Directorate-General for Health & Consumers

Major and Chronic Diseases

REPORT 2007

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MAJOR AND CHRONIC DISEASES REPORT 2007

By the Task Force on Major and Chronic Diseases
of DG SANCO's Health Information Strand

April 2008

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1A Foreword

During the Public Health Programme 2003-2007 it was decided to build up Working Parties and Task Forces in order to create a cooperation mechanism between the European Commission and the Member States in different areas for health information. The aim of these bodies is to provide a forum for stakeholders, national experts and EU project leaders to discuss initiatives in their area and to disseminate results, outcomes and recommendations coming from projects. Another object of the working parties is to support the Commission in their work and to highlight gaps and special topics in their field of action.

The topics to be discussed in working parties are normally very broad and therefore it was decided to build up subgroups – the so called task Forces. One of the task forces is the Task Force on Major & Chronic Diseases which is a subgroup of the working party Mortality and Morbidity.

In 2006 the Task Force Major & Chronic Diseases decided to give better visibility to their extensive work. One of the outcomes is this report. It was written on voluntary basis by expert members of the Task Force Major & Chronic Diseases.

Many thanks to all the experts and in particular to the Scientific Secretariat, NIVEL in the Netherlands, for their help in making this report a reality.

The report provides an overview of the main topics which were discussed during the different meetings of the task force. It also highlights the results and ongoing activities of different projects which were or are funded by the European Commission.

The report on Major and Chronic Diseases will improve information in the area of major and chronic diseases.

I think that this report will give the necessary visibility and attendance that the task force on Major and Chronic Diseases worked to achieve.

Andrej Ryś

1B Status of the report

This report was produced by the Task Force on Major and Chronic Diseases (TFMCD) at the request of DG SANCO C2 (Health Information). In summer 2007, all leaders of running projects within the TFMCD were approached for contributing to the report on a voluntary basis. Based on the positive reactions of those project leaders, who were able to find the time and resources to contribute (either alone or in cooperation with their expert colleagues), a disease based division of chapters was made. This division was as much as possible in line with the Major and Chronic Diseases information sheets available at the DG SANCO website at that time.

Authors were asked to show the contribution of their projects to European Public Health Information, as much as possible according to a pre-structured template. It was left to the decision of the authors to use those data which were, in their opinion, either of the best quality, or most feasible to use within the time they could make available for writing their contribution to this report. This flexible approach has two major consequences. Firstly, the contents of this report are a reflection of the authors' findings and opinions, and do not necessarily reflect the opinion or the position of the European Commission. Secondly, besides project results, different public (EU, WHO) and scientific data sources have been used. If necessary in terms of copyright, permission for publication was obtained for the non-public materials (tables, figures) used in this report.

The writing of this report was steered and coordinated by an Editorial Board, which consisted of:

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The Commission gratefully acknowledges the time and efforts dedicated to the realization of the Major and Chronic Diseases Report 2007 by the members of the Editorial Board.

2 The Task Force on Major and Chronic Diseases

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Summary:
The Task Force on Major and Chronic Diseases (TFMCD) is one of the implementing structures of the Health Information and Knowledge Strand of the EU Public Health Programme 2003-2008. At the core of the TFMCD are the major and chronic diseases related projects funded under this Programme. The general purpose of the TFMCD is to help building the EU Health Information and Knowledge System on major and chronic diseases, which can be regarded as a matrix: different actions are needed at different levels in national and supranational public health monitoring systems, and this needs to be done for multiple diseases and conditions. Therefore, the TFMCD projects are involved in a wide array of activities, which are related to identification of data needs, indicator development, data collection and analysis, quality assurance, and dissemination and promotion of outcomes. In these activities, both morbidity and mortality aspects are taken into account. There are close links between the work done in the TFMCD and activities of the Working Party on Health Indicators related to the ECHI indicator lists.

1 Context and mandate

There is an increasing demand for health information for political decision-making, not only at national level, but also at European level . It was therefore decided to create a comprehensive and sustainable health monitoring and information system in the EU Public Health Programme 2003-2008, in order to establish comparable quantitative and qualitative indicators on health and health-related behaviour of the population, diseases and health systems at Community level: the "EU Health Information and Knowledge System". This System has been developed and operationalised in the Health Information and Knowledge Strand, which was one of three Strands within the EU Public Health Programme 2003-2008. The other two Strands were Health Threats and Health Determinants.

Several implementing structures were established for the Health Information Strand at the beginning of the Programme, among which seven Working Parties (see figure 1, and the DG SANCO website: http://ec.europa.eu/health/ph_information/implement/implement_en.htm). One of these is the Working Party on Morbidity and Mortality (MMWP). The purpose of the MMWP is to provide a forum for discussion and exchange of views and experience on information and knowledge in the fields of Morbidity and Mortality at National, Sub-national and European Union level. The MMWP serves as an expert group to advise on information and knowledge for monitoring Community policies and other initiatives in the field of morbidity and mortality.

The availability of high quality, comparable data is vital especially in the field of major and chronic diseases, which represent a heavy burden of disease for the EU citizen and which use a great deal health care resources. The European Commission therefore decided to establish, as a substructure of the MMWP, a Task Force on Major and Chronic Diseases (TFMCD), to specifically help building the EU Health Information and Knowledge System on major and chronic diseases. In addition to the TFMCD, other substructures of the MMWP are the Task Force on Rare Diseases and the Task Force on Health Expectancies. The latter has the specific task to ensure the proper implementation of the EU structural indicator Healthy Life Years (HLY).

