, Wales and Northern Ireland in relation to their policies to address inequalities, including their approach to setting health inequalities targets.

As Blackman and colleagues have outlined, the 'audit culture' within public services is stronger in England than in other parts of the UK and this has contributed to the setting of a range of targets within the NHS, including health inequalities targets [4]. In England, these targets were established earlier than in Scotland, Wales or Northern Ireland. There are two 'headline' targets that were announced in February 2001. Since then, various technical changes have been made such that the targets are now expressed as [5]:

- To reduce by at least 10 per cent the gap in life expectancy between the most disadvantaged "spearhead" group of areas with the lowest life expectancy at birth and the population as a whole by 2010.
- To reduce by at least 10 per cent the gap in infant mortality between *routine and manual groups* and the population as a whole by 2010.

Both of these targets are defined in slightly odd ways. The "spearhead" group of areas used for the life expectancy target represents almost but not quite the most disadvantaged quintile of local authorities. Whereas the "routine and manual" group used for infant mortality is intended to be an approximation to the original use of the term "manual". The new term was adopted as a result of the introduction of a new National Statistics Socio-Economic Classification (NS-SEC). But it appears to contradict the technical guidance provided by the Office of National Statistics.

Although the name of the third class in the '3' Class version of NS-SEC is 'Routine and manual occupations' this does not perpetuate the manual/non-manual divide. Changes in the nature and structure of both industry and occupations have rendered this distinction both outmoded and misleading
(http://www.statistics.gov.uk/methods_quality/ns_sec/glossary.asp).

Alongside the headline targets, twelve national health inequalities indicators have been adopted - which cover mortality from specific diseases, access to health care, health behaviour and the wider social determinants of health - to provide a wider context for assessing progress [5].

Wales established 'health gain' targets in 2002. These were expressed in somewhat more general terms than those in England. They relate to specific leading causes of death such as cancer and coronary heart disease (CHD). For example:

- To improve CHD mortality in all groups and at the same time aim for rapid improvement in the most deprived groups
- To improve cancer mortality in all groups and at the same time aim for rapid improvement in the most deprived groups

However, considerable effort has been made to develop more specific health inequality indicators [6], some or all of which might be adopted as targets in due course [7]. Most recently, a new set of health inequalities targets have been established in Wales specifically aimed at addressing childhood poverty. Box 1 sets out these targets.

Box 1: Child Health Inequality Targets in Wales

In October 2006 the Welsh Assembly Government published milestones and targets to measure progress towards eradicating child poverty in Wales. They address the topics of: income and work; education; housing; and health, including child health inequalities targets. These state that by 2020 the:

- ratio of infant mortality rates between the most deprived and the most affluent fifths of the population will be no more than 1.3 (30%)
- ratio of low birth weight rates between the most deprived and the middle fifth of the population will be no more than 1.12 (12%)
- percentage of caries among the 5 year old children of the most deprived fifth of the population will be 55.3%
- percentage of caries among the 12 year old children of the most deprived fifth of the population will be 46.2%
- ratio of childhood pedestrian injuries reported to the police between the most deprived and the middle fifth of the population will be 1.20 (20%)

The strategy also makes a commitment to develop new targets in areas where current data is limited, such as childhood obesity.

Source: Welsh Assembly Government [8].

In Scotland, health improvement targets were adopted after a lengthy process of deliberation, involving the establishment of a “measuring inequalities in health” working group whose recommendations were received by the Scottish Executive in 2003. The working group recommended that 23 indicators should be employed to monitor trends in inequality. Their proposals were accepted and reported in the White Paper *Improving Health in Scotland: the challenge* [9]. However, the working group cautioned against the creation of explicit targets [10]. The Scottish Executive chose to reject this advice and to focus on reducing health inequalities by increasing the rate of improvement across a range of indicators for the most deprived communities by 15%, by 2008. The six indicators are shown in Box 2.

Box 2: Scottish Health Inequalities Targets

For adults : - coronary heart disease, mortality rates (for under 75s) - cancer, mortality rates (for under 75s) - adults smoking (aged 16-64) - smoking during pregnancy (at 3 month stage) For young people : - teenage pregnancy (aged 13-15) - suicides in young people (aged 10-24)

Source: Scottish Executive, [11]

In Northern Ireland, targets were included in the 2002 public health strategy, *Investing for Health* [12]. The overall goal is to reduce inequalities in health between geographic areas, socio-economic and minority groups. Like England, two specific targets have been adopted. These are:

- To halve the gap in life expectancy between those living in the fifth most deprived electoral wards and the average life expectancy here for both men and women between 2000 and 2010
- To reduce the gap in the proportion of people with a long standing illness between those in the lowest and highest socio-economic groups by a fifth between 2000 and 2010

Graham's typology of inequality in health provides a useful framework for understanding the differences between the approach to target setting between the constituent parts of the UK [1]. She identifies three types of strategies. First, policies and targets that are intended to improve the health of the poorest. Second, those that aim to close the gap between the bottom and the top, or average position. Finally, there are those that reduce the slope of the gradient as a whole [1]. A common criticism of targets everywhere is that no country has yet expressed these in terms of the gradient. The targets adopted by different parts of the UK fall into the first two categories – improving the health of the poorest, and closing the gap.

Scotland and to a lesser extent Wales chose to express their health inequalities targets as objectives to improve the health of the poorest in society. In contrast, targets in England and Northern Ireland and those related to child poverty in Wales focus on 'closing the gap'. Given these differences in approach, it is worth asking what issues have arisen in relation to the formulation of the targets and what progress has been made to date in achieving the different forms of health inequalities targets in the UK. We use England and Scotland as examples of each type of approach.

Progress in England and Scotland

In England, the targets were established in 2001 and use 1995-97 (life expectancy) and 1997-99 (infant mortality) as the baseline, with the aim of achieving the targets by 2010.

Data for 2003-2005, allow some preliminary conclusions to be made about progress to date. For both targets, the prognosis is not good.

Table 1 shows changes in the relative gaps between the target groups and the average for the population as a whole for male and female life expectancy and infant mortality.

In relation to life expectancy, the relative gap between the spearhead group of local authorities and England as a whole has increased from 2.57 to 2.61 per cent for males and from 1.77 to 1.91 per cent for females between 1995-97 and 2003-5. The relative gap in the infant mortality rate between routine and manual groups and the population overall has widened from 13 per cent in 1997-1999 to 18 per cent in 2003-05 [5].

In England, therefore, no real progress has been made and the trends appear to be moving in the wrong direction, despite the introduction of a whole series of policies aiming to improve life expectancy and lower infant mortality rates among the poorest [13].

In Scotland there is some evidence of modest progress but the monitoring period is as yet very short and the emerging trends may not be robust. In the first two years, an assessment of all six health inequalities targets shows improvement in the most disadvantaged areas for five of them considered on their own. In terms of inequality ratios, however, three indicators are improving, two are worsening and one is broadly neutral [11].

It is worth highlighting the approach being adopted in Scotland as it is quite distinctive. Figure 1 illustrates the approach to setting health inequalities targets in relation to smoking during pregnancy [14].

The bars in Figure 1 show smoking rates since 1994 in the most advantaged and disadvantaged quintiles of geographical areas as measured by the Carstairs deprivation index. The triangles in Figure 1 show the inequality ratio calculated as the most disadvantaged rate divided by the most advantaged rate.

By the time that health inequality targets were set as part of the 2004 spending review, a reduction of 15.2 per cent in rates of smoking in the most deprived areas had been observed between 1994 and 2003, which represents a decrease of -1.81 per cent per annum. The way in which the health inequality target is expressed requires that the rate of decline should increase by 15 per cent over that observed for the period 1994 to 2003. This implies a reduction of -2.08 per cent from the baseline figure of 35.8 in 2003 to yield a target figure of 32.2 for 2008 [11].

During the first year of the target period, between 2003 and 2004, there was a -8.38 per cent reduction in smoking during pregnancy in the most deprived areas. This was the biggest annual decrease in percentage terms since the start of the data series in 1994. It represents 83 per cent of the reduction planned for the five-year period 2003-8. In terms of the target set by the Scottish Executive, this would represent considerable progress if it were not for the probable fact that the reported reduction in the most disadvantaged areas are almost certainly overstated (see below).

However, what Figure 1 also shows is that even if there was a decrease in smoking during pregnancy in the most deprived areas, the percentage decrease in the most affluent areas was almost twice as high at -16.91 per cent between 2003 and 2004. This means that the inequality ratio actually widened by 10.27 per cent in the first target year from 2.63 (2003) to 2.90 (2004). Thus while smoking in pregnancy rates declined overall - possibly including among the most disadvantaged - the more rapid improvement among affluent groups' means that inequalities expressed in terms of the relative rate ratio have actually grown.

In both England and Scotland, it would appear that considerably more sustained effort is required if progress is to be made towards reducing health inequalities. But whether or not the officially designated targets can be met on schedule is not the only issue that demands attention.

Emerging Issues

Although some progress has been made, a number of problems remain in relation to using targets as a purposeful instrument in health inequalities policy. Not least are the dilemmas of targets themselves.
These include:

- Conceptual dilemmas
- Biased reporting
- Statistical fallacy

Conceptual Dilemmas

Questions have been asked in the UK about the appropriateness of the infant mortality indicator for at least the last five years [15]. In spite of the concern, however, many issues remain unresolved, and to understand why there is still disquiet about the present formulation of the infant mortality target it is necessary to examine the available data on infant mortality. We use for this purpose those published by the Office for National Statistics in 2006.

Table 2 summarises some of the key results. It shows that of the 645,881 live births in England and Wales in 2006 just under 0.5 per cent resulted in infant deaths (3188). However, the infant mortality rate was substantially higher (6.95) among those births registered by the mother only than those where both the mother and the father were jointly named at registration (4.78). It is important to note that sole registered infant deaths are not included in the official target for health inequalities even though there is clear evidence that this is a particularly disadvantaged sub group of the population [16]; [17].

Table 2 also provides data on the socio-economic (NS-SEC) distribution of nearly all (98.5 per cent) jointly registered infant deaths where information was available. No data are provided for sole registered deaths. Infant mortality rates for different socio-economic groups are calculated using as the denominator data obtained from a 10% sample of births where the father's socio-economic group has been coded. There is a reasonably clear gradient of infant mortality rates from a low of 2.79 among those classed as "large employers and higher managerial" (NS-SEC 1.1) to more than double that among "semi-routine" (6.47) (NS-SEC 6) and "routine" (6.02) (NS-SEC 7) groups. However, the rate is even higher (8.8) in a residual category (NS-SEC Other).

One of the peculiar features of the health inequalities target in this area is that it compares infant mortality rates taken from a rather odd group of "disadvantaged" groups with the average for all jointly registered births only. This disadvantaged group is defined as "routine and manual" and comprises NS-SEC categories 5-7.
In our view it is misleading to exclude sole registered births which had above average mortality rates and accounted for more than **10 per cent** of all infant deaths. It seems equally strange that the target group for inequality purposes includes NS-SEC group 5 that has a relatively good infant mortality rate (3.84) while the excluded groups (other and sole registrations) have the worst death rates. The 'other' category includes the long term unemployed and those who have never worked. Furthermore, these two excluded groups constitute more than one-fifth (**22 per cent**) of all deaths.

A more appropriate revised target might exclude NS-SEC group 5 ("lower supervisory and technical") that has a relatively low infant mortality rate and include the two groups outlined above where infant death rates are consistently and demonstrably higher. At the very least the selection of the existing health inequality target is contentious in that it does not properly reflect the underlying nature of contemporary social inequalities relating to infant mortality.

Biased Reporting

As the example of smoking in pregnancy in Scotland illustrates, one of the problems associated with setting targets that rely only on improving health amongst the poorest is that inequalities can widen in terms of relative differences between social groups depending on the rate of improvement among more affluent groups. However, in examining the data used to measure smoking in pregnancy in Scotland (the SMR02) we discovered another problem that may arise when assessing progress towards achieving inequalities targets – variations in reporting and recording smoking by social groups.

Smoking status during pregnancy is recorded on the SMR02 form at a booking visit to a maternity unit – a woman's pre-natal check that usually occurs at the end of the first trimester of pregnancy. The responses are categorised into "never smokers", "former smokers", "current smokers" and "don't knows". We obtained SMR02 data for the period between 1997 and 2002 and examined the pattern of responses, particularly in

Glasgow, for a study examining reductions in smoking during pregnancy in Scotland's largest city[i]. Table 3 illustrates the results.

The key features of Table 3 are set out below.