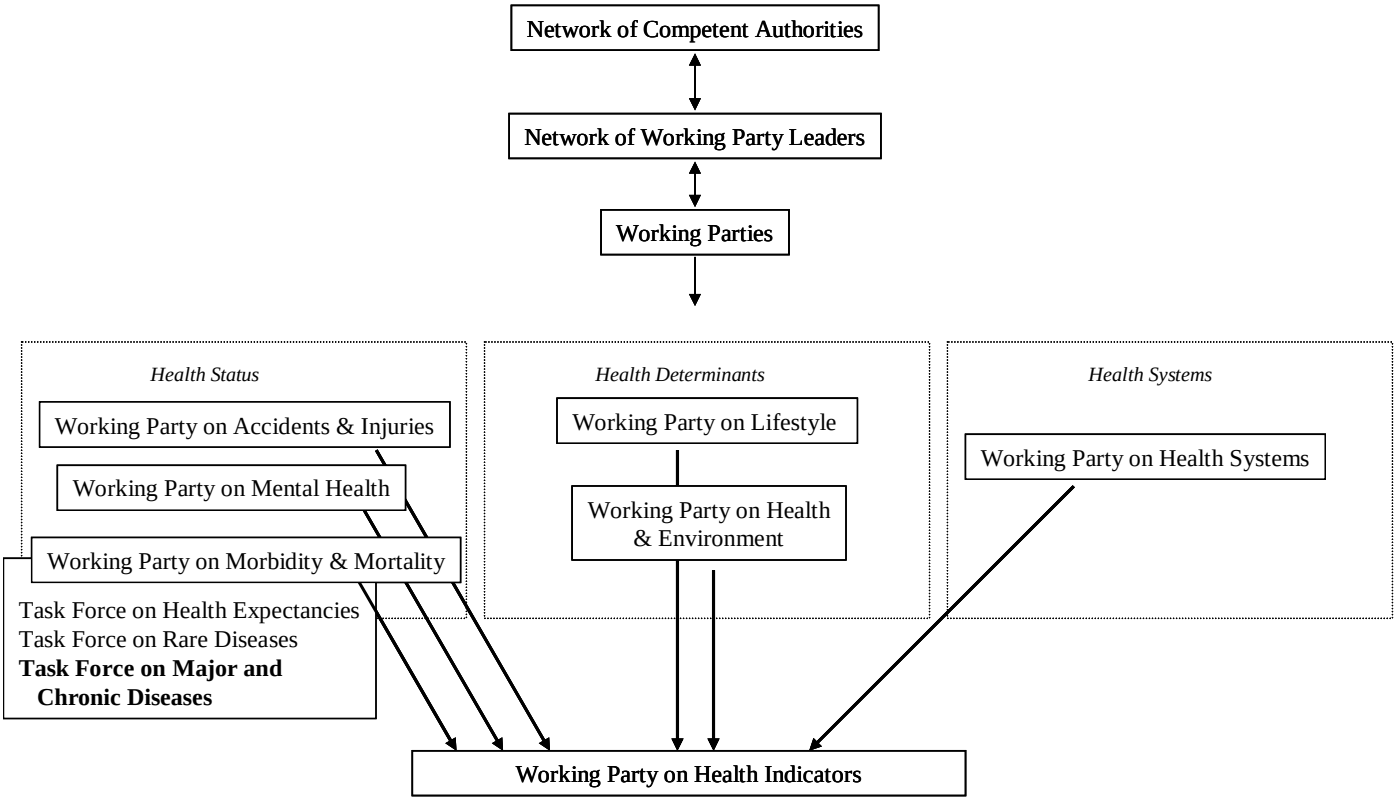

Figure 1 Implementing structure of the Health Information and Knowledge Strand of the Public Health Programme 2003-2008 (at the beginning of the Programme), and the place of the TFMCD within this structure

The TFMCD consists of project leaders of major and chronic diseases projects under the Public health Programme 2003-2008 and former project leaders from the previous public health programmes, national experts in major and chronic diseases, and representatives of Non-Governmental Organisations (NGOs). The major aims of the TFMCD are:

- to advise and assist the European Commission Public Health Directorate promoting optimal epidemiological information and collecting information on prevention, diagnosis and treatment of major and chronic diseases in Europe, in recognition of the unique added value to be gained for major and chronic diseases through European coordination.
- To provide a forum for discussion and exchange of views and experience on issues related to major and chronic diseases and conditions defined in the Community Public Health Programme and annual Work Plans.

Under the Public Health Programme 2003-2008, the TFMCD met twice a year in Luxembourg. The full mandate of the TFMCD is available at the website of DG SANCO: http://ec.europa.eu/health/ph_information/implement/wp/morbidity/taskforce_chronic_en.htm

2 Activities of TFMCD projects

The TFMCD helps building the EU Health Information System for MCD in a comprehensive and sustainable way. The structure underlying the System can be regarded as a matrix: collecting and disseminating comparable, valid data requires different actions at different levels in national and supranational public health monitoring systems, and this needs to be

done for multiple diseases and conditions. In the former Public Health Programme the development of indicators for different groups of diseases and conditions has received ample attention. Building on these results sustainable operation of the EU Health Information and Knowledge System has been emphasized under the Programme 2003-2008. Existing data sources have been used as much as possible in setting up this System. Making an inventory of available data (such as from morbidity registers, health surveys, hospital discharges etc.) and making these data more comparable (e.g. by harmonising coding practices) is, therefore, one of DG SANCO's priorities.

With regard to the above-described first axis of the matrix, the specific objectives TFMCD projects should aim for are described in the Task Force's mandate:

- To widen access to high quality information on causes, diagnosis, screening methods, counseling, treatment and care for major and chronic diseases;
- To promote the availability of high quality comparable major and chronic diseases epidemiological data across Europe regarding incidence, prevalence, survival and inequalities within and between countries;
- To promote the development of improvements in the classification and coding system for major and chronic diseases to supplement the International Classification of Diseases, in liaison with WHO;
- To promote the development of improvements in the methods of collection of data and Europeans classifications and coding systems for major and chronic diseases used by the European Statistical System;
- To promote effective surveillance and early warning and cluster response in relation to changing risk factors for major and chronic diseases;
- To promote the exchange of ideas and information regarding quality of life issues, and regarding patient preferences and choice;
- To assist in the diffusion of "good and best practice" by means of presentation and comparison of national health information;
- To advise the Commission services in the implementation of disease or morbid conditions modules in the Commission Eurobarometer survey or in other components of the European Health Survey System.

These objectives are being achieved through a wide array of project activities, among which: the refinement of existing indicators; the development of new indicators in fields so far not yet adequately covered; building networks of expertise; the development of tools and (best practice) guidelines and the organisation of trainings and workshops for proper implementation of these products; setting up databases and data collection systems; and designing adequate reporting strategies. Dissemination of project results is usually done through different means targeting specific audiences, e.g. papers in scientific journals, policy health reports and public websites. The (projects of the) TFMCD, furthermore, provides expert input for DG SANCO policy developments (e.g. annual Work Plans, Communications) and contributes to European health reporting. A full listing of TFMCD projects is available at the TFMCD website: http://www.nivel.eu/EC/TFChronicDiseases. This website contains links to project websites, if available, and to more detailed project information at the website of DG SANCO.

3 Contribution of TFMCD to ECHI indicator system and the European Health Interview/Examination Survey

The European Community Health Indicators (ECHI) are at the core of the EU Health Information and Knowledge System. The ECHI project under the Health Monitoring Programme (1997-2002) has developed a comprehensive list of indicators, including their operational definitions, in close co-operation with many other projects under the Health

Monitoring Programme. At the end of the Programme, the list contained approximately 400 items/indicators. There was a strong wish from the European Commission to develop a shortlist, in order to prioritise work for harmonisation of data collection by EU Member States. ECHI undertook the task of selecting the indicators for the shortlist in close collaboration with the project leaders, Working Parties and the Commission departments involved. Thus, the so called ECHI shortlist was created (2004), containing a total of about 100 indicators on demographic and socio-economic factors, health status, health determinants, health services, health interventions and health promotion. For about 40 shortlist indicators data are readily available and reasonably comparable. All the ECHI indicators, which were not selected for the shortlist, remain on the so called ECHI long list, to be implemented in the future. Currently, preparations for the implementation of the shortlist in all EU Member States are ongoing. The short and long lists, as well as metadata tables, which contain definitions of the shortlist indicators and an overview of available data sources per indicator, are available at the ECHIM website: http://www.echim.org. ECHIM is the scientific secretariat for the Working Party on Health Indicators (see below).

It is impossible to collect data and produce ECHI indicators without a very good basis in the form of EU instruments to gather this information. Therefore, EU action, through the different projects in the different Working Parties, focuses on improving the quality and the comparability of these instruments (health surveys, disease registers, hospital activity, health accounts, etc.) to make it easier for Member States, European networks and ECHI to compare and analyse information (see above; 'activities of TFMCD projects'). So, Working Parties' and Task Forces' expertise is used for all phases of data management related to the ECHI indicators: the analysis of data needs in their respective area; definition of indicators and quality assurance; technical support for national efforts; data collection at EU level; reporting and analysis; and promotion of the results.

The development and implementation of the ECHI indicator system is coordinated by the Working Party on Health Indicators, which is, therefore, a cross-cutting Working Party, exchanging relevant developments and activities with all other Working Parties (see figure 1). The contribution of the TFMCD to the ECHI indicators system is specifically related to the indicators on health status. There is a continuous exchange of information between the TFMCD and the Working Party on Health Indicators, e.g. on project outcomes (data, tools) related to the ECHI short list and long list, and on the update of the shortlist, which took place in 2007. This exchange is systematically operationalised through having ECHI representatives attending the TFMCD meetings and vice versa, and through biannual overviews of ECHI indicator system related project output, which are made by the TFMCD's Scientific Assistance Office (a in 2005 funded project, see:
http://ec.europa.eu/health/ph_projects/2005/action1/action1_2005_9_en.htm).