- There appears to be a 7 percentage point reduction (-15%) in current smoking in the most deprived quintile in Glasgow compared with virtually no change in the most advantaged quintile.
- The changes over time by deprivation category in Glasgow are broadly consistent with the national data trends.
- The two most important reasons for the reduction in deprived areas are (a) the 4.14 percentage point increase in those classified as "don't know" and (b) those recorded as "never smokers" (-3.96 percentage points).
- There is a much more substantial increase in the proportion of "don't knows" in the most disadvantaged quintile (1.22% to 5.36%) than in the most advantaged (1.84% to 2.17%).
- There is also a larger relative reduction in the number of births in the most disadvantaged areas (-15.3%) than in the least disadvantaged (-8.9%).

The key message from Table 3 is that a large part of the apparent reduction in smoking in the most deprived areas in Glasgow between 1997 and 2002 was artefactual. Instead of the reduction in smoking in pregnancy being driven by a rise in the number of women quitting ('ex-smokers'), it appears to have been driven by a rise in the proportion of 'don't knows' and 'never smokers'.

Why did this occur? First, we suspect that - given the increased emphasis in recent years on the importance of **not** smoking during pregnancy - there was a tendency for some expectant mothers to provide false information about their smoking status when asked at the time of their booking visit. The issue of inaccurate self-reporting of smoking status amongst pregnant women has been highlighted by other studies [18]; [19].

There may also be reluctance among midwives to further explore the issue during the booking visit, particularly with women whose 'other problems' (teenage pregnancy, drug misuse) may seem more significant. Some current smokers would not answer the question about smoking and were recorded as "don't knows" and others might have claimed to be "never smokers". If either of these possibilities is valid then they will have the effect of exaggerating the rate of decline of current smokers in the most disadvantaged areas.

It is also possible that the rise in "never smokers" was valid and was associated with the relatively faster decline in the number of births in the most disadvantaged areas. In part, this trend is also associated with an increasing average age of mothers, which in turn might be associated with a relatively higher reduction in the number of "unplanned" pregnancies that might have been associated with higher rates of smoking.

[i] The study 'Reduction in smoking during pregnancy in Glasgow' was funded by the Glasgow Centre for Population Health.

Nevertheless, it seems to us to be unsafe to accept at face value that there was as much of a reduction in smoking during pregnancy in the most disadvantaged areas as the official statistics in Scotland appear to suggest[ii].

Measuring inequality in smoking in pregnancy in Scotland provides a good example of how drawing attention to a particular issue, and formulating a specific target to reduce it, might exacerbate the problem. An unintended consequence of the policy focus on this area has been increasing awareness among women that they shouldn't be smoking during pregnancy, and therefore should not report smoking, even if they are smokers. This may also be coupled with reluctance among some midwives to ask about smoking status or explore the issue in any depth. This in turn seriously compromises the accuracy of statistics used to measure progress towards achieving the target.

Statistical fallacy

There is one further problem that has not as yet received the attention it perhaps deserves. Scanlan [20] argues that much "health inequalities research is suspect" because it fails to take account of relationships between the rates at which two groups experience (or avoid) an outcome and the ways in which these relationships are influenced by the prevalence of the outcome. In particular, he argues that increases in relative differences in inequalities are associated with reductions in the absolute size of inequalities. He also asserts that there is a general relationship between the prevalence of an outcome and the size of relative differences between social groups. One interpretation of this claim is that as measures of any particular outcome improve in general then relative inequalities are bound to increase but that the real world significance of these is greatly exaggerated.

As a result of the generalized nature of the phenomena that he has observed and described in a number of papers, Scanlan sets out what he calls an "interpretive rule".

"When two groups differ in their susceptibility to an outcome, the rarer the outcome (a) the greater tends to be the relative difference in rates of experiencing it, and (b) the smaller tends to be the relative difference in rates of avoiding it." [20]. As a result, and to a much greater extent than is commonly realized, Scanlan further claims that whether or not inequalities are increasing in any useful sense of the word is at best misunderstood or at worst simply unknowable.

If there is any weight in these arguments they would have important implications for the ways in which governments seek to assess the nature of their efforts to reduce inequalities. If they fail to take account of "Scanlan's rule" they run the risk of guaranteeing failure, largely for conceptual and methodological reasons rather than for social welfare reasons.

[ii] Since our analysis was made available to the Scottish Executive in 2006, the Information and Statistics Division (ISD) of the NHS in Scotland has acknowledged the problems with SMR02 data and published a detailed description of the issue on their web pages (see http://www.isdscotland.org/isd/2911.html)

Now there is a possibility that the difficulties surrounding the health inequalities gap are overstated, but there are certainly real world examples to be found that resonate with Scanlan's arguments. For example, in her work on social inequalities in birth outcomes in Sweden, Gisselmann [21] shows that "part of the explanation for the increased inequalities (that she identifies) is likely to be found in the decline in the proportion of women with low education" (p. 68).

Implementation failure

Regardless of how targets are conceived it is absolutely essential that action plans are developed to support them and that they are implemented effectively. In fact, serious attention is rarely given to the process of implementation. We use the example of infant mortality in England to illustrate the failures of implementation that can occur and also to show how they might be remedied.

Table 1 showed earlier that progress towards achieving the PSA health inequality targets in England is poor: the gap is widening rather than narrowing. An important new report [22] about the failure of the infant mortality target to make adequate progress illustrates the nature of the implementation failure that has occurred and shows the importance of audit and review, widening the scope of interventions (to include wider determinants of health) and supporting local implementation efforts – if the situation is to be improved in future.

The 2007 Review of the Health Inequalities Infant Mortality PSA Target was carried out between May and November 2006 and based on data available between 2002 and 2004. Findings were based on fieldwork visits and interviews with NHS and local government staff - plus discussions with experts in the area of child and maternity care. The key message from the field was that the infant mortality target was not sufficiently known or understood despite individual examples of leadership and good practice.

Five challenges to delivering the target were identified. First, there was no recognition of the target or the widening gap between the routine and manual group and the overall population. Second, services were not fully delivering to target groups. Third and fourth, there was a lack of leadership and systems to support delivery and a lack of knowledge and understanding of the target. Finally, the review found that there was a poor handling of data and gaps in the evidence base, in spite of possibilities available to design services to help meet the target and reduce health inequalities in infant mortality.

Evidence about the effectiveness of interventions to reduce infant mortality is demonstrably weak, particularly those that will narrow the gap between the routine and manual group and the overall population. The review does, however, attempt to quantify the impact of four interventions on reducing the inequalities gap through modeling.

- If the prevalence of obesity in the routine and manual group was to fall by 23% to the current level of obesity in the population as a whole, this would reduce the gap by 2.8%.
- Meeting the national target to reduce smoking in pregnancy from 23% to 15% in the routine and manual group would reduce the gap by 2%.
- Reducing sudden unexpected deaths in infancy in the routine and manual group by persuading 1 in 10 women in this group to avoid sharing a bed with their baby or putting it to sleep prone (on its front) would reduce the gap by 1.4%.
- Achieving the teenage pregnancy target would reduce the gap by 1%.

It was not possible to quantify the impact of other interventions such as early booking and improving services for teenage parents. Nevertheless, ensuring that all these interventions are delivered to the routine and manual group may help to reduce the gap in infant mortality and meet the target. There is now also a commitment to try to quantify the impact of wider social determinants – such as improving housing conditions for the disadvantaged and meeting the 2010 child poverty target – on reducing the relative inequalities in infant mortality. Beyond that there is an important recognition that implementation plans need to be devised in a more thought-through and practical way with tangible support for those delivering services at the local level.

While the purpose of English policy for health inequalities and infant mortality has remained largely constant in recent years, the latest strategies for action are now more detailed and fined tuned. The latest review sets out what we know and what we need to know and a strategy to deliver the target. A re-affirmation of the government's commitment to tackle health inequalities in infant mortality and to meet the 2010 target is backed up with a clear message about what should be done and what is actually happening in some areas. The review starts to address important questions of policy implementability and feasibility that, if properly addressed, increases the probability that desired outcomes will be achieved. In any event the report demonstrates the value of detailed audit and review at local, operational level where progress is clearly unsatisfactory.

Conclusion

There is a growing consensus among both policy makers and policy analysts that targets are in some way essential in plans for reducing population health inequalities. Moreover, the development of 'high level' targets has been identified as a key requirement of effective policy making [23].

But the process of setting and monitoring health equity targets is more complex than might be expected. Despite the fact that experience in the different parts of the UK is as advanced as anywhere in Europe we have identified both conceptual and operational dilemmas that ought to be more clearly understood and acted upon

In the case of infant mortality for example, unless the spotlight focuses on appropriate populations, then the targets devised cannot be used as accurate measures of progress or otherwise. Similarly, if figures collected for smoking in pregnancy are recorded wrongly then information on progress towards targets is unreliable. And if, as we discussed finally, the health inequalities gap itself is under critical scrutiny, what do we make of it (changes in size - lengthening or shortening) as a policy target? In general, what do we do about targets if they have so many actual and potential flaws?

The immediate answer cannot be to be rid of targets altogether, as is sometimes suggested. Simply put, whatever the problems with targets we cannot renounce policy priorities and neither can we stop measuring progress towards them. Rather we must stay aware that figures on progress can be wrong because of target imperfections and that the solution involves changes to both the construction and use of targets. First, there is a need for more accurate data to construct the targets, while at the same time having some broad but focused intermediate goals and indicators as pointers to progress. The queries around the changing size and shape of the health inequalities gap also suggests that government shouldn't pay too much attention to any particular target in isolation.

There are many different ways to specify health equity goals and to establish monitoring systems to review and report on progress towards meeting them. What is most important is that targets make sense in the policy context where they are employed, that they are closely monitored and that the results are disseminated for public scrutiny. On balance, though, we believe that the most sensible approach may be similar to that originally advocated by the MIHWG [10] in Scotland but ignored by the Scottish Executive in actually setting targets. There may also be considerable merit in a broadly similar approach being developed by the Norwegian government in its *National strategy to reduce inequalities in health* [24].

In both cases there is a strong commitment to monitoring a basket of indicators to gauge progress in tackling inequalities but without specifying targets in terms of precise levels of reduction within specified timeframes. Whatever approach is adopted it is crucial in our view that health inequality goals should be linked to indicators that can be updated on a regular basis, that the data is widely disseminated, and that regular reports should be produced by government agencies explaining what progress, or lack of it, has been made.

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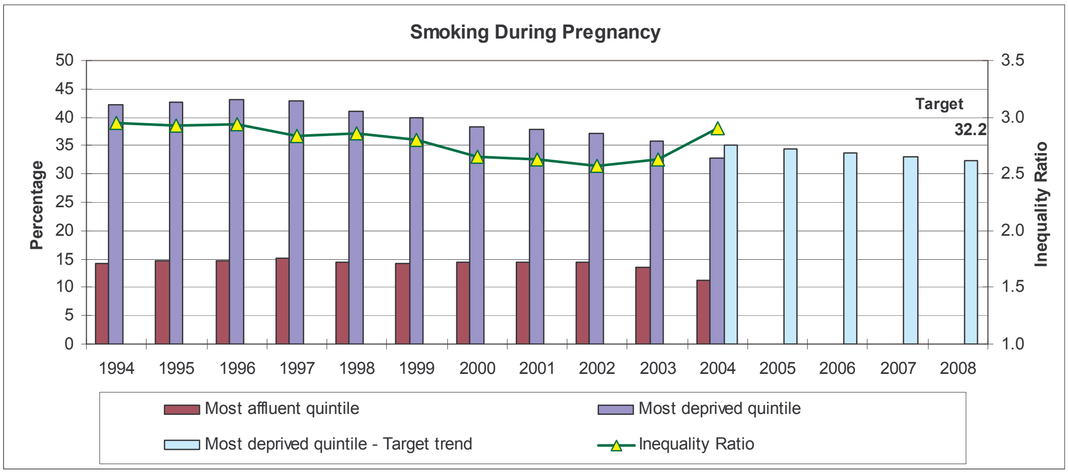
Table 1: Progress towards Health Inequality Targets in England, Relative Gap (% difference)

Target	1995-97	1997-99	1999-2001	2001-03	2003-05
	%	%	%	%	%
Life expectancy					
- males	2.57	2.66	2.62	2.61	2.61
- females	1.77	1.85	1.85	1.87	1.91
Infant mortality	14	13	17	19	18

Source: Health Inequalities Unit, Tackling Health Inequalities: 2003-05 data update for the National 2010 PSA Target, Department of Health, London, December 2006