3.1 Health interview/examination surveys related projects

It is envisaged that in future European Health Interview Surveys (EHIS) and European Health Examination Surveys (EHES) will constitute an important source of information for part of the ECHI indicators, among which the health status indicators. Eurostat plays a vital role in the development, jointly with DG SANCO, of the European Health Survey System (EHSS), which entails both EHIS and EHES. Data for EHIS will be gathered through the European Statistical System. The first data collection round for the so called core modules of EHIS is planned for 2009. Currently, DG SANCO is exploring the possibilities for EHES as an additional source of information in the future. More information on the EHSS is available at the website of DG SANCO:
http://ec.europa.eu/health/ph_information/dissemination/reporting/ehss_en.htm.

Under the EU Public Health Programme 2003-2008 there are two Health Interview/ Examination Survey related projects, which are crosscutting projects for the Working Party on Health Indicators and the TFMCD. These are:

▷ The 2004 funded EUHSID project (European Union Health Surveys Information Database). Its general aim is updating the Health Interview Survey (HIS)/Health Examination Survey (HES) database. This database was established under the Health Monitoring Programme 1997-2002 and represents an inventory of nationally and internationally administered health surveys in EU Member States, EFTA countries and some countries of other regions (USA, Canada and Australia) from 1991 onwards. The database contains practical information related to the survey (institutions, contacts) as well as content related information (e.g. questions used, methodologies applied). Besides adding the latest surveys carried out in the European region, EUHSID specifically focuses on: refining the coding of survey instruments and the search capacities of the database; documenting recommendations for new standardized instruments to be used in population health surveys in Europe; and comparing the content of the questionnaires and examination protocols used in population health surveys in Europe with the recommendations. The HIS/HES database is available at: https://hishes.iph.fgov.be

▷ The FEHES project (Feasibility of a European Health Examination Survey). Its main objective is to examine and analyse the feasibility of carrying out a European HES or repeated national HESs in EU Member States. This goal will be reached through: the creation of a network of experts and institutes for implementing HES in all EU Member States; the description and analysis of the feasibility of models of HES with different intensity and costs; the collection and assessment in all EU-countries of information on factors affecting feasibility of HES; making proposals and recommendations for the future of HES in the EU and all Member States; and the preparation of a proposal for a European HES pilot, to be carried out both in Member States with and without previous national HES experience. More information is available at the project website: http://www.ktl.fi/fehes/

4 Mental health

Mental health is an integral and important part of population health: it is estimated by WHO that one fourth of the 'population burden of disease' is due to mental ill health. The International Labour Organization (ILO) estimates that mental ill-health costs are 3-4 % of GDP, mainly through lost productivity (Gabriel & Liimatainen, 2000). Good mental health is increasingly important for economic growth and population well-being in Europe. The transformation of Europe into an information society and technological changes in working life cannot successfully be achieved without giving population mental health special consideration. Mental health information is, therefore, an important field within the European health information system.

A core aim of any mental health policy is to create knowledge and raise awareness on the extent of mental health problems in the population (including among specific groups in the population) and to develop population-level mental health promotion and mental disorder prevention. To be able to act on these aims, mental health policy is dependent on a sound mental health information system with a good coverage. Regrettably, most current regional, national and international health information systems are weak in the field of mental health. The European Commission has therefore supported improvement of mental health monitoring in several grants from the public health programme (Lehtinen 2004).

The Working Party on Mental Health was one of the seven working parties for health information created in 2003. However, the working party was discontinued in 2005 due to re-organisation of mental health issues within DG SANCO, when the responsibility for mental health issues was transferred from the health information unit to the health determinants unit.

Currently mental health projects co-funded by the Public Health Programme are allocated either to the TFMCD or to the Health Determinants Unit C4.

The MINDFUL project (see www.stakes.fi/mindful), coordinated by the Finnish National Research and Development Centre for Welfare and Health STAKES, aimed at improving population mental health monitoring in EU by defining a common set of mental health indicators, analysing availability and preparing of a common European database. Furthermore, it aimed at improving the status of mental health information by widening the scope of the mental health monitoring systems to cover not only mental disorders and mental health systems, but also positive mental health and determinants of mental health, which had previously been rather neglected. Building on existing research and previous development projects, MINDFUL shows that data on mental health-related mortality and on psychiatric hospital use are available to a reasonable extent, but also that huge information gaps exist, notably in the areas of mental health determinants, community-based mental health services and mental health expenditure. The main outcomes of MINDFUL have been reported by Lavikainen et al (2006).

After thorough survey of validity, psychometric properties, availability and policy relevance, the MINDFUL project recommended a final set of 35 mental health indicators (Table 1). 15 of the 35 MINDFUL indicators rely on population surveys for their collection.

The MINDFUL database, consisting of indicator metadata and numerical data for each of the 35 MINDFUL mental health indicators, is freely available for researchers, developers, and the public, through the project website http://www.stakes.fi/mindful (click on 'Indicators'). The database covers the period from 1990 onwards. Available data were retrieved from international databases, national statistical offices, survey reports and published scientific articles. In addition to national total population data, the MINDFUL database also contains breakdowns by sex, age and NUTS21 regions where available.

[1] The Nomenclature of Territorial Units for Statistics (NUTS) is defined for the Member States of the European Union. The NUTS is a three-level hierarchical classification, that subdivides each Member State into a whole number of NUTS 1 regions, each of which is in turn subdivided into a whole number of NUTS 2 regions and so on. Because the subdivision depends on the size of the population, both NUTS 1 and 2 are equivalent to the whole country in some smaller countries. These include Cyprus, Denmark, Estonia, Latvia, Lithuania, Luxembourg, Malta, and Slovenia

Table 1 The MINDFUL list of mental health indicators for Europe

GROUP	DOMAIN	INDICATOR
Health status	*Cause specific mortality*	1a. Suicide
		2a. Deaths of undetermined intent
		3. Drug related deaths
		4. Alcohol related deaths
	Morbidity, disease specific	5. Any anxiety disorder
		6. Major depression
		7. Hazardous and harmful drinking
		8. Suicide attempts
	Morbidity, generic	9. Psychological distress
		10. Mental disorders and adjustment among children and adolescents
		11. Energy, vitality
		12. Happiness
		13. Psychological impairment
Determinants of health	*Personal conditions*	14. Sense of mastery
		15. Self-Esteem
	Social and cultural environment	16. Social support
		17. Negative life events
		18. Childhood adversities
Health systems	*Prevention, health protection and promotion*	19. Suicide prevention
		20. Mental health promotion
	Health resources	21. Number of psychiatric beds
		22. Number of psychiatrists
		23. Number of child (and adolescent) psychiatrists
	Health care utilisation; psychiatric care and social services	24. Number of in-patient episodes due to mental health conditions
		25. Number of long-stay patients
		26. Involuntary placements
		27. Use of outpatient services
		28. Self-reported use of mental health services
		29. Use of antidepressants
		30. Use of antipsychotics
		31. Use of anxiolytics
		32. Use of hypnotics
		33. Disability pensions due to mental disorders
		34. Sickness allowance spells due to mental disorders
	Expenditure	35. Expenditure on mental health services

To be able to successfully combat the European epidemic of mental ill-health, the increasing use of psychiatric services, and increases in sick-leave and early retirement due to mental disorders (Järvisalo et al. 2005), policy makers and citizens need information on mental health determinants. The MINDFUL Project has recommended that the EHIS core module should be strengthened in the field of mental health by including data collection on five central psycho-social determinants of health and mental health, i.e. 'Sense of mastery', 'Social support', 'Negative Life-events', 'Self-esteem'; and 'Childhood adversities'.

The MINDFUL Project also scrutinised evidence on childhood determinants of adult mental disorder (Fryers, 2007). Based on the outcomes of this inventory, recommended indicators to capture childhood determinants of adult mental disorder are ‘Negative life events’ and ‘Childhood adversities’. This work is continued in the project "School Children Mental Health in Europe", which is co-funded by the EC Public Health Programme health determinants strand.

Furthermore, the MINDFUL Project analysed feasibility of structural indicators of positive mental health. Using the Delphi methodology, a set of 31 indicators of social and environmental factors that have a positive impact on public mental health was proposed. Further development and data collection in relation to these structural indicators will be performed in the Monitoring Positive Mental Health Environments (MMHE) Project, which is co-funded by the EC Public Health Programme health information strand.

Mental health has individual, social, ethical, economic and societal precursors and consequences that should be addressed in all Member States. Adequate and comparable information on mental health at population level will be an indispensable pre-requisite for tackling these problems, in targeting measures effectively towards required priorities, and in monitoring progress to agreed goals. MINDFUL has demonstrated the need for further development of policy-relevant European mental health monitoring, to support the aims of the Commission's 'Green Paper on Mental Health', the recent Commission initiative to establish an "EU Mental Health Pact", the implementation of the WHO 'Mental Health Action Plan for Europe', and major EC policies, such as the 'Lisbon Agenda'.

MINDFUL has also shown that, in many cases, mental health data are simply not-available. And when available, they are often non-comparable between Member States, due to differences in data collection, indicator definitions and health systems. The current state of mental health monitoring in the EU indicates that there is lack of co-ordination of and support to Member States. Work is needed to support further harmonisation of mental health indicators and to secure the development and retrieval of data on determinants of mental health. Such work can hardly be done within projects, and thus the introduction of a policy-relevant mental health monitoring system requires infra-structure support. A 'European Mental Health Observatory', supported by the Commission, was therefore recommended by the MINDFUL Project to establish leadership and ensure comparability of mental health monitoring in EU. Such an observatory could be associated with the 'European Centre for Disease Control' and closely collaborate with international organisations such as WHO and OECD. Such an Observatory could be built according to the model of the 'European Monitoring Centre for Drug and Alcohol Abuse' (EMCDDA), which has successfully developed and implemented monitoring of drug abuse.

It is essential that mental health indicators are incorporated in the forthcoming 'European Health Survey System' (EHSS). In spite of the magnitude of mental health problems and the importance of positive population mental health, mental health is not sufficiently covered in the current core module of the ‘European Health Interview Survey’ (EHIS). Special emphasis should be put on policy-relevant indicators, such as indicators of positive mental health, and data on vulnerable groups at risk of developing mental ill-health. Work to develop a structural

mental health indicator should commence and the mental health contribution to the 'healthy life years' indicator needs to be explored in detail.

5 Health of people with intellectual disabilities

Disability is not itself a disease state. However, abundant evidence suggests that people with disabilities are likely to incur secondary health conditions, and thus disparities are evident when people with disabilities are compared with their peers. An emerging perspective is that multiple and complex factors associated with access to care, identification of disease and treatment availability contribute to negative health disparities among people with disabilities.

People with intellectual disabilities comprise a group within the populations of all countries at risk of significant social disadvantage. An estimated five million persons or 1% of the population of the EU 27 Member States have intellectual disability, the preferred term for a condition known as ‘mental retardation’ in the United States or ‘learning disability’ in the United Kingdom. Other terms such as ‘mental handicap’ persist elsewhere. Defined by significant limitations in cognitive and adaptive functioning, intellectual disability is present from birth or the early developmental period.

Today, people with intellectual disabilities have an increased life expectancy. In many of the more developed countries, they will experience middle and older age. Higher rates of obesity, diabetes and epilepsy, and lower rates of cardiovascular fitness and preventative health screening are among the many health disparities that have been identified for this segment of the population. They are at heightened risk of incurring mental health disorders. A growing body of published evidence reports on the risks, characteristics, assessment strategies and treatment outcomes of those described by clinicians as having dual diagnosis: that is, persons who have lifelong intellectual disability and who also have a diagnosis of a mental health condition.

As they comprise an especially disadvantaged group with evident health disparities people with intellectual disabilities should be identified specifically in health information surveys, rather than subsumed under the larger, more diverse group of people with disabilities Reliable, comparable information about people with intellectual disabilities is needed to determine health status and health care needs and thus promote equity.

The activities of partners in POMONA I (2002-2004) yielded an evidence-based set of 18 health indicators for people with intellectual disabilities, consistent with the ECHI set developed previously for the general population. The main task of POMONA II (2005-2008) is to apply this indicator set. To date, the POMONA 18 indicator set has been operationalized in a comprehensive survey instrument, which has been translated into 13 languages, field-tested and revised. The POMONA 18 survey instrument includes two standardized measures that specifically relate to (a) screening for the presence of psychiatric disorder and to (b) assessment of problem or challenging behaviours among persons with intellectual disabilities.

Ethical approval was secured in all countries where this was a requirement. One element of the project was to investigate whether Health Information Surveys in Europe currently include or potentially might include information about the health of people with intellectual disabilities. Physical and mental health data related to1300 participants were gathered by November 2007 (http://www.pomonaproject.org).

Activities within POMONA II focus on strategies at Community level to gather reliable, comparable and sustainable health information about a large segment of the population with

evident health disparities and social disadvantage. The project shares the stated priorities of the TFMCD in building the EU Health Information System for Major and Chronic Diseases:

* Reliable, valid methods to gather comparable health data
* Make available data about health inequalities within and between countries
* Disseminate results within Member States, at Community level and internationally among health policy makers, health professionals, researchers, advocates and other stakeholders.

6 Mortality related projects

As explained above, the scope of the TFMCD entails both morbidity and mortality aspects. There are several projects within the TFMCD, which focus primarily on mortality. These are:

▷ The 2004 funded ANAMORT project (Analysis of injury mortality in the European Union). It aims to produce relevant indicators, which can be used throughout Europe to account for injury mortality. Its general objectives are: to evaluate the quality and comparability of injury mortality statistics in Europe; and to produce validated results on the causes of death by injury in Europe, allowing comparisons among countries. In the project's analyses the sub-groups on the Eurostat Causes of Death Shortlist, and detailed sub-groups established in the course of the project will be applied. The results will allow the attribution of observed differences in mortality rates either to differences in certification and/or coding, or to real differences in mortality conditions. More information is available at: http://www.dsi.univ-paris5.fr/AcVC/anamort.htm

▷ The 2003 funded MONSUE project (Monitoring Suicidal Behaviour in Europe). It aims to reduce the frequency of suicide, suicide attempts and the repetition rate of suicide attempts in various European countries, by assessing the magnitude of the problem (monitoring of suicides and suicide attempts), and by identifying groups at risk, risk factors, and specific variables (methods, "hot spots", time variables etc.), which can be influenced to prevent this behaviour. Based on these findings guidelines for prevention of suicides and suicides attempts will be developed. Read more at:
http://ec.europa.eu/health/ph_projects/2003/action1/action1_2003_31_en.htm