Figure 1



Source: Scottish Executive, 2005

Table 2: Infant Mortality by Social Factors, England and Wales, 2005

Category	**Live Births**	**Infant Deaths**	**Infant Mortality Rate**
Joint Registered	600,716	2,874	4.78
Sole Registered	45,165	314	6.95
Total	645,881	3,188	4.94
NS-SEC (10% sample)			
1.1	4,437	124	2.79
1.2	6,013	225	3.74
2	12,169	450	3.70
3	3,457	176	5.09
4	8,220	332	4.04
5	7,857	302	3.84
6	6,628	429	6.47
7	7,893	475	6.02
Other	3,612	318	8.80

Source: Office of National Statistics, "Infant and perinatal mortality by social and biological factors, 2005", Health Statistics Quarterly, 32 (Winter 2006), 82-86

Table 3: Smoking during pregnancy: Numbers of births by self-reported smoking status, Glasgow, 1977-98 to 2001-02

Year	**MOST DEPRIVED QUINTILE**					**LEAST DEPRIVED QUINTILE**				
	Births	**Smoking Status**				**Births**	**Smoking Status**			
		never	**current**	**former**	**d/k**		**never**	**current**	**former**	**d/k**
1997+98	11,154	5,105	4,981	932	136	2,942	2,355	299	234	54
Rate		45.77	44.66	8.36	1.22		80.05	10.16	7.95	1.84
2001+02	9,449	4,699	3,564	680	506	2,668	2,164	264	182	58
Rate		49.73	37,72	7.20	5.36		81.11	9.90	6.82	2.17
Change	**-15.3%**	**+3.96**	**-6.94**	**-1.16**	**+4.14**	**-8.9%**	**1.06**	**-0.27**	**-1.13**	**0.34**

Part VIII

Policy recommendations

Chapter 33

Strategies to Reduce Socio-economic Inequalities in Health in Europe: Lessons from the Eurothine Project

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Introduction

Background

At the start of the 21st century, all developed countries are faced with substantial inequalities in health within their populations. People with a lower level of education, a lower occupational class, or a lower level of income tend to die at a younger age, and to have, within their shorter lives, a higher prevalence of all kinds of health problems. These health inequalities present themselves frequently as gradients, with mortality and morbidity going up gradually with each step down the social ladder. This leads to remarkable differences between socioeconomic groups in the number of years that people can expect to live in good health (‘health expectancy’). In all European countries with available data, differences in health expectancy typically amount to 10 years or more, counted from birth [1].

The current interest in health inequalities can be linked, at least in Europe, to the publication of the Black report in England in 1980, which documented the widening of health inequalities despite the advent of the National Health Service and the rise of the welfare state in the decades after World War II, and recommended a number of specific policies to reduce these inequalities [2]. The Black report contributed to heightened awareness of health inequalities all around Europe as well as in developed countries in other parts of the world. As a result, an enormous amount of descriptive data has been collected and analysed in many countries, testifying to the existence of substantial inequalities in health in all countries with good data.

While all these descriptive studies were going on, the emphasis of academic research in this area has shifted from description to explanation, not only to satisfy scientific curiosities but also to find entry-points for policies and interventions to reduce health inequalities. As a result, our understanding of the causes of socioeconomic inequalities in health has expanded tremendously, and has allowed interested policy makers to start searching for strategies to reduce these inequalities. Countries are in widely different stages of policy development in this area, but in some countries (e.g. England) political windows of opportunity have arisen which have led to large-scale implementation of policies to tackle health inequalities. In other countries (e.g. Sweden, the Netherlands, Norway) comprehensive plans have been developed for tackling health inequalities, which are in various stages of implementation [3].

This chapter aims to bring together the policy implications of the results of the Eurothine project, an international collaborative project funded by the European Commission. Within this project, a number of descriptive and explanatory studies of socioeconomic inequalities in health have been conducted, taking advantage of the variation in health, health determinants and socioeconomic conditions within Europe. Also, a number of reviews of intervention effectiveness and evaluation studies of specific policies to tackle health inequalities have been carried out. This chapter presents the lessons learned in this project, within a general framework based on the necessary ingredients of strategies to tackle health inequalities.

General framework for policies to reduce health inequalities

Socioeconomic inequalities in health have been documented for years, at least since the 19^{th} century, and we cannot expect to be able to reduce them substantially without a powerful, sustained and systematic effort. Several attempts have been made to develop systematic strategies to tackle health inequalities [3-6], and our digest of these attempts is that reducing health inequalities requires the following: political commitment; attainable objectives; package of effective policies and interventions; effective implementation; evaluation and monitoring.

Political commitment

Reducing health inequalities requires action in many fields, and deciding for such policies will usually require political decision making. Fortunately, however, an engagement to reducing health inequalities is not the monopoly of a single political ideology. Policies to reduce health inequalities can be justified on the basis of various ideological perspectives, not only the egalitarian perspectives which tend to determine social-democratic political choices. A liberal perspective can also lead to an engagement with reducing health inequalities, particularly among children, for example on the basis of the need to achieve equal opportunity for social and economic success. Similarly, religiously inspired preferences for ‘solidarity’ with the disadvantaged may also provide a basis for policies to reduce health inequalities [7].

An analysis of the recent history of engagement with tackling health inequalities in various European countries clearly shows the importance of political commitment. The cold reception of the Black report by a Conservative government in Britain is just one well-known example of how the absence of political will can lead to years of ignoring health inequalities in health and other policies, despite abundant evidence about their importance for population health. It was only after the change from a Conservative to a Labour government in Britain in the late 1990’s that health inequalities became a legitimate object of policy-making in this country [8]. Similar changes in political commitment have been observed elsewhere, for example in Spain (where a ‘Spanish Black report’ was ignored by a conservative national government in the late 1990’s) [9] and in the Netherlands (where the recommendations of the ‘Albeda committee’ were largely ignored by a center-right government in the years 2002-2007) [10].

Attainable objectives

Although socioeconomic inequalities in health have been found in all countries with available data, the existence of variations in the magnitude of health inequalities over time or between countries suggests that health inequalities are to some extent modifiable. Evidence from Britain suggests that inequalities in mortality were large in the early 20th century, declined until 1950, and then started to rise again [11], suggesting that if we identify the driving forces behind these changes we can reduce these inequalities again. Previous studies of our group have shown that in the 1980’s and 1990’s there were clear differences between countries in the magnitude of health inequalities, in particular for specific diseases like ischemic heart disease [12,13], suggesting that if we identify the determinants of these variations we can reduce health inequalities in those countries where current inequalities are relatively large.

These variations can be used to inform quantitative target setting, a policy instrument which has been introduced in this field by the World Health Organization which included a 25% reduction of health inequalities among its targets for the Health For All by the Year 2000 strategy [14]. The formulation of quantitative targets may help to steer policy, and to provide a benchmark for evaluation. For this reason, several European countries have introduced quantitative targets in their health policies, including their policies to reduce health inequalities [15,16].

Package of effective policies and interventions

Strategies to reduce health inequalities should be evidence-based. This implies that entry-points are chosen carefully (e.g. that the determinant addressed by the policy or intervention plays a key role in generating health inequalities), and that interventions can be expected to work (e.g. that there is theoretical and/or empirical support for their effectiveness).

Studies investigating the explanation of health inequalities in various European countries have identified a wide range of entry-points, from reducing inequalities in income and other resources to providing extra health care to disadvantaged population groups, over reducing exposure to specific health determinants like smoking and occupational risk factors in lower socioeconomic groups [17]. There is no agreement on which of these levels provides the best entry-point, but it is likely that strategies which simultaneously address a range of entry-points will be most effective.

Studies investigating the effectiveness of policies and interventions to reduce health inequalities are scarce [18]. The need for such evidence has only been recognized recently, and because of the size of the task and the practical barriers to collect this evidence, no single country has the resources to rapidly build a satisfactory evidence-base. Exchange of research findings between countries, and systematic assessments of the available evidence are therefore needed.

Effective implementation

There is often a great gap between the intentions of policy-makers, and the actual delivery of policies and interventions to the populations concerned. This applies generally to all fields of policy, but is an even more serious problem in the field of reducing health inequalities, where it is essential that large sections of the population are reached by the policies and interventions which have been chosen, and that the latter are delivered according to standards. This has important resource implications, as well as implications for delivery modes and quality assurance procedures.

Very few countries have experience with delivering policies and interventions which explicitly aim to reduce health inequalities. England is the most important exception, where a systematic approach to implementation has been developed. Critical to this process of implementation has been a regular stream of official reports setting out the rationale for interventions, the progress being made, and audits of practical developments [19-21].

Evaluation and monitoring

Currently, the basket of policies and interventions which have been shown to be effective to reduce health inequalities is still very limited. This implies that new policies and interventions will have to be developed, and, perhaps more importantly still, that all policies and interventions that are implemented are evaluated carefully.

Even if strategies to reduce health inequalities employ packages of policies and interventions of known effectiveness, it is still necessary to assess whether the strategy helps to reduce health inequalities at the population level. Continuous monitoring of health inequalities therefore is essential, and will also help to sustain the political will to reduce health inequalities over an extended period of time [22].

Outline of this chapter

We will present the policy lessons of the Eurothine project in three sections. We will first summarize our findings on ‘variations in health inequalities between countries’, and list opportunities and priorities for reducing health inequalities in Europe. It can, among other things, inform discussions about what are ‘attainable objectives’ in this field.

The following section of this chapter summarizes our ‘explanatory studies’, and although these are mainly limited to health behaviours and health care, this section provides some important suggestions with regard to entry-points for policies to reduce health inequalities in Europe. Among other things, it suggests that there are differences between countries in what are the most important entry-points for policy.

The next section of this chapter summarizes our ‘evaluation studies’, and lists the main results of our evaluations of policies and interventions in three fields: quantitative target setting, labour market and welfare policies, interventions and policies to improve health-related behaviours, and health care interventions and policies.

The final section of this chapter contains our main conclusions and recommendations.

Variations in health inequalities between countries

A general note on monitoring health inequalities

As explained above, routine production of population-wide data on health inequalities is important for many reasons, e.g. for keeping health inequalities on the political agenda and for monitoring the effect of national strategies (or the lack thereof) on health inequalities. Recommendations for monitoring health inequalities in the European Union have been formulated previously [22], and although the data situation is slowly improving, the Eurothine project shows that it is still far from satisfactory.

The main gaps in data collection in the European Union are:
- Certain countries lack even the most basic descriptive data on socioeconomic inequalities in self-assessed health and mortality. This applies especially to mortality.
- Many countries which do collect basic descriptive data have severe deficiencies in those data, e.g. small sample sizes of surveys, unlinked cross-sectional designs for mortality data, too low frequency of data collection, etc.
- Many countries only collect data on self-assessed health and/or mortality by socioeconomic status, and do not collect data on socioeconomic inequalities in other health outcomes, such as cancer incidence and survival, injuries, etc.
- Many countries do not systematically collect information on socioeconomic inequalities in relevant health determinants, such as material living conditions, psychosocial factors, health-related behaviours, and health care utilization.
- Finally, even if satisfactory data are collected, international comparability is often far from optimal.

This implies that the European Commission has an important role to play in improving data availability, by specifying in its data collection directives that countries should routinely report on socioeconomic inequalities in a number of health outcomes and health determinants, according to standard specifications.

First thing to note is not variations, but ubiquity

In the Eurothine project we have found that socioeconomic inequalities in health are substantial everywhere in the European Union, both in terms of (premature) mortality and in terms of self-assessed health [23]. This confirms what we and others have found before: there is no European country in which reducing health inequalities should not be a priority for public health policy. During the past two decades, there is no clear tendency for health inequalities to become smaller over time. On the contrary, some health inequalities, particularly relative inequalities in mortality, are increasing over time in many European countries [24].

Although we see good opportunities for reducing health inequalities, the ubiquity of health inequalities shows that we should not be too optimistic about the feasibility of reducing health inequalities substantially within a short period of time. This is all the more the case as even highly developed welfare states like those in the Nordic countries have substantial inequalities in health, not only on a relative but often also on an absolute scale [23]. Apparently although universal welfare policies effectively reduce inequalities in income, in access to adequate housing, in access to health care etc., they are not a guarantee for eliminating health inequalities. They might be considered necessary but insufficient measures to reduce health inequalities. This clearly points to the need to develop innovative approaches which are geared to the nature of health inequalities in modern Western societies.

Opportunities for reducing health inequalities: health inequalities which are smaller in some populations

Variations in the magnitude of health inequalities between countries suggest that reductions are feasible. At the level of general health measures, the main variations are those in inequalities in mortality. In our studies, we found that the smallest inequalities in mortality, both on a relative and an absolute scale, are seen in some Southern European populations (Torino, Barcelona, Madrid, and the Basque county) [23]. This illustrates that health inequalities are not immutable, and that substantial improvements in the European Union as a whole are theoretically possible.