▷ The 2005 funded CANICULE project (Etude de l'Impact de la Canicule d'Aout 2003 sur la Population Européenne). This project aims to determine the magnitude of excess mortality (number of deaths) in Europe during the heat wave of Summer 2003, specifying the countries and periods in question. It then aims to determine its impact on the population of very old people; what fraction died during the summer? This study should assist in understanding better the impact of temperatures on mortality trajectories in the highest ages. According to meteorologists, heat waves may well occur more frequently in the future - more intense and longer. It seems relevant in these condition, therefore, to study the impact of heat waves on the mortality of the very old, whose numbers have increased radically over the past few years. More information on heat wave related mortality is available at the SANCO site:
http://ec.europa.eu/health/ph_information/dissemination/unexpected/unexpected_1_en.htm

Also member of the TFMCD is the HEM project (Closing the Gap - Reducing Premature Mortality. Baseline for Monitoring Health Evolution Following Enlargement), which was funded in 2003. As its name implies, this project aims to close the gap in premature mortality between old EU and new Member States. It does so through, among other things, the creation of a baseline for monitoring evolution of preventable and premature morbidity, disability and mortality risk factors following the enlargement of the European Union in 2004, and favourable modification of major risk factors for diseases, especially alcohol, selected nutritional factors (obesity), and tobacco. The HEM project has contributed to the chapter on Ischemic Heart Disease in this report. More information on (other) project outcomes is available at: http://www.hem.waw.pl

7 Other disease/condition based projects

Most projects in the TFMCD focus on a specific disease/condition or disease cluster. The majority of these describe their contribution to the EU Health Information and Knowledge System in one of the following chapters of this report. There are, however, a few disease based projects which are not represented in this report :

▷ The EUNICE project (EU Network for Information on Cancer) has been launched in 2004. The objective of Eunice is to compile, compare, analyze interpret and disseminate information relevant for monitoring the status of cancer burden in the European populations; and planning and evaluating of cancer control measures at national and EU level. It will also help to refine indicators, especially in areas related to cancer screening, treatment and outcome evaluation. It will establish a common database, which will be used to plan programmes of cancer control in the EU (benchmarking and scenario development) and to monitor their outcome. More information on the EUNICE project is available at the website of DG SANCO:
http://ec.europa.eu/health/ph_projects/2004/action1/action1_2004_33_en.htm

▷ The IMCA II project (Indicators for Monitoring COPD and Asthma in the EU), which was funded in 2005, builds on the results of the IMCA I project. During the first phase of the project, a comprehensive list of indicators for respiratory conditions was developed. IMCA II aims to collect routine data on mortality, hospital discharges, health care, human resources and health care utilization costs in order to estimate the indicators defined by the IMCA I project for all countries involved in the project for a period of 10 years. The project will also develop a module on COPD and asthma to be incorporated in European Health Examination Surveys. The module's feasibility will be tested and pilot performance will be assessed in four geographical areas in Spain, Italy, Sweden and Germany. For more information: http://ec.europa.eu/health/ph_projects/2005/action1/action1_2005_22_en.htm

▷ the ENE project (European Network on Endometriosis) was funded in 2006. It seeks to raise understanding and promote awareness of the impact of endometriosis across the EU and to create an international network of expertise and opportunities for all professionals and individuals dealing with the disease. It will do so by developing a new European Endometriosis Support Alliance (EESA) to coordinate and provide comprehensive support and training to the 4 sectors associated with the condition i.e. individuals, researchers/academics, doctors/nurses and employers; creating an internet based Endometriosis Community Gateway (ECG), that will provide the focal point for all individuals and groups requiring information and support; and completing a comprehensive pan-European epidemiological study of over 10,000 women with endometriosis in order to develop a research-based information and support base. Basic project information is available at:
http://ec.europa.eu/phea/documents/2006_Health_Information.pdf

▷ The NephroQUEST project (European Nephrology Quality Improvement Network), also funded in 2006, focuses on data on renal replacement therapy, which entails both dialysis and renal transplantation. The project aims to ensure EU-wide dissemination of comparable, high-quality renal replacement therapy data collection by the following actions: acceptance of a standardized indicator set, development of standardized information technology for automated data collection and raising the level of new or already existing but less well developed registries to high standards. For more information visit the NephroQUEST website: http://www.nephro-quest.org

▷ The last of the TFMCD projects funded in 2006 is the EUROLIGHT project (Highlighting the impact of the headache in Europe). The project's general objective is to gather, in collaboration with NGO's and health care professionals, reliable and comparable information on the global public health impact of headache disorders. For this purpose, a questionnaire will be developed by the project and tested in 10 pilot EU countries. This exercise should serve as the basis for future EU level surveys. Through its activities, the project aims to raise

awareness in policymakers, health professionals and citizens, and to improve patients' quality of life. More information is available at the project website: http://www.eurolight-online.eu

Reference list

Fryers T. Children at Risk. Childhood Determinants of Adult Psychiatric Disorder. Helsinki: STAKES, 2007.
http://www.stakes.fi/EN/Julkaisut/Kirjakauppa/bookshop_research_reports/t167_en.htm

Järvisalo J, Andersson B, Boedeker W, Houtman I. Mental disorders as a major challenge in prevention of work disability. Social security and health reports 66. Helsinki: KELA The Social Insurance Institution, 2005.
http://www.kela.fi/in/internet/liite.nsf/NET/150305153403SV/$File/Katsaus66_netti.pdf

Lavikainen J, Fryers T, Lehtinen V (Eds). Improving mental health information in Europe. Proposal of the MINDFUL project. Helsinki: STAKES, 2006.
http://www.stakes.fi/pdf/mentalhealth/Mindful_verkkoversio.pdf

Lehtinen V. Action for Mental Health. Activities co-funded from European Community Public Health Programmes 1997-2004. European Commission, Health and Consumer Protection Directorate-General and STAKES, 2004.
http://ec.europa.eu/health/ph_determinants/life_style/mental/docs/action_1997_2004_en.pdf

3 Atherosclerotic Cardiovascular Diseases: Ischaemic Heart Disease and Stroke

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Abbreviations

AMI	Acute Myocardial Infarction
ACS	Acute Coronary Syndrome
BMI	Body Mass Index
CABG	Coronary Artery Bypass Graft
DBP	Diastolic Blood Pressure
CT-Scan	Computed Tomography Scan
CVD	Cardiovascular Disease
ECHIM	European Community Health Indicators Monitoring
EU	European Union
EUROCISS	European Cardiovascular Indicators Surveillance Set
EUROSTAT	Statistical Office of the European Communities
HEM	Health Evolution Monitoring
HES	Health Examination Survey
HDL	High-density lipoprotein
HIS	Health Interview Survey
ICD	International Classification of Disease
IHD	Ischaemic Heart Disease
MRI	Magnetic Resonance Imaging
PTCA	Percutaneous Transluminal Coronary Angioplasty
SBP	Systolic Blood Pressure
WHO-HFA	World Health Organization – Health for All
WHO MONICA	World Health Organization MONItoring trends and determinants of CArdiovascular diseases

1 Introduction

Cardiovascular diseases (CVD) are one of the leading causes of death and hospitalization in both genders in nearly all countries of Europe [1]. The most frequent CVD are those of atherosclerotic origin, mainly ischemic heart disease (IHD) and stroke. CVD clinically manifest itself in middle life and older age, after many years of exposure to unhealthy lifestyles (unhealthy diet, physical inactivity, and smoking habit) and risk factors (high blood pressure, high cholesterolemia, diabetes, obesity) [2-5]. Although CVD prevalence is very high, its occurrence is largely preventable maintaining risk factors at favourable level during life span. Epidemiological studies have demonstrated that cardiovascular risk is 'reversible', that means that by lowering the level of risk factors it is possible to reduce the number and severity of events, or delay the event occurrence.

Even though the clinical onset is mainly acute, CVD often evolve gradually, causing substantial loss of quality of life, disability, and life long dependence on health services and medications. They also result in premature deaths. CVD are associated with adverse outcomes in elderly people, including cognitive impairment, dementia and decreased physical performance [6-7]. The societal costs of CVD are substantial and include not only those directly related to health care and social services, but also those linked to illness benefits and retirement, impact on families and caregivers, and loss of years of productive life.

Since 1970 CVD mortality has been decreasing in the majority of Western European countries but increasing in Eastern Europe [8-10]; during recent years mortality has also been decreasing in some Eastern European countries.

The evolution of mortality rates from all-cause mortality and CVD (in particular IHD and stroke) over 30-year period from 1970 to 2000 in the age-range 45-74 years was described and interpreted: early declines could be due to changes in environmental risk factors, such as diet and lifestyle factors; more recent declines to improvements in modern cardiovascular treatments, responsible of both decreasing morbidity and increasing survival [9].

The World Health Organization MONItoring trends and determinants of CArdiovascular diseases (WHO MONICA) Project [11], a 10-year monitoring project of fatal and non fatal coronary and cerebrovascular events, showed that incidence of coronary events in the age range 35-64 years was higher in Northern, Central and Eastern Europe than in Southern and Western Europe; it was falling more rapidly in Northern and Western Europe compared to Southern and Central Europe; in some Eastern European countries incidence was rising. The geographical pattern in incidence rates trend was similar to the geographical pattern in death rates trend.
The magnitude of the CVD burden contrasts with the usual paucity, poor quality and comparability of data available on incidence and prevalence of CVD beyond mortality, on distribution of risk factors and prevalence of high risk conditions, other than rigorous but limited studies carried out in certain geographical areas.
This chapter focus on CVD, in particular on IHD and stroke, gives some information on risk factors distribution, reviews mortality and morbidity trends and describes, when available, the indicators suggested by the EUROCISS[1] Project (European Cardiovascular Indicators Surveillance Set) for inclusion in the European Community Health Indicators Monitoring (ECHIM) short list.
It also presents some results from the Health Evolution Monitoring (HEM) - Closing the Gap project for the assessment of avoidable premature deaths (20-64 years).

2 Health Determinants/Risk Factors

After the Second World War many epidemiological studies were conducted to identify risk factors and demonstrate reversibility of risk through primary prevention. Among them, the most important were:

- the Seven Countries Study, of more than 12,000 men ages 40-59 years at base-line, examined for the first time at the end of the 1950s and followed up for 40 years; it was the first study which compared coronary heart disease (today defined as IHD) incidence, risk factors and lifestyles using a common protocol and standardized methodology in different international cross-country populations (USA, Finland, the Netherlands, Yugoslavia, Italy, Greece, Japan) [12].
- the Whitehall Study, of almost 20,000 men ages 40-69 years examined in 1960s and followed-up at regular intervals, is still being carried out (and since 1985 women have also been included). This study produced important insight into the determinants of health, highlighting the importance of the social environment in disease causation and cautioning against using stress uncritically as an explanation [13].
- the MONICA Study, from the mid-1980s to mid-1990s, monitored coronary events and classic risk factors in 38 populations from 21 countries. Population surveys to estimate trends in risk factors were carried out in men and women ages 35-64 years [14].
- the North Karelia Project represents the best European example of community-based primary prevention approach. In the 1970s people in the province of North Karelia in Finland had a very unhealthy, high saturated fat diet and, as a consequence, high serum total cholesterol levels and very high rates of IHD. From that time, a community-based approach based on interventions not only at individual level but also at population level, promoting community changes for health, was implemented and produced control of chronic diseases [15].

These studies have clearly demonstrated that CVD have a multifactorial aetiology, which means that several factors contribute to their development. Age is the most important factor, followed by hypertension, obesity, smoking habit, diabetes and hypercholesterolemia. These factors are all caused by unhealthy lifestyles, which include a too rich diet (excess of saturated fats, salt, alcohol, simple sugar and low consumption of fibres) associated with physical inactivity and smoking habit.

Table 1 Estimated prevalence of hypertension for men and women of different age ranges in 22 EU countries for the last year available at WHO-Geneva database

Country	Last year available	Age groups		Prevalence %		Method of data collection
		Men	Women	Men	Women	
Austria*	1999	25-64		12.9	9.1	physical measurement
Belgium	2001	15+		13.4	15.8	administered questionnaire
Bulgaria*	1996	35-44		16.5	9.7	physical measurement
		45-54		32.0	30.8	
		55-64		45.9	47.5	
Cyprus	1990	35-64		13.0	10.0	physical measurement
Denmark	2000	16+		7.9	9.3	self-reported
Estonia**	2001	20-54		32.1	15.4	physical measurement
Finland*	2001	30-44		14.7	5.0	physical measurement
		45-54		25.1	15.7	
		55-64		30.7	26.4	
		65-74		33.0	38.5	
France**	1996	16-86		37.7	22.2	physical measurement
Germany*	1999	18-79		30.8	29.7	physical measurement
Greece**	2002	18-89		36.7	23.7	physical measurement
Hungary***	1994	18+		7.9	5.1	physical measurement
Italy*	1998	35-74		33.0	30.0	physical measurement
Lithuania*	1993	35-64		29.4	23.2	physical measurement
Luxembourg*	1985	35-64		10.4	11.2	physical measurement
Malta**	1985	25-64		48.7	43.8	physical measurement
The Netherlands	2001	15+		9.4	12.8	administered questionnaire
Poland*	1993	35-64		20.8	19.5	physical measurement
Romania***	1997	15-84		4.9	4.5	physical measurement
Slovakia**		20+		52.0	32.0	physical measurement
Spain**	1990	35-64		46.2	44.3	physical measurement
Sweden	2003	16-84		3.5	3.1	administered questionnaire
United Kingdom**	2003	16+		34.3	30.1	physical measurement

* Definition criterion: ≥ Systolic Blood Pressure (SBP) 160 and/or Diastolic Blood Pressure (DBP) 95 mmHg
**Definition criterion≥ SBP 140 and/or DBP 90 mmHg or on antihypertensive medication
***Definition criterion: SBP ≥ 160 mmHg
Source : WHO-Geneva database http://www.who.int/infobase/report.aspx (accessed on 2007)

Some of these risk factors are continuous (blood pressure, cholesterol, body mass index) and no level exists over or under which the disease does not develop: risk factors thresholds are arbitrary and the only way to reduce the risk of developing the disease is to increase the proportion of the population with favourable cardiovascular risk profile [16]

Data on CVD risk factors at national level are difficult to obtain due to the high cost of Health Interview Surveys (HIS)/Health Examination Surveys (HES). Some data, not always collected in the same way, are available at the World Health Organization - Health For All (WHO-HFA) database [17]: data on the most important modifiable risk factors at population level (blood pressure, cholesterol, body mass index and blood glucose) are reported. These factors, together with age and gender, are able to predict atherosclerotic CVD. Table 1 provides estimated prevalence of hypertension in 22 countries for men and women of

different age ranges for the last year available. The different data collection methods (self-reported, administered questionnaire, physical measurement) and diagnostic criteria used for the definition of hypertension (SBP≥160 or DBP≥95 mmHg; SBP≥140 or DBP≥90 mmHg; SBP≥160 mmHg or regular use of antihypertensive medication) do not affect the increase of the prevalence with age. Hypertension is found to be higher among women of advanced age.