Variations between countries in the magnitude of health inequalities are much more striking at the level of specific diseases, such as ischemic heart disease, various cancers, and injuries for which we studied inequalities in mortality in a wide range of European countries. Both on a relative and an absolute scale the variations are immense. For ischemic heart disease, inequalities in mortality are almost negligible in some Southern European populations, comparatively speaking, but the same applies to lung cancer in Sweden, cerebrovascular disease and injuries in England, etc. [23,25,26]. If one could combine the smallest disease-specific inequalities observed anywhere in Europe into one counterfactual scenario, inequalities in mortality in the European Union could almost be eliminated. This of course presupposes that we know how some populations have achieved much smaller inequalities for a particular disease outcome than others, and that is not yet the case. Nevertheless, these variations provide some tantalizing suggestions.

More effort continues to be needed to understand the patterns and dynamics of health inequalities. A better understanding of what explains between-country and temporal variations in health inequalities will help us not only to find opportunities for tackling them, but also to more clearly see what degree of health inequalities might actually be avoidable.

Priorities for reducing health inequalities: health inequalities which are larger in some populations

In the Eurothine project we have also found that some health inequalities are systematically larger in some populations. The most important example is that both relative and absolute inequalities in mortality are larger in many Eastern European populations [23,27]. This suggests that tackling health inequalities is a particularly urgent priority for public health policy in Eastern Europe. The European Union could support national and local policies in these countries by recognizing this priority in its own policies, not only in the public health field but also in other areas (e.g. structural funds).

Another main finding of the Eurothine project is that the contribution of specific diseases to health inequalities clearly differs between national populations, e.g. ischemic heart disease largely drives mortality inequalities in the North and West of Europe, but is relatively unimportant for mortality inequalities in the South. In Southern European populations, cancer is relatively more important as a cause of inequalities in mortality. In Eastern Europe, external causes are relatively more important [23,25,27]. To the extent that policies to reduce health inequalities address specific determinants, these findings show that different countries need different policies. For example, if one wants to reduce inequalities in mortality in Northern Europe, one should prioritize interventions which help to reduce inequalities in ischemic heart disease, but this should not be a priority (as far as health equity is concerned) in Southern Europe.

Determinants of health inequalities

A general note on explaining health inequalities

Previous research has shown that socioeconomic inequalities in health have a complex explanation. The fundamental factor is that social stratification is associated with inequalities in access to various resources, both material and immaterial. It is generally recognized that the link between socioeconomic position and health rests on two mechanisms, an indirect ‘causal’ effect of socioeconomic status on health, through inequalities in access to various resources, and a ‘selection’ effect of health on socioeconomic status, through inequalities in opportunities for upward, or risks for downward, social mobility. The ‘causal’ effect of socioeconomic status on health is likely to be mediated by a range of factors, including material living conditions, psychosocial conditions, health-related behaviours, and health care utilization [28,29].

Because of limitations in the type of data available at the European level, we have collected evidence on two groups of factors only, health-related behaviours and health care utilization. These are not necessarily the most important mediating factors, but do provide clear entry-points for policies and interventions to reduce health inequalities. It is important to note that the type of evidence which international comparisons can provide is complementary to the type of evidence from individual-level studies, e.g. prospective cohort studies. While the latter are stronger in providing evidence on causality (e.g. by their longitudinal nature, and by providing opportunities to adjust for confounding factors), international-comparative studies take advantage of a wider range of variation in inequality in health determinants.

Health-related behaviours

In most European countries, smoking is strongly patterned by educational level, occupational class, income level, wealth, etc. [30]. We have been able to study socioeconomic inequalities in smoking in the whole of Europe, including Eastern Europe, and have found important differences between countries in the social patterning of smoking, particularly among women. We have found indications that some of these differences are explained by differences in gender emancipation [31]. Our findings suggest that between-country differences in the social patterning of smoking play an important role in explaining international patterns of health inequalities, particularly for mortality [23,26]. This confirms the important role of smoking in generating health inequalities as found in many individual level studies, and suggests that smoking is an important entry-point for policies to tackle health inequalities in many European countries, particularly those in the North, West and East. This applies less to Southern Europe, but policies to prevent uptake of smoking in lower socioeconomic groups in the South may help to prevent larger health inequalities in the future.

Differences between countries in the social patterning of excessive alcohol consumption are also likely to play an important role in explaining international patterns of health inequalities [23,32,33]. Excessive alcohol consumption is a particularly important entry-point for policies to tackle health inequalities in Eastern Europe. Different patterns of excessive alcohol consumption are important in different countries, and policies and interventions should therefore be tailored to the specific behaviours prevailing in each country.

Many other health-related behaviours are also strongly socially patterned, and although the Eurothine study has not collected or found evidence on their role in generating health inequalities, they also provide possible entry-points for policy. This applies to obesity, for example, which is strongly socially patterned, particularly by education, among women and in Southern Europe [23,34,35]. Although we have not been able to study its role in generating health inequalities, with the exception of diabetes [36], it is likely that inequalities in obesity will contribute to larger health inequalities in the future, and are therefore an important entry-point for policy in many countries, particularly in Southern Europe. This includes leisure-time physical activity, which we also found to be strongly socially patterned in many European countries [37].

Health care

In the Eurothine project we have found evidence that lack of access to good quality health care is part of the causal chain leading from low socioeconomic position to ill-health, because there are important socioeconomic differences in mortality from conditions amenable to medical intervention [23,38]. These differences are found everywhere, but particularly in Eastern Europe, suggesting that improving access to good quality health care should be a high priority there [23,38].

Survey data which were analysed in the Eurothine project show that many forms of health care utilization are more frequent in higher socioeconomic groups. In many European countries, higher socioeconomic groups more often use specialist care for their health problems [39]. Also, lower socioeconomic groups more often report to have forgone health care because of the costs, or because they were not available [40]. In many countries, lower socioeconomic groups also less often use preventive care, such as flu vaccination and breast cancer screening [41].

This implies that improvements in the health care system can play a role in reducing health inequalities in many countries, and that policies to promote financial, geographical and cultural access to good quality health care services for people with low socioeconomic status should be a priority for health care policy in all European countries. It should be a special priority in Eastern Europe.

Effectiveness of interventions and policies

A general note on evaluating interventions and policies to reduce health inequalities

There is a general paucity of evidence in this area, so it is important to continue constructing a systematic evidence base. Within Eurothine, only a modest contribution could be made to this objective, both in terms of coverage of relevant entry-points for policy, and in terms of strength of evidence which could be collected. Nevertheless, we have brought together some interesting new evidence in four areas, to be summarized in the following paragraphs. This was partly guided by two new instruments which we developed, a set of 'criteria for assessment of evidence' (consisting of 5 steps, in which 4 criteria are applied to evaluate the evidence collected in a single evaluation study) [42] and a 'transferability instrument' (consisting of 4 steps, during which the transferability of evidence from one setting to the other is assessed) [43].

Because of the complexity of the task, and the practical barriers for conducting evaluation studies, no single country has the capacity to build a comprehensive evidence-base for tackling health inequalities on its own. It is therefore essential to create opportunities for mutual learning from each other's evaluation studies. Not all studies are published in the international (English-language) literature, however, and even if they are there are considerable time-lags between the availability of the study results and the moment they are published. A clearing house is needed for pro-active identification, thorough evaluation, and quick dissemination of evidence from around Europe that can help policy-makers at the European, national and local levels to develop rational strategies for tackling health inequalities. A proposal for such a clearing-house is presented elsewhere [44].

Experiences with quantitative target setting

Many European countries nominally adhere to the 25% reduction of health inequalities target of the World Health Organization [45], but only a few have committed themselves to specific targets for reducing health inequalities in their health and other policies [46].

We have reviewed these experiences, and found some 'good practices' in the United Kingdom, where quantitative targets to reduce health inequalities exist in all four of its constituent parts [47]. Some (such as in Scotland) focus on improving the health of disadvantaged populations, whereas others (in England, for example) are concerned with reducing the gap between disadvantaged groups and more affluent comparator groups. England has the most extensive experience of using targets to drive forward its strategy of reducing health inequalities, and although progress has in some ways been disappointing, there are some interesting lessons to be learned.

England has adopted 'headline targets' in relation to life expectancy and infant mortality, which were negotiated with the Treasury and are part of public service agreements that commit the whole of government, and not just the Department of Health. There is ministerial commitment to monitoring progress in relation to the targets and to publish the results on a regular basis. Alongside data about the headline targets information from a wider basket of indicators about social, behavioural and health-care related determinants (such as child poverty, smoking, and access to general practitioners) are also published [47].

One of the most interesting features of the English experience with targets has been the commitment to pay close attention to the process of implementation. Partly as a result of the exposure to public scrutiny there have been cross-government investigations of why progress to date in achieving the targets has been modest. A review of the infant mortality target, for example, shows how greater attention to processes of implementation and performance management combined with better guidance about evidence-based policy options could stimulate faster progress in the future [47].

Although many conceptual and technical issues are still unresolved, we believe that quantitative target setting is a useful instrument which deserves wider application in all European countries that are serious about tackling health inequalities.

Labour market and welfare policies

In the Eurothine project we have tried to study the association between a country's welfare policies and the magnitude of health inequalities between lone and couple mothers. The reason for focusing on health inequalities between lone and couple mothers is that this is a field where clear effects were expected, but in our studies we did not find that relative or absolute inequalities in self-assessed health between lone and couple mothers are systematically smaller in countries with more generous welfare policies [48]. We should notice, however, that our studies did not have an optimal research design: they were rather simple cross-sectional studies, instead of longitudinal studies which relate changes in welfare policies at one point in time to changes in health inequalities during a follow-up period. We can therefore not conclude that welfare policies have no impact on health inequalities between lone mothers and couple mothers.

More generally speaking, most of the available evidence suggests that universal welfare services (including universal health services) and transfers do have an impact on improving the health of populations, and in particular on improving the health of vulnerable subpopulations [49]. The evidence about their impact on health inequalities between socioeconomic groups, however, has been less clear [50]. In the Eurothine project, we have performed a number of studies comparing the magnitude of socioeconomic inequalities in health between groups of countries with different types and levels of welfare provision (e.g. the Scandinavian or Social-democratic welfare regime, the Anglo-saxon or Liberal welfare regime, the

Continental or Bismarckian welfare regime, etc.) [23,51,52], or with different political traditions which can be expected to have had an impact on labour market and welfare policies (e.g. countries which have mainly been governed by Social-democratic or Christian-democratic parties, or which have only lately become Democracies) [53,54]. Although there were a few ‘positive’ findings (e.g., inequalities in self-assessed health appeared to be larger in some of the ‘late democracies’ in Southern Europe) [53,54], there were also a number of counterintuitive findings (e.g., health inequalities do not appear to be systematically smaller in the North of Europe) [23,51,52].

Several different explanations seem to be possible. In addition to the methodological explanation mentioned above, there is also the possibility that higher socioeconomic groups have benefited more from these welfare policies than the rest of the population, just like all improvements in health tend to take place more rapidly in higher socioeconomic groups of the population. If this is indeed the case, then this would call for a need to combine universal policies that affect the whole population with more targeted policies aimed at vulnerable populations.

We believe that further study of this important question is urgently required. Among the labour market and welfare policies which need to be studied with regard to their impact on health inequalities, special attention should be paid to policies aimed at encouraging participation in society, full employment, universal services and transfers, reduction of income inequalities, working life interventions, as well as environmental and consumer protection policies. These socio-economic and political determinants have been proven to be of great relevance in explaining the level of health of populations [49] and, therefore, it would be worth analyzing their impact on reducing health inequalities.

This is an area that calls for the development of data gathering systems that collect information on labour markets and welfare state policies that could provide evaluation of their impact on health inequalities. Part of the problem now is the lack of good quality longitudinal data that is comparable across different types of welfare regime, which would permit investigation of the possible links between changes in welfare policies and health inequalities.

Interventions and policies to improve health-related behaviours

In the Eurothine project we have also tried to assess the effect on health inequalities of various policies and interventions aimed to improve health-related behaviours, with a focus on smoking. We found some evidence that the implementation of comprehensive tobacco control policies is associated with lower smoking rates in lower socioeconomic groups. Pricing policies and bans on smoking advertisements policies are important ingredients of these policies [55]. Our evaluation of one intervention, the British NHS Stop Smoking Services, suggests that this can make a modest contribution to reducing socioeconomic inequalities in health, but more needs to be done to achieve a sizable reduction and new approaches need to be developed, evaluated and implemented [56].

These services were introduced after the publication of a major strategy for tobacco control in the white paper *Smoking Kills* in 1985. These treatment services were made available to all smokers, and typically consisted of 6-8 weeks group or individual counselling plus nicotine replacement therapy. Huge efforts were made to encourage disadvantaged smokers to access these services, and to achieve positive discrimination so that the provision of services was skewed towards smokers living in deprived areas. Although this was partly successful, the positive impact on reducing inequalities in smoking was undermined by delivering a standard package of care to all service recipients. As a result, disadvantaged smokers had lower cessation rates. Nevertheless, these British experiences show that if services can be tailored better to the variable needs and circumstances of smokers, there is a very real prospect of a substantial reduction in inequalities in smoking [56].

Health care interventions and policies

In the Eurothine project we were able to pay relatively much attention to health care interventions and policies, and although this should not be misunderstood as indicating that health care is the primary entry-point, our studies do suggest that health care interventions and policies can help to reduce health inequalities.

A review of studies evaluating different financing schemes confirmed that direct payments (including informal co-payments) by citizens for health care increases the risk of inequalities in health care utilization [57]. Also, a review of studies evaluating the effect of different ways of organizing female cancer screening programs showed that population-based programs, active recruitment strategies, involvement of primary care physicians, and strategies based on well-established theoretical models are effective in reducing socioeconomic inequalities in attendance rates [58]. Finally, our analysis of inequalities in utilization of preventive services among the elderly suggests that well implemented national programs with high coverage rates leave little room for inequalities in uptake [41].

General conclusions

(1) Socioeconomic inequalities in health are substantial throughout Europe, and represent one of the main challenges for public health policy in all European countries, as well as in the European Union as a whole. Reducing these health inequalities, by improving the health of people with lower levels of education, occupational class or income, will lead to substantial improvements in over-all population health.

(2) Variations in the magnitude of health inequalities between countries, both at the level of general health measures and at the level of specific diseases, strongly suggest that a reduction of health inequalities is feasible. At the same time, the ubiquity of health inequalities even in countries with well-developed social and health care policies warns against too great optimism, and shows that innovative policies and great determination will be required to achieve this goal.

(3) In order to reduce health inequalities, strategies should be developed which are powerful, sustained and systematic. This requires political will, attainable objectives, effective policies and interventions, effective implementation, and evaluation and monitoring. During the past decade, some European countries have

been making important first steps in developing, and sometimes implementing, such strategies but much more needs to be done.

(4) Policies and interventions to reduce health inequalities should be tailored to the specific pattern of health inequalities prevailing in a country. Countries differ strongly in the diseases which make the largest contribution to inequalities in over-all health, as they do in the health determinants which make the largest contribution to the explanation of health inequalities. Policies and interventions to reduce health inequalities deserve special priority in countries with relatively large health inequalities, particularly in Eastern Europe.

(5) Policies addressing ‘upstream’ determinants of health inequalities, including income and education, are necessary ingredients of strategies to reduce health inequalities, but the persistence of health inequalities in countries with universal welfare systems shows that they are not sufficient to eliminate health inequalities. Policies addressing ‘midstream’ and/or ‘downstream’ determinants are therefore also needed.

(6) Health-related behaviours (particularly smoking and excessive alcohol consumption) are important intermediary factors on the causal pathway between low socioeconomic status and ill-health in many countries. They represent important entry-points for policies and interventions to reduce health inequalities. The evidence collected in this study suggests that comprehensive approaches, tackling a range of determinants of these behaviours, and including still-to-be-developed innovative methods, are likely to be needed to effectively reduce socioeconomic inequalities in health-related behaviour.

(7) Lack of access to good quality health care is likely to be an important intermediary factor on the causal pathway between low socioeconomic status and ill-health in some countries, particularly in Eastern Europe. Avoiding these inequalities is an important entry-point for policies and interventions to reduce health inequalities, and requires no or few direct payments by consumers, and organizational measures to improve access for lower socioeconomic groups, including access to prevention programs.

(8) Quantitative target setting is a useful instrument to guide policy making, and to support the evaluation of strategies to reduce health inequalities. Variations between European countries in the magnitude of (disease-specific) health inequalities can be used to find attainable targets for health inequalities. Quantitative targets for inequalities in determinants contributing to health inequalities may help to steer policies in the right direction.

(9) Monitoring of health inequalities should be improved in many countries. All European countries should be able to monitor socioeconomic inequalities in mortality, morbidity and health determinants on a routine basis, following generally accepted monitoring guidelines. The European Union should promote this by including the socioeconomic dimension in its health data collection guidelines. At the European level, a databank should be created which allows comparisons of health inequalities between countries and over time.

(10) Further research is needed to increase knowledge about possible entry-points for policies and interventions to reduce health inequalities, and to evaluate on-going and newly developed policies and interventions. Although most of this research will need to be funded by national funding agencies, the importance of the findings for many other countries justifies considerable investments at the European level too. European funding is essential for studies which want to take advantage of variations in determinants or policies between European countries. A clearing-house should be established to pro-actively identify and assess evidence on the effectiveness of policies and interventions to reduce health inequalities throughout Europe.

(11) It may not be realistic to eliminate health inequalities in the foreseeable future, but reducing them to more acceptable levels is well within the realm of possibility. What is required is a genuine determination to follow the logic of emerging evidence, and to apply it to the health outcomes of greatest concern in any particular setting. Health inequalities can be reduced if we really choose to.

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Part IX

Appendices

Appendix A

Judging the transferability of results of foreign studies on the effectiveness of interventions to reduce health inequalities

Instrument developed by Department of Public Health, MC Rotterdam
Case study: Smoking cessation services in deprived areas in England

Structure of instrument

Part 1. Description of the results of the intervention study
1.1. Key documents and other sources of information
1.2. The intervention method
1.3. The internal validity of the evaluation study
1.4. The observed effectiveness in lower SES groups
1.5. Summary and conclusion

Part 2. The potential relevance of the study to the Netherlands
2.1. Potential effect of this type of intervention on health inequalities
2.2. Relationship of this type of intervention to current policies, programs and interventions
2.3. Evidence needed for development and evaluation of this type of interventions
2.4. Summary and conclusion

Part 3. Implementation of the intervention within the Netherlands
3.1. Experiences with the implementation of the intervention within the study population
3.2. Problems and possibilities for implementation of the intervention in Dutch practice
3.3. Possibilities to adjust the intervention according to the Dutch situation
3.4. Summary and conclusion

Part 4. Effectiveness in the Dutch context
4.1. Mechanisms and factors that may explain the observed effect
4.2. Differences between the Netherlands and the study population in relevant factors
4.3. Observed variations in effectiveness according to population, place and period
4.4. Estimation of effectiveness in case of implementation in the Netherlands
4.5. Summary and conclusion

Part 5. Conclusion

Appendix 1: Abstract of key document

Appendix 2: Background to the instrument

Part 1. Description of the results of the intervention study

1.1. Key documents and other sources of information

Key document

- *Bauld L, Chesterman J, Ferguson J, Judge K. "NHS Stop smoking services and health inequalities". Draft.*

Other documents on the intervention

- *Bauld L, Chesterman J, Judge K, Pound E, Coleman T. "Impact of NHS smoking cessation services: variations in outcomes in England". Tobacco Control, 2004.*
- *Chesterman J, Judge K, Bauld L, Ferguson J. "How effective are smoking cessation services in reaching smokers in disadvantaged areas in England?" Addiction, 2004.*

Relevant literature consulted

Literature from England, Netherlands and other countries on SES differences in smoking, especially on differences in smoking cessation and success with cessation attempts. We also consulted studies on the effectiveness of interventions at personal level and area level aimed to help smokers stop smoking. In the latter literature, including some Cochrane reviews, there was little attention to SES differences in effectiveness of the interventions.

Did you obtain sufficient documentation to judge the transferability of the results?

Yes, more or less. The three documents mentioned above contain detailed information on both the implementation of the intervention and on its effectiveness according to SES group.

1.2. The intervention method

What is the general strategy of the intervention?

To offer smoking cessation service within local communities

What are the key elements of the intervention?
(Mention elements that would be maintained in case application to the Netherlands. Also mention innovative elements, which aim to enrich the current approaches.)

- *Development of a national system of "NHS Stop Smoking Services" with a focus on deprived areas;*
- *Integrated supply of different types of methods and means that may be increase a person's chance to successfully stop smoking;*
- *Supply of these methods and means in such a way that they are accessible, affordable, and acceptable to people who live in deprived areas.*

How was the intervention carried out in the study population?

- Ultimate, health-related objectives.

The aim was to improve the utilisation and the effectiveness of smoking cessation services by smokers in England, and especially those living in deprived areas.

- The target population (size, age-sex structure, SES composition), place (country, region, area) and period

A large number of areas in England, with special emphasis to deprived areas ("Health Action Zones"). The evaluation of the effectiveness is based on a study in two areas (Nottingham en North Cumbria) with well-developed smoking cessation services. Observation period is 2002-2003. Smokers living in deprived areas and with low education and income are over-represented in the study.

- The intervention products (e.g. information, personal advise and care, improvement in living and working conditions, laws, health care programs).

Within each area, a smoking cessation coordinator was appointed. This person had to develop a series of smoking cessation services, such as one-to-one contact with "smoking cessation advisers", group sessions and support, and supply of NRT or other medication.

- Other information. Persons who delivered the intervention products (e.g. physicians, nurses, social workers, peers), settings where they operated (e.g. hospital, school, work place, institution, local centre) and supportive measures.

The smoking cessation coordinators cooperated to a varying degree with locale GP's and other health care professionals. They also involved local services, such as social centres and pharmacies. Much effort was invested in making the services accessible and acceptable for the local population, e.g. by (a) recruiting personnel from the local population, (b) disseminating information on the smoking cessation services through local channels and (c) placing the services at accessible and well known places such as local health clinics.

1.3. The internal validity of the evaluation study

What is the general design of the study?

Interview survey with one-year follow-up (N=2069).

Is this design sufficiently strong for the evaluation of the effectiveness this intervention?

Yes. A RCT might perhaps have been possible, but in this case an observational study with longitudinal design is in principle adequate to demonstrate the effectiveness.

Are there other problems with the evaluation study that could have affected the internal validity of the results (tick below).
X other problems with design of study (1,2)
O implementation of the study is poor
O evident problems with selection of participants
O evident problems with confounding
O statistical analysis is poor
O statistical power is low
O reporting is incomplete
X other (3)

Explanation
1: The study is limited to smokers who use the smoking cessation services. There is no information on trends in smoking cessation in the target areas at large.
2: There is no control group or control area for which "autonomous" smoking cessation trends could have been measured. However, according to the authors' evaluation, this cannot seriously have affected the validity of their results.
3: There are a few more specific problems, such as the lack of CO validation to quit rates. To our judgment, these problems cannot have biased the results of the study to an important extent.

General judgment of the internal validity of the evidence
O very strong O strong X sufficient O weak O very weak

1.4. The observed effectiveness in lower SES groups

What are the outcome measures (including control groups) to be used to asses the effectiveness of the intervention?

(1) The % of smokers that have used the smoking cessation services by setting a quit date at these smoking cessation services. (2) The % of quitters who were still smoke-free after 12 months. There is no control group.

In these terms, how large is the effectiveness of the intervention among lower SES groups (or in the entire study population, if this mainly consists of people with low SES)?

See table 1. Lower SES groups use smoking cessation services more often than higher groups. There is a twofold difference between the lowest and highest group (2.3 versus 1.3 %). The percentage of quitters who are successful after 12 months is lowest among the lowest SES group (13.0%) and about as large among the other groups (15 to 19%). The net effect is that in most SES groups, about the same % of all smokers (circa 0.40%) are smoke-free after 12 months.

Can the effectiveness be determined in a similar way for higher SES groups? If so, does the degree of effectiveness vary according to SES?

Yes. See above for details.

Does this mean that, assuming that the evidence has sufficient internal validity, the intervention is at least as effective among lower as among higher SES groups?

Yes. In relative terms (in %, as in table 1) the intervention is about equally effective in low and high groups. In absolute terms (i.e. the absolute number of smokers who are able to quit) the intervention may be more effective among lower SES groups. In any case, the intervention may help to reduce smoking prevalence in the general population, without increasing SES differences in smoking.

Table 1 The % of smokers that set a quit date, and the % of quitters who were still smoke-free after 12 months, by SES

SES (combination of education, housing tenure and living conditions)	% making a quit attempt (1)	% successful after 1 year (2)	% successful in relation to total number of smokers (1) * (2)
Lowest 20%	2,3	13,0	0,42
Next 20 %	1,9	15,0	0,38
Mid 20%	1,6	14,8	0,37
Next 20%	1,5	18,8	0,47
Highest 20%	1,3	16,9	0,17

1.5. Summary and conclusion

Summary of 1.1. Do you have sufficient information on the implementation and effectiveness of the intervention?