Table 2 shows data on total cholesterol distribution collected through HES: cholesterol is measured in almost all countries, even though the standardization of laboratory lipid assays still remains difficult. Prevalence, although defined with different diagnostic criteria (total cholesterol≥5.2 mmol/l or ≥6.2 mmol/l or ≥6.5 mmol/l ≥ or ≥7.8 mmol/l), increases with age and is higher among women of advanced age.

Table 3 reports smoking habit collected through a questionnaire. On average, prevalence of smoking in women is lower except in Sweden but in several countries this trend is going to change. It is worth noting that in some countries the last available data go back to several years ago. Prevalence of smoking in men is generally higher in Central, Eastern and Southern Europe than in Northern Europe; in women is generally higher in Northern and Southern Europe than in Central and Eastern Europe.

Obesity is also included among the most important risk factors for the prevention of CVD. Nowadays, due to the increasing trend in adult and children, obesity (Table 4) has become a key issue. Obesity, defined by WHO as Body Mass Index (BMI)≥30 Kg/m2, is strongly related to blood pressure, cholesterol, diabetes and impaired glucose tolerance [18]. The WHO-World Health Report 2002 estimated that over 7% of all disease burden in developed countries is caused by raised BMI [19].

Table 2 Estimated mean values of total cholesterol (TC) in mmol/l and prevalence of hypercholesterolemia in 27 EU countries for men and women of different age-ranges for the last year available at WHO-Geneva database

Country	Year	Age groups		Estimated mean value TC		Prevalence %		Method of data collection
		Men	Women	Men	Women	Men	Women	
Austria*	1999	25-64				21.1	22.3	physical measurement
Belgium	2002	15+		5.5	5.6			WHO Global Comparable Estimates
Bulgaria**	1996	35-44				39.0	29.5	physical measurement
		45-54				43.4	51.4	
		55-64				40.7	67.7	
Cyprus*	1990	35-64				36.0	28.0	physical measurement
Czech Republic	2002	15+		5.5	5.5			WHO Global Comparable Estimates
Denmark	2002	15+		5.4	5.3			WHO Global Comparable Estimates
Estonia***	2002	20-54				50.0	45.9	physical measurement
Finland*	2001	30-44				26.5	12.5	physical measurement
		45-54				37.0	29.7	
		55-64				33.2	47.5	
		65-74				28.5	43.8	
France	1990	40-50	35-50			17.0	5.9	self-administered questionnaire
Germany****	1999	18-79				8.3	9.2	physical measurement
Greece***	2002	18-89				39.8	35.3	physical measurement
Hungary**	1994	18+				29.3	25.8	physical measurement
Ireland	2002	15+		5.6	5.4			WHO Global Comparable Estimates
Italy**	1998	35-74				20.0	24.0	physical measurement
Latvia	2002	15+		5.3	5.3			WHO Global Comparable Estimates
Lithuania	2002	15+		5.3	5.4			WHO Global Comparable Estimates
Luxembourg	2002	15+		6.1	5.9			WHO Global Comparable Estimates
Malta	2002	15+		5.7	5.9			WHO Global Comparable Estimates
The Netherlands*	2001	15+				11.2	11.5	physical measurement
Poland***	1992	25-64				46.3	40.1	physical measurement
Portugal	2002	15+		5.3	5.1			WHO Global Comparable Estimates
Romania**	1997	30-84				20.3	20.8	physical measurement
Slovakia***		20+				53.0	54.0	physical measurement
Slovenia	2002	15+		5.3	5.3			WHO Global Comparable Estimates
Spain***	1992	25-64				53.2	48.1	physical measurement
Sweden*	1999	25-74				30.7	31.7	physical measurement
United Kingdom*	1998	16+				20.0	24.0	physical measurement

*Definition criterion: tot chol≥6.5 mmol/l
**Definition criterion: tot chol≥6.2 mmol/l
***Definition criterion: tot chol≥5.2 mmol/l
****Definition criterion tot chol≥7.8 mmol/l
Source : WHO-Geneva database http://www.who.int/infobase/report.aspx (accessed on 2007)

Table 3 Estimated prevalence of smoking habit in 27 EU countries for men and women of different age-ranges for the last year available at WHO-Geneva database

Country	Last Year available	Age		Prevalence		Source of information
		Men	Women	Men	Women	
Austria*	1999	25-64		33.9	24.2	physical measurement
Belgium**	2001	15+		28.0	20.0	administered questionnaire
Bulgaria*	1997	18+		38.4	16.7	administered questionnaire
Cyprus***	1990	35-64		46.0	15.0	physical measurement
Czech Republic*	2003	18+		33.0	19.9	administered questionnaire
Denmark*	2000	16+		36.8	31.9	physical measurement
Estonia*	2002	16-64		45.0	18.0	self-administered questionnaire
Finland*	2004	15-64		27.0	20.0	self-administered questionnaire
France**	1996	16-86		30.0	20.0	physical measurement
Germany*	2000	18-59		32.3	27.3	self-administered questionnaire
Greece**	2002	18-89		51.0	39.0	physical measurement
Hungary**	2002	13-15		34.3	32.5	self-administered questionnaire
Ireland**	2002	35-54		26.0	25.0	self-administered questionnaire
		55+		19.0	16.0	
Italy*	2002	15+		31.1	22.3	administered questionnaire
Latvia*	2004	15-64		47.3	17.8	self-administered questionnaire
Lithuania*	2002	20-64		43.7	12.8	self-administered questionnaire
Luxembourg*	1985	35-64		51.0	18.1	physical measurement
Malta*	2002	15-98		29.9	17.6	administered questionnaire
The Netherlands	2001	15+		32.2	25.3	administered questionnaire
Poland*	1996	15+		40.9	19.4	administered questionnaire
Portugal*	1999	15+		29.3	7.9	administered questionnaire
Romania***	2003	15+		33.2	10.3	administered questionnaire
Slovakia*	2003	18+		32.8	14.3	administered questionnaire
Slovenia*	2003	18+		25.3	16.8	administered questionnaire
Spain*	2001	16+		39.1	24.6	administered questionnaire
Sweden*	2003	16-84		16.5	18.8	administered questionnaire
United Kingdom*	2002	16+		27.0	25.0	administered questionnaire

*Definition: current daily user
**Definition: current user
***Definition: user
Source: WHO-Geneva database http://www.who.int/infobase/report.aspx (accessed on 2007)

Table 4 Estimated prevalence of obesity (defined as BMI≥30 Kg/m^2) in 27 EU countries for men and women of different age-ranges for the last year available at WHO-Geneva database

Country	Year	Age		Prevalence		Source of information
		Men	Women	Men	Women	
Austria	1999	25-64		9.7	13.7	medical examination
Belgium	2001	15+		10.7	11.0	administered questionnaire
		35-44		22.5	22.0	
Bulgaria	1996	45-54		23.0	36.0	physical measurement
		55-64		25.2	43.5	
Cyprus	1990	35-64		19.0	24.0	physical measurement
Czech Republic	1999	15+		15.0	13.5	administered questionnaire
Denmark	1997	15+		8.0		administered questionnaire
Estonia	2002	16-64		11.8	14.4	self-administered questionnaire
		30-44		15.4	13.7	
Finland	2001	45-54		23.3	25.4	physical measurement
		55-64		27.5	31.9	
France	1997	15+		7.0		administered questionnaire
Germany	1986	25-69		16.2		physical measurement
Greece	2002	18-89		20.2	15.4	physical measurement
Hungary	1994	18+		21.0	21.2	physical measurement
Ireland	2002	18+		14.0	12.0	self-administered questionnaire
Italy	1998	35-74		18.0	22.0	physical measurement
Latvia	2004	15-64		11.9	19.5	self-administered questionnaire
Lithuania	2002	20-64		16.2	15.8	self-administered questionnaire
Luxembourg	1997	15+		9.0		administered questionnaire
Malta	1985	25-64		22.2	32.9	physical measurement
The Netherlands	2001	15+		7.2	9.5	administered questionnaire
Poland	1996	15+		10.3	12.4	administered questionnaire
Portugal	1997	15+		9.0		administered questionnaire
Romania	1997	15+		9.1	19.1	physical measurement
Slovakia		20+		18.0		physical measurement
Slovenia						
Spain	1997	15+		11.0		administered questionnaire
Sweden	2003	16-84		10.4	9.5	administered questionnaire
United Kingdom	2003	16+		23.0	23.4	physical measurement