Yes.

Summary of 1.2. Is the general strategy and innovative character of the intervention sufficiently clear?

Yes.

Summary of 1.3. Can the evaluation study provide evidence with sufficient levels of internal validity?

Yes, even though there are a few data problems

Summary of 1.4. Does the available evidence indicate that the intervention was at least as effective among lower groups as among higher SES groups?

Yes, even though it may not be more effective

Conclusion. Could you recommend to evaluate this intervention study with regards to its relevance, implementation and effectiveness in the Dutch context?

Yes.

Part 2. The potential relevance of the study to the Netherlands

2.1. Potential effect of this type of intervention on health inequalities

Is the key target variable of the intervention (a health problem or health determinant) relevant to health inequalities in the Netherlands?

Yes. Smoking is an important determinant of socioeconomic inequalities in premature mortality and in the occurrence of some major chronic diseases. Smoking cessation is an important contributor to smoking inequalities in the Netherlands, as people from lower SES less often succeed in their attempts to stop smoking.

Is the general strategy of the intervention potentially relevant to address the health problem in the Netherlands? Does this also apply to lower socioeconomic groups?

Yes. The supply of smoking cessation services at the local level may increase the utilisation of effective means and methods to stop smoking. Establishment of local services may have additional value compared to existing services in the Netherlands, which all are based on health care facilities. The reach among lower groups may be increased especially if smoking cessation services would be made available locally in ways that are accessible, affordable and acceptable to the local residents.

Are the distinguished SES groups (or related groups with social disadvantage) relevant to the Netherlands?

Yes. The intervention study focuses on SES differences at two levels: at the area level and –within areas- at the household or individual level. Both dimensions are important for the supply of smoking cessation services. The SES groups that are distinguished at the individual level are defined in terms of both education and material living condition. This broad, encompassing definition is relevant to the Dutch context. Furthermore, it is useful that the study applies a fine stratification according to population quintiles.

Are the distinguished age and sex groups relevant to the study?

No information on the age range is given (probably it is representative of a population of quitters). A distinction between men and women is not made, although it would have been informative.

2.2. Relationship of this type of intervention to current policies, programs and interventions

Is this type of intervention already applied in the Netherlands at a large scale?

No. It is only applied on limited scale, in few areas. Not with the same systematic approach as in the English case. In addition, no special efforts are made to make local services available especially to lower SES groups and residents of deprived areas.

If this intervention is already applied, is there sufficient opportunity for further development and innovation?

-

In the Netherlands, may this type of intervention be redundant because of other, existing interventions, programs and policies? Does this explain why this intervention has not yet been developed in the Netherlands?

Yes. There may be overlap with existing smoking cessation services that are offered within health care facilities, such as GP centres and hospitals. Unlike the NHS in England, the health care system in the Netherlands is not district based. This may reduce the added value of a system of local stop smoking services in a Dutch context.

Are there possibilities for this intervention to link up with the current Dutch practice, including recent developments, current concerns of future changes?

Yes. There is increasing interest in the public health field to develop programs and services at the level of local communities. This may provide a context in favour of developing local smoking cessation services.

2.3. Evidence needed for development and evaluation of this type of interventions

Do we need scientific evidence for the development and implementation of new interventions among lower SES groups in the Netherlands? Can some of this evidence come from other countries?

Yes. We need evidence to show how smoking cessation services can best be made accessible to lower SES groups, and whether local services in deprived area are effective to this end. In the Netherlands, there is no evidence on the role of local smoking cessation services. Evidence from other countries, especially a “close” country like England, can help to estimate how effective such services may be in the Dutch context.

Is there a need for evidence that can be used to evaluate the effectiveness of existing interventions among lower SES groups in the Netherlands? Can some of this evidence come from other countries?

Not applicable

Can we expect that new evidence on the (lack of) effectiveness of this type of intervention will be taken into account (instead of being discarded) by policy makers and health care professionals?

Uncertain. Vested interests and practical concerns may dominate decision-making. However, there is a wide concern with persistently high levels of smoking in the Netherlands. Decision makers may therefore be open to evidence that show whether and how smoking cessation means and methods can reach a larger part of the Dutch population.

2.4. Summary and conclusion

Summary of 2.1. Can this type of intervention potentially contribute to reducing health inequalities in the Netherlands?

Yes

Summary of 2.2. Does this type of intervention link up with the current Dutch practice to a sufficient extent?

Uncertain. It does link up with community-based public health, but this type of service may be redundant given the available of other smoking cessation services within the Dutch health care system.

Summary of 2.3. Do we need information from other countries on the implementation and effectiveness of this type of intervention among lower SES groups?

Yes

Conclusion: Is the potential relevance of the intervention study for the Netherlands sufficiently high to look at the transferability of results?

Yes, even though the relevance may be reduced due to differences in health care organization.

Part 3. Implementation of the intervention within the Netherlands

3.1. Experiences with the implementation of the intervention within the study population

Which problems were encountered during the implementation of the intervention, and how have they been resolved?

• Problems with financing and continuity?

No, generally not. Services were developed with extensive financial resources from the NHS. Resources are important, also in terms of effectiveness. Areas with more resources were found to have achieved a greater reach among the population than areas with fewer resources.

• Problems with human resources and expertise?

Yes. In some areas, there were difficulties in contracting personnel and developing expertise. This especially occurred in the first years of the project. Areas where it was easier to attract and maintain personnel achieved a greater reach among the population than areas with fewer resources.

• Problems with organisation and services?

Yes. If the coordinator was not available full time, collaboration with other organisations and persons (e.g. nurses, pharmacies) could not be developed. This too had an effect on the reach of the services among the population. Local leadership was a decisive factor.

• Problems with political support?

No, not reported.

• Problems with acceptation and involvement of the population?

No, not reported.

•
Ethic problems, other problems (see also the next question)?

No, not reported.

Did the intervention have any negative side effects, especially on lower SES groups? If so, what measures were undertaken to address these problems?

No, not reported.

3.2. Problems and possibilities for implementation of the intervention in Dutch practice

Which problems and factors could make this type of intervention fail in the Netherlands?

• Problems with financing and continuity?

Yes. The need for large investment in financial and human resources may be an obstacle to the implementation in the Netherlands.

• Problems with human resources and expertise?

Yes, as above.

• Problems with organisation and services?

Yes, there is potential competition and conflict with health care providers (GPs, specialists, specialised nurses) in other sectors of the Dutch health care system. At least, coordination of services would be strongly needed.

• Insufficient political support?

No major problems expected.

• Insufficient acceptation and involvement of the population?

No major problems expected.

• Ethic problems, other problems (see also next question)?

No major problems expected.

What factors or processes could make this type of intervention succeed in the Netherlands? (Do not mention factors that simply mirror the problems mentioned above.)

(a) Evidence to show that available means and methods of smoking cessation will be used by hard-to-reach groups if these are provided by specialized local services.
(b) Raising the interest in this type of delivery service of possible stakeholders, such as local health district offices, local health insurance companies, pharmacies, and pharmaceutical companies.

3.3. Possibilities to adjust the intervention according to the Dutch situation

Adjustments to the intervention itself, taking into account the problems that were encountered within the study population.

No important adjustments were indicated. However, the experience warn that sufficient resources should be made available and some time is needed, before local smoking cessation services are created that have a considerable reach among the local population.

Adjustments to the intervention itself, taking into account the problems that are foreseen with large-scale application in the Netherlands.

A stepwise implementation is needed, in which the first step is to explore how the proposed stop-smoking services could fit into the Dutch health care system. The next step would be to explore how sufficient financial and human resources can be made available to set up effective services.

Adjustments made in order to better link up with existing interventions, programs and policies in the Netherlands.

Careful coordination is needed with the services that are currently provided by health care professionals. It may be underlined that the proposed type of service does not replace smoking cessation means and methods, but that it aims to increase their reach among lower socioeconomic groups and in deprived areas.

Focus of the intervention on specific population groups or geographical areas where the implementation is relatively easy or cost effective.

The services may be implemented in the Netherlands on a more limited scale, for example among a few specific municipalities or areas with special need for such services. Similarly, the services may concentrate on ethnic groups who have high smoking prevalence rates and who are concentrated in the main cities of Amsterdam, Rotterdam and The Hague.

Anticipate future changes in the Netherlands. Wait for new opportunities.

The Dutch health care system is changing rapidly, with an increasing role of health insurance companies, who are developing their own products, and exploring new markets. Also, community health districts may redefine their roles and instrument. Such developments may give opportunities for new and local type of smoking cessation services.

3.4. Summary and conclusion

Summary of 3.1. Were important problems met during the implementation of the intervention in the study population?

Yes, but also large differences between areas in the extent to which these problems have been resolved. Often, problems were encountered during the initiation phase, but they were resolved later on.

Summary of 3.2. What are the essential conditions that determine success or failure of implementation in the Netherlands?

Problems that may cause failure should be resolved. These require (a) linking up of local cessation services with the services that are already offered by the health care system and (b) creating the conditions for large investment in financial and human resources. Success may be stimulated by enhancing support of potential stakeholders.

Summary of 3.3. Are there possibilities to facility the implementation by adjustment to the Dutch situation? (other than those mentioned above)

Yes. It may be recommended to implement the services within fewer areas or for some ethnic minority groups.

Conclusion. Could this type of intervention be implemented in the Netherlands? If so, in which form, for who, when?

Uncertain. Implementation on short term is most likely on limited scale only. On a longer term, large-scale implementation might be possible, depending on current and future developments in the Dutch health care system.

Part 4. Effectiveness in the Dutch context

4.1. Mechanisms and factors that may explain the observed effect

Is the intervention based on a theoretical framework that specifies how the observed effect could have been achieved?

No.

If not, based on insights from the literature that you consulted, could you indicate through which factors and mechanisms this effect could have been brought about?

It is difficult to construct a clear and encompassing explanatory framework for such a large scale and complex intervention like this. We will distinguish the two outcome measures separately (see 1.4).
One of the outcome measures was the % of quitters who were still smoke-free after 12 months. This % was not higher among lower SES groups, but even generally lower (table 1, second results column). This lower rate of success is found in many studies, which attribute this to different factors such as stronger nicotine dependence, less supportive social environments, lower self-efficacy, and greater daily stress. In the English context, the same factors may play a role. The SES differences in success rates appear to be relatively small in this English case, which may perhaps reflect some favourable effects of the intervention, such as a more effective application of the smoking cessation methods in the local context.
The other outcome measure was the % of smokers that have used the smoking cessation services by setting a quit date at these smoking cessation services.
This % was clearly higher among the lower SES groups (table 1, first results column). Thus, the intervention was successful in reaching lower SES groups. Different

explanatory frameworks in the field of health care use may be used to explain this finding, such as the Andersen model or the distinction between the four A's of Accessibility, Affordability, Acceptability & Appropriateness. The NHS stop smoking cessation services paid considerable attention toe ach of these elements (see 1.2) even though from a practical rather than theoretical inspiration.

Do empirical studies related to the intervention show why the observed effects are greater, or at least as great, among lower SES groups?

This is not studied.

4.2. Differences between the Netherlands and the study population in relevant factors

Does the Dutch population differ from the study population with respect to the nature, occurrence and proximate determinants of the outcome measure?

Not much. The Netherlands and England are in a similar phase of the smoking epidemic. The overall prevalence of smoking is slightly lower in England. Possibly, in England a larger part of smokers belong to the group of "contemplators" (i.e. those who consider to stop, and perhaps have tried to do so, but who have failed to succeed until now). However, smokers in the two countries have probably an about similar "stage of change" distribution.

Does the Dutch population differ from the study population with respect to the interventions and policies that have been carried out in this area?

Not much. In general, tobacco control policies in England are slightly ahead of the Dutch policies. This especially applies in the development of smoking cessation services, many of which are free-of-cost in England but not in the Netherlands. However, the differences are small, and at short or medium term, smoking cessation services as they are developed in England might become part of the Dutch tobacco control policies as well.

Does the Dutch population differ from the study population with respect to the socio-demographic composition and socioeconomic stratification?

Not much. The two communities that have been evaluated concern a "medium sized urban community" and a "much more rural community". These two areas are in many respects comparable to the Dutch communities in urban and rural areas. Compared to the Netherlands, England has greater inequalities in relationship to income and to area of residence. However, it seems unlikely that these greater inequalities would have strongly influenced the effectiveness of the intervention.

Does the Dutch population differ from the study population with respect to the general factors, such as different histories, cultures, social structures or institutions, which could have influenced the results?

One possible factor is the willingness of people to turn to a professional for advice on smoking cessation (rather than considering this to be a private matter) and to look for a professional in one's own area (rather than looking for specific institutions). To our knowledge, there are no great differences between English and Dutch culture either in attitudes towards use of health professionals, or in orientation on local neighbourhoods. A structural difference is that the English health care system is organized district wise by means of local Health Authorities. This structure facilitated the formation of local smoking cessation services as a means to deliver the entire local population. The Netherlands lacks a district-wise organisation of health care; much is left to private initiative (under universal public insurance). As a result, it may be more difficult to create a national network of smoking cessation services.

4.3. Observed variations in effectiveness according to population, place and period

Did the study show that the intervention was about equally effective among lower SES groups for different age groups and for both sexes?

Unknown. Not studied.

Did the study show that the intervention was about equally effective among lower SES groups for different places (regions, cities, etc) and for different periods?

In different parts of England the new smoking cessation services were found to be effective among deprived areas. However, there is some variation between areas in the degree of effectiveness. There is no evidence from different areas on the effectiveness per SES group.

Do other studies show that this type of intervention was about equally effective among lower SES groups in other places (regions, cities, etc) or other periods?

Unknown. Not studied.

If there are indications that the effectiveness of this type of intervention varies according to population, place and period, which factors have been shown to cause these variations?

Variations between areas in overall effectiveness were mainly due to the extent to which services have had the time to be fully developed. More generally, these variations are not due to the use of different cessation methods in different areas, but they are due to differences in the way in which these methods were made available to the local population.

4.4. Estimation of effectiveness in case of implementation in the Netherlands

Assuming that this type of intervention would now be applied in the Netherlands, would there be reasons to expect the effectiveness to be lower than in the study population?

Yes. Under the Dutch health care system, it might be more difficult to set up a national or local system of smoking cessation services that would be able to effectively reach the local population.

Alternatively, assuming that the intervention would be applied in the Netherlands, are there reasons to expect the effectiveness to be higher than in the study population?

No.

Could the effectiveness of the intervention in the Dutch context possibly be increased by adjustments of the intervention to the Dutch situation (see section 3.3.). If so, how?

Yes. By (1) linking up of local cessation services with the services that are already offered by the health care system and (b) creating the conditions for large investment in financial and human resources. We should note that the intervention study concerned two areas with fully developed services; it may therefore be difficult to increase the effectiveness beyond the levels observed in these areas.

Assuming that this intervention would be applied in the Netherlands, and that it would be adjusted in ways indicated above, would its effectiveness be lower or higher than in the study population? (Do try to make a choice)

Lower. Perhaps it would be just slightly lower. It would only be higher under certain conditions that are unlikely to be realized in the Netherlands on a short or medium term.

4.5. Summary and conclusion

Summary of 4.1. Is it clear which factors and mechanisms are responsible for the effect of the interventions has been brought about?

More or less.

Summary of 4.2. Is the Dutch population similar to the study population with respect to all factors that could strongly influence the effectiveness of the intervention?

No. They are similar in most, but not all factors. There is a large difference in the extent to which health care services are organized geographically.

Summary of 4.3. Is the effectiveness of the intervention constant across populations, places and periods?

Uncertain. There are variations between areas, in relationship to the extent to which smoking cessation services had been developed.

Summary of 4.4. Could we expect that the application and adjustment of this intervention in the Netherlands would show lower or higher effectiveness than in the study population?

Probably lower.

Conclusion. How strong do you consider the transferability of the evidence on the effectiveness of this intervention?

O very strong O strong O sufficient X weak O very weak

Explanation
There is little insight into the mechanisms that explain the observed effects. Organizational factors seem to play an important role, and these factors may work out quite differently within the Dutch context.

Part 5. Conclusion

To part 3. On implementation.

Given the evaluation of part 3, how would you recommend to start the implementation of this type of intervention in the Netherlands?

O start directly at major scale (national or large regions)
X start only at minor scale (small areas or specific groups)
X first perform a small-scale experimental study
O do not start the intervention, because large problems are foreseen

A large-scale implementation cannot be justified, as large investments would be needed, while the effectiveness is yet too uncertain.

To part 4. On effectiveness.

Assume that this type of intervention would be applied in, and adjusted to, the Dutch context. Could the intervention study be used to estimate how effective this intervention may expected be among lower and higher SES groups?

No. Predictions of expected trends are not possible, given the large problems of transferability. The English study may however be used when defining intervention goals. If we would strictly follow the English results, these goals might be defined as: (a) the annual smoking cessation rate increases among lower SE groups to at least the *same extent as among upper groups, and (b) when services are fully developed, annual cessation rates will have increased by 0,3% to 0,5% points.*

Conclusion
What does this intervention study contribute to the evidence base for tackling health inequalities in the Netherlands? If its estimates of effectiveness cannot be transferred to the Dutch situation, what else could we learn from this study?

Even though estimates of the effectiveness of this study cannot be transferred to the Dutch context, the English study has the value to demonstrate that local cessation services may be developed to increase the utilisation of existing smoking cessation methods by lower SES groups. Even when the English intervention cannot be implemented in the same way within the Dutch context, some of its elements may be used in interventions that could be developed within the Netherlands, e.g. by District Health Offices. The key element of these measures should be to improve the accessibility, affordability and acceptability of effective smoking cessation methods for lower SES groups.

Appendix 1: Abstract of key document

Background: NHS Stop Smoking Services are a key part of the strategy to reduce inequalities in smoking prevalence in England. This paper aims to assess the contribution that services can make to a reduction in inequalities between social areas, which range from 32.1 per cent prevalence in the most disadvantaged communities to 23.3 in the most affluent.

Methods: Data were obtained about the personal and neighbourhood characteristics, smoking behaviours, treatment regimes and 52-week CO validated outcomes of 2069 smokers setting a quit date between May and November 2002 in two contrasting areas of England. The social distribution of quitters was compared with estimates of smoking prevalence to assess impact on inequalities. Potential longer-term impact was also simulated.

Findings: Success rates at 52 weeks are inversely associated with disadvantage, but the proportion of smokers being treated is greater among more disadvantaged groups. The net effect of services in a full year is to reduce smoking prevalence in the most disadvantaged quintile of the population by 0.42 per cent compared with 0.18 per cent for the most advantaged quintile. It is estimated that it might take as long as 50 years for existing levels of service provision to reduce inequalities by as little as 10 to 15 per cent.

Interpretation: NHS Stop Smoking Services can make a contribution to reducing inequalities in smoking prevalence. To achieve ambitious government targets, however, requires not only that more effective cessation services are developed but also that other aspects of tobacco control policy make a much larger contribution.

Appendix 2: Background to the instrument

An important target of international and national health policies is to reduce socioeconomic inequalities in health by improving the health of disadvantaged groups. Unfortunately, there is yet little scientific evidence on the effectiveness of different policies, programs and interventions that may be initiated or intensified in order to reduce health inequalities. The accumulation of this evidence base is a slow process, especially when the evidence should come from one individual country such as the Netherlands. The evidence base can be improved at a more rapid pace when experiences with similar interventions in other countries are added.

For this reason, an instrument was developed that should facilitate drawing lessons from policies, programs and interventions that have been carried out in other countries with the aim to reduce socio-economic inequalities in health. The instrument is intended for use by scientists who are searching for scientific evidence on the effectiveness of possible interventions to reduce socio-economic inequalities in health. More specifically, the instrument is intended for researchers working in one particular country, such as the Netherlands, who wish to learn from the experiences of other countries.

The instrument should be applied to individual intervention studies that evaluate specific policies, programs or interventions from other countries. For each single study, the instrument helps to assess whether evidence on the effectiveness of the studied intervention can be applied to one's own country. In addition, the instrument may help to determine how these interventions should be modified in order to facilitate their implementation and to increase their effectiveness in one's own country.

The instrument consists of four steps that (a) summarize key features and outcomes of the intervention study, (b) evaluate the potential relevance of the intervention to one's own country, (c) evaluate problems and possibilities with the implementation of the intervention and (d) evaluate the extent to which evidence on the effectiveness of the intervention can be generalized to one's own country. Each step is made up of a series of open-ended questions, which are preferably addressed by means of careful literature review and by discussions among a group of experts representing different disciplines.

In order to test and improve the instrument, it was applied to eight case studies from countries outside the Netherlands, mostly from the UK and the USA. The instrument and its application to these 8 case studies were discussed in a workshop with about 20 experts from the Netherlands. This workshop concluded with a series of recommendations for improvement of the instrument, which were taken into account in the current version of instrument.

In the final report 1, this instrument was applied to six case studies, all from the UK and USA. Most case studies were in the field of tobacco control 2-4 and dietary education 5-6, while one study evaluated integrated health care for asthma patients in inner city areas 7. Each case study dealt with the transfer of study results from the intervention populations towards the Netherlands. In the Dutch report, the six case studies were documented and evaluated according to the four-step procedure outlined above.

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Appendix B

Towards criteria for assessment of effectiveness of policies and interventions to reduce health inequalities

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Introduction

One of the main objectives of the Eurothine project is, “to assess evidence on the effectiveness of policies and interventions to tackle the determinants of health inequalities, and to make recommendations on strategies for reducing health inequalities in participating countries”. To achieve this objective, separate work packages will analyze evidence on the effectiveness of policies and interventions on health-related behaviors (VIII), health care policies and interventions (IX), and labor market and welfare policies (X). As a first step, criteria for the assessment of evidence will have to be developed and agreed upon. It is the purpose of this memo to propose a set of criteria that can be used in these three work packages.

As an introduction to this memo, we will first define the main concepts mentioned in this objective. An “intervention” is a set of specific actions with a coherent objective to bring about change or produce identifiable outcomes, while a “policy” is a more general plan of action to address a political issue (and may comprise various interventions). Their “effectiveness” is determined in relationship to the change of the outcomes that the interventions or policies aimed to produce. In these terms, interventions or policies may be successful or unsuccessful, or find themselves somewhere in-between. Outcomes in our case will usually have to be specified in terms of health or health determinants or their distribution (including health behaviour, health care utilisation and health-threatening living conditions). “Evidence” comprises the interpretation of empirical data derived from systematic investigations. These systematic investigations have in common that they focus on the data on the effects (intended effects, harms, unexpected positive effects, costs) of interventions. Such data may stem from experimental studies or from non-experimental studies.

We believe that the European dimension of Eurothine offers exciting opportunities for contributing to the evidence-base on effectiveness of policies and interventions to tackle health inequalities. First, because the evidence base from any single country is highly fragmentary, and therefore needs to be complemented with evidence from elsewhere. This is especially true for experiments that are evaluated for their effectiveness using high standards of internal validity. Such studies may be rare, especially when the additional focus on socioeconomic groups is desired. The few examples that are available throughout Europe may need to be evaluated and disseminated more fully.

Second, because differences between European countries themselves may provide ‘natural experiments’ of the effect of interventions and policies. The large heterogeneity of Europe provides new opportunities for learning. This especially applies to national-level policies, which may often be impossible to evaluate on an experimental basis, for which comparison to countries with different policies may provide useful lessons.

At the same time, the large heterogeneity between European countries raises the issue of transferability across different settings. “Transferability” encompasses the question of “external validity”: would the same degree/lack of effectiveness be observed within one setting also be observed in another setting? In addition, transferability refers to the questions on the implementation of the same intervention in different setting. Is it possible to implement an effective intervention in different settings? To what extent can this intervention be adopted to local situation, without seriously compromising its effectiveness?

We will start this memo by sketching the background of the 3 Eurothine work packages which are devoted to interventions and policies, and by outlining a general approach to building up an evidence base for policies and interventions to tackle health inequalities. We will then make two 'nested' proposals: one for a step-wise approach to create an optimal learning experience, and one for a set of criteria that can be used to assess the quality of evidence collected during evaluation studies.

Background

Within Europe, there is considerable diversity in the way scientific evidence is being used to underpin policies to reduce health inequalities. This is illustrated by the way three recently designed comprehensive blueprints were developed. The Acheson Committee commissioned 18 reviews of the evidence covering seven overarching policy areas, together with major socio-demographic factors over the life-course. Much of the evidence in the commissioned reviews related to the contribution of specific factors to the explanation of health inequalities, not to the effectiveness of policies and interventions tackling them [1]. By contrast, a Dutch strategy was developed at the end of a six-year research program in which 12 studies were carried out to assess the effectiveness of various intervention options. The results of these studies were then discussed with experts and policy-makers, to see how these fitted into the existing evidence-base and in current policy [2]. In Sweden the emphasis was on evidence relating to the explanation of health inequalities. The process was one of consultation with practitioners and policy-makers that ensured their commitment with the final recommendations. Evidence demonstrating that the strategies will actually work in terms of reducing health inequalities was not provided [3].

This diversity is also seen in the opinions of different researchers on what type of evidence is needed to underpin policies and interventions in this field. There are those who argue that in view of the urgency of starting to tackle health inequalities ('doing nothing is not an option' [4]), one should be prepared to start intervening on the basis of plausibility. Political 'windows of opportunity' are usually short, e.g. 4 years at most, and they may be closed before careful evaluation studies have been conducted [5]. A parallel has been drawn with nineteenth century public health interventions for which controlled intervention studies have never been done, but which were implemented on the basis of plausibility and have proven to be highly successful [6]. Under the pressure of politicians wanting to see rapid results, the best that can be achieved in terms of scientific evaluation may then be large-scale implementation accompanied by a 'real time' evaluation study of the intervention, concurrent with its implementation, using some quasi-experimental design (before-after study, interrupted time-series study) [7].

On the other hand, there are those who argue that this is a strategy with serious risks. Like in other areas of social and health policy, the actual results of policies and interventions to reduce health inequalities could easily be counterintuitive. There are many historical examples of ‘plausible’ interventions and policies that did not work, or actually had adverse effects [8]. The fact that there are no systematic differences between countries in the magnitude of health inequalities, despite large differences in health, social and economic policies, should also warn us against optimism about the effects of policies and interventions that seem plausible. Shouldn’t one expect the magnitude of health inequalities in the Nordic countries, with their long histories of egalitarian economic, social, and health care policies, to be smaller than in other Western European countries? The fact that this is not the case, suggests that policies which could plausibly be seen as conducive to reducing health inequalities, may not have the expected effects, or at least be far from sufficient. Several explanations have been suggested, including that the generous ‘welfare state regimes’ in the Nordic countries paradoxically enable people in lower socioeconomic groups to participate in an affluent life-style, including smoking, lack of physical exercise, overeating, and excessive alcohol consumption [9]. In addition to that, one could argue that any investment in reducing health inequalities should be justified on the basis of a comparison of its cost-effectiveness with that of other possible investments in health and well-being, and that producing credible evidence is therefore essential [10].

A staged approach to creating an evidence base for policies to tackle health inequalities

The Eurothine project is based on the idea that it is important to more systematically collecting evidence on the (cost-)effectiveness of interventions and policies to reduce health inequalities, even if one might disagree on what types and levels of evidence are needed before policies and interventions to reduce health inequalities are widely implemented. The next question then is what types and levels of evidence should be collected. Schematically, the evidence-base underpinning decisions to implement a policy or intervention to tackle health inequalities could be built up in the following sequence [11]:

- Creating a theoretical rationale for the intervention or policy: identifying factors which make a substantial, independent contribution to the explanation of health inequalities, and understanding their mechanisms with a view to finding entry-points for policies and interventions.
- Developing an intervention or policy which could target these factors: adapting existing, or creating new, interventions or policies which are likely to do more good than harm, which will differentially benefit lower socioeconomic groups, and which can be implemented on a sufficiently large scale to have an impact on health inequalities at the population level.
- Demonstrating the (cost-)effectiveness of this intervention or policy: showing empirically that the policy or intervention reduces health inequalities in settings

similar to that in which it will be implemented, taking into account any harmful side-effects, and to an extent that justifies its cost.

To a large extent, the first stage has already been completed before the Eurothine project started. On the basis of previous studies, we believe that a convincing case can be made for the contribution of certain health-related behaviors, health care policies and interventions, and labor market and welfare policies to the explanation of health inequalities. The Eurothine project aims to contribute evidence that is useful for the second and third stages. It is important, however, to see these stages as a sequentially ordered learning process, which over time requires different types of evidence.

The second stage could be seen as a ‘development’ stage. Often, new approaches will have to be developed and carefully assessed, e.g. with regard to the balance between benefits and harms. In this stage, powerful evaluation designs are usually not necessary, just as in the case of drugs development where so-called phase I and II studies are usually small and uncontrolled [12]. Because of the scale of the problem of health inequalities, which requires changing the ‘gradient’ of health problems in whole populations, it is crucial, however, that policies and interventions are developed which can effectively reach large sections of the population.

After the development stage, ‘promising’ new approaches will need to be evaluated for their effectiveness under ‘real-life’ circumstances. Clearly, Randomized Controlled Trials will not always be feasible, particularly for the evaluation of policies and interventions that are applied on a population-wide scale. Sometimes, Community Intervention Trials, in which groups of people (school classes, neighborhoods) instead of individuals are allocated to the intervention and control condition, will then be a good alternative. But in many circumstances one will have to rely on quasi-experimental or even observational designs to inform policymakers on the effectiveness of new approaches. Controlled before-after studies or interrupted time-series designs could then be used, or observational studies of ‘natural experiments’, e.g. by making comparisons between countries [13]. Systems for grading the quality of evidence from experimental studies have been available for some time already, but recently new grading systems which can also be used for grading evidence from non-experimental studies have been developed [14], as well as a comprehensive grading system (‘GRADE’), which integrates a number of different aspects relating to the quality of evidence and strength of recommendations across a wide range of interventions and contexts [15]. For each important outcome, the latter approach recommends to perform a systematic review of evaluation studies, and to assess four key elements: study design, study quality, consistency across studies, and ‘directness’ (an aggregate of various aspects covering external validity, surrogate versus final outcomes, etc.). It also recommends to look explicitly at the balance of benefits and harms, and the balance of net benefits and costs.

A complicating factor in evaluating the effectiveness of policies and interventions to reduce health inequalities is that this effectiveness should be measured in terms of favorably changing the distribution of health problems in the population, not of reducing the rate of health problems in a particular group. A ‘full’ study-design therefore requires the measurement, in one or more experimental populations and one or more control populations, of changes over time in the magnitude of health inequalities. Any other design, such as an experimental study of changes over time in the rate of health problems in lower socioeconomic groups only, requires rather strong assumptions to be made, in this case on the absence of health effects in higher socioeconomic groups [16]. Fulfilling this requirement is rather difficult in experimental study designs, which is an additional argument for accepting quasi-experimental and observational evidence in this area.

A step-wise approach to creating an effective learning exercise

In order to create an effective learning experience that fits the 'state-of-the-art' in each of the three areas (health-related behaviors, health care policies and interventions, and labor market and welfare policies), we suggest that the three relevant work packages in Eurothine follow a step-wise approach.

1. Choose an appropriate focus.
The three areas to be covered by the work packages still are rather broad.

- Which health-related behaviors (smoking, excessive alcohol consumption, diet, physical exercise, …) will be covered? Which types of interventions or policies (universal, targeted, environmental, personal, …) will be covered?
- Which aspects of the health care system (financial barriers, utilization rates, quality of care, …) will be covered? Which types of interventions and policies (insurance schemes, area based approaches, peer educators, …) will be covered?
- Which aspects of labor market and welfare policies (unemployment benefits, labor market opportunities of the chronically ill, social safety nets, …) will be covered? Which types of interventions and policies (benefit schemes, legislation, reintegration programs, …) will be covered?

These decisions will have to be guided by, among other things, an evaluation of which are the most relevant aspects, what are the most promising approaches to tackle health inequalities, and what resources (time, data, …) will be available to look into them.

2. Specify evaluation questions.
Before evaluation studies can be assessed, a preliminary analysis has to be made of the questions that need to be answered by evaluation studies. Relevant aspects to be considered include:

- What are relevant outcome measures (mortality, self-assessed health, smoking, surgery rates, intervention uptake rates, …), and will costs have to be considered as well?
- What are relevant measures of effectiveness (e.g. difference in before-after change between those exposed to intervention/policy and the non-exposed), and which distributional aspects should be covered by the evaluation (effectiveness in whole population, effectiveness in lower socioeconomic groups only, relative or absolute differences in effectiveness between socioeconomic groups, …)?

- In what context should evidence have been collected (which time-period, which continent, which social security or health care system, …)?

3. Identify existing evidence and choose appropriate learning method.
Before we start to collect any evidence, it is important to identify the learning stage in which we find ourselves. In some cases, abundant evidence on the effectiveness of policies or interventions to tackle inequalities in health determinants may already be available, and several reviews of the evidence may already have been conducted. In that case, conducting a 'review of reviews' may be the appropriate learning method. At the other extreme, no evaluation studies may as yet have been reported in the scientific literature, but we know that an informal evaluation study is currently being conducted or has recently been completed. In that case, collecting more detailed information on this study from the investigators may be the appropriate learning method.

In general, we distinguish between the following learning methods:
(a) Conducting a 'review of reviews'.
(b) Conducting a systematic review or meta-analysis of studies which have been reported in the scientific literature.
(c) Conducting an empirical analysis ourselves, on the basis of existing data (e.g. by analysis of registration data on a 'natural experiment', or by secondary analysis of data collected in a Randomized Controlled Trial)
(d) Collecting unpublished information from a formal evaluation study which is currently being conducted or has recently been completed.
(e) Collecting information on 'best practices', i.e. intervention programs or policies which according to practitioners fulfill an exemplary role.

4. Conduct learning exercise.
After having chosen the appropriate learning method, this will have to be applied. A set of criteria for assessing evidence from empirical evaluation studies will be proposed in the next section.

5. Grade quality of evidence and strength of recommendations, and phrase conclusions.
Eurothine will be based on the idea that 'one size does not fit all': depending on the stage in the development process of interventions and policies to tackle particular health inequalities, various learning methods and research designs may be appropriate. In order to create transparency about our results, however, it is important to carefully grade the strength of the evidence which has been collected. Sometimes the evidence will be strong, and a good basis for recommendations to policy-makers; in other cases, the evidence will be weak, and further study may be necessary to inform policy-makers sufficiently about the prospects for tackling health inequalities. We propose to use the recently developed 'GRADE' system for grading evidence and strength of recommendations [15].
Recommendations on implementation of policies or interventions that have been found to be (cost-)effective should be supplemented by recommendations on further research, if the learning exercise shows that final answers cannot yet be given.

Criteria for assessment of effectiveness of policies and interventions to reduce health inequalities

We propose the following set of specific criteria to assess evidence on effectiveness of policies and interventions to reduce health inequalities. These criteria can to some extent be applied in all types of learning exercise, from 'reviews of reviews' to describing 'best practices'. For each of these criteria, further specific guidance can be found in the literature. After we have agreed on the criteria, check-lists will be developed which can be applied in each of the relevant work packages.

1. Theoretical foundations of the intervention.
   - Has the target of the intervention be chosen in accordance with existing knowledge about how these particular health inequalities are generated?
   - Have state-of-the-art intervention methods been chosen, which have (perhaps in other contexts) been shown to be at least potentially effective?

2. Internal validity of effect estimates.
"Internal validity" is defined as "absence of bias in measuring effect". An assessment of internal validity therefore requires a careful evaluation of possible sources of bias which may have affected the measure of effectiveness reported by the investigators. We propose to base this assessment on a series of criteria which are scored on a scale from 1 to 5, and then summarized in a final score for each evaluation study (e.g. from 'very good' to 'very poor').
These criteria are:
   - Quality and appropriateness of the study design (e.g. experimental, quasi-experimental, observational).
   - Quality of study execution (e.g. recruitment of representative subjects, quality of data collection, control for relevant confounders in the analysis).
   - Precision of effect estimates (number of events observed, width of 95% confidence intervals, …)
   - Consistency of study findings with an intervention effect (e.g. do changes in process measures support conclusions about changes in outcome measures)?

3. External validity of effect estimates.
"External validity" refers to generalisability of the results from the study population to one or more 'transfer' populations. For Eurothine, a key question is whether the degree of effectiveness found for a study population in one country, will also be found if the same intervention or policy will be applied in other countries. It will usually be difficult to determine the degree of generalisability beyond doubt. However, indications can be obtained by applying a series of criteria.
   - Consistency of effect in different populations (e.g. are similar effects seen in different subgroups, do similar intervention studies obtain similar results?)
   - Correspondence in terms of underlying mechanisms (e.g. does the determinant that was the target of the intervention or policy have a similar impact in both the study and the transfer populations?)

- Correspondence in terms of ‘background’ interventions (e.g. are both populations similar with regards to the timing and intensity of existing interventions?)

4. Potential for reducing health inequalities.
   - What is the estimated effect of the intervention or policy on the specific health inequalities targeted by the intervention or policy?
   - To what extent will ‘total’ health inequalities (e.g. differences in health expectancy between socioeconomic groups) be reduced when the intervention or policy is fully implemented?

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