BMI=Body Mass Index
Source : WHO-Geneva database http://www.who.int/infobase/report.aspx (accessed on 2007)

Due to differences in data collection methodology (self reported or measured), diagnostic criteria adopted for risk factor definition (hypertension and hypercholesterolemia) and age ranges considered, it was not possible to pool data, provide trends overview and comparison among high risk countries. Therefore, it is important to take into consideration some data from the WHO-MONICA Project (Table 5) collected between mid 1980s and 1990s through standardized methods [14]. Trends data show a decrease in systolic blood pressure in all participating countries and also in cholesterol in many of them. MONICA results showed that changes in classic risk factors explain only a part of the change in CVD [20].

Table 5 WHO-MONICA Project : data refer to 13 EU populations. Prevalence of smoking (%), mean values of systolic blood pressure (mmHg), total cholesterol (mmol/L), BMI (Kg/m2) and annual average change in brackets measured in the final survey – women and men aged 35-64 years

Country	Population	Year	Mean of final survey (average annual change)							
			Daily smoking (%)		Systolic blood pressure (mmHg)		Total cholesterol (mmol/L)		Body-mass index (kg/m^2)	
			WOMEN	MEN	WOMEN	MEN	WOMEN	MEN	WOMEN	MEN
Belgium	Charleroi	1990-93	29 (0.09)	48 (-0.30)	125 (0.05)	131 (0.19)	6.1 (0.042)	6.2 (-0.011)	26.8 (-0.14)	27.1 (0.09)
	Ghent	1990-92	27 (0.21)	43 (-0.34)	122 (-0.07)	129 (0.37)	6.0 (0.005)	6.0 (-0.026)	26.1 (-0.12)	26.4 (0.14)
Czech Republic	Czech Republic	1992	23 (0.32)	39 (-0.75)	134 (-0.13)	137(-0.12)	6.1 (-0.004)	6.2 (-0.022)	27.8 (-0.07)	27.6 (0.05)
Denmark	Glostrup	1991-92	45 (0.72)	43 (-0.29)	121 (-0.47)	126 (-0.08)	5.8 (-0.019)	6.0 (0.001)	24.7 (0.01)	26.0 (0.05)
Finland	Kuopio Province	1992	13 (0.02)	30 (-0.70)	139 (-0.61)	140 (-0.58)	5.8 (-0.059)	6.0 (-0.048)	27.1 (0.04)	27.3 (0.09)
	North Karelia	1992	11 (0.17)	27 (-0.47)	137 (-0.49)	142 (-0.06)	5.7 (-0.064)	6.0 (-0.034)	27.1 (0.00)	27.5 (0.06)
	Turku/Loimaa	1992	19 (0.23)	29 (-0.62)	135 (-0.38)	139 (-0.52)	5.7 (-0.045)	5.9 (-0.045)	26.2 (0.02)	27.1 (0.09)
France	Lille	1995-96	17 (0.44)	33 (-0.82)	129 (-0.73)	135 (-0.60)	5.8 (-0.087)	5.8 (-0.082)	26.4 (0.07)	26.4 (0.07)
	Strasbourg	1995-97	15 (-014)	23 (-1.06)	127 (-0.85)	135 (-0.72)	5.9 (0.036)	6.0 (0.036)	26.2 (-0.07)	27.3 (0.03)
	Toulouse	1994-96	22 (-0.02)	24 (-1.57)	117 (-0.88)	125 (-0.69)	5.6 (-0.024)	508 (-0.009)	24.5 (0.03)	26.1 (0.06)
Germany	Augsburg (rural)	1994-95	16 (0.24)	24 (-0.82)	129 (-0.40)	136 (0.04)	5.9 (-0.017)	6.1 (-0.010)	26.8 (0.01)	27.8 (0.05)
	Augsburg (urban)	1994-95	25 (0.43)	35 (-0.31)	131 (0.21)	137 (0.24)	5.9 (-0.034)	6.2 (-0.013)	26.5 (0.02)	27.1 (0.03)
	Bremen	1991-92	30 (-0.40)	45 (-0.51)	128 (-1.59)	132 (-0.82)	6.2 (0.0022)	6.2 (0.017)	26.3 (-0.02)	26.8 (0.08)
	East Germany	1993-94	11 (-0.78)	26 (-1.45)	137 (-0.27)	141 (-0.04)	5.8 (-0.017)	5.8 (-0.009)	26.4 (0.05)	26.9 (0.10)
Iceland	Iceland	1993-94	31 (-0.38)	23 (-0.17)	121 (0.29)	125 (0.08)	6.0 (-0.031)	6.2 (0.015)	26.3 (0.16)	26.8 (0.09)
Italy	Area Brianza	1993-94	23 (-0.06)	34 (-0.89)	127 (-0.91)	131 (-0.71)	5.9 (0.062)	5.9 (0.037)	25.5 (0.00)	26.4 (0.10)
	Friuli	1994	22 (-0.46)	29 (-0.96)	134 (-0.36)	140 (-0.19)	5.7 (-0.064)	5.9 (-0.042)	25.8 (-0.06)	26.9 (0.06)
Lithuania	Kaunas	1992-93	4 (-0.16)	35 (-0.91)	134 (-0.28)	137 (0.16)	6.2 (0.035)	6.0 (-0.016)	28.0 (-0.16)	27.1 (-0.07)
Poland	Tarnobrzeg Voivodship	1992-93	21 (0.50)	54 (-0.44)	134 (-0.22)	134 (-0.08)	5.5 (0.000)	5.6 (0.021	28.5 (0.12)	25.9 (0.04)
	Warsaw	1993	34 (-0.69)	52 (-0.93)	128 (-1.52)	132 (-1.35)	5.6 (0.013)	5.7 (0.020)	27.5 (0.02)	27.1 (0.03)
Spain	Catalonia	1994-1996	15 (0.50)	41 (-1.10)	118 (-0.48)	121 (-0.50)	5.5 (-0.024)	5.6 (-0.023)	27.4 (0.08)	26.7 (0.09)
Sweden	Gothenburg	1994-96	29 (-0.50)	25 (-0.47)	130 (0.20)	134 (0.17)	5.4 (-0.085)	5.6 (-0.063)	24.9 (0.06)	26.2 (0.10)
	Northern Sweden	1994	28 (0.50)	21 (-0.41)	126 (-0.25)	130 (-0.21)	6.1 (-0.009)	6.3 (-0.005)	25.7 (-0.01)	26.4 (0.06)
UK	Belfast	1991-92	25 (-1.28)	29 (-0.82)	129 (-0.41)	135 (0.12)	5.9 (-0.024)	5.9 (-0.012)	25.6 (0.01)	26.3 (0.06)
	Glasgow	1995	41 (-0.68)	41 (-1.17)	126 (-0.93)	133 (-0.70)	6.1 (-0.047)	6.1 (-0.011)	26.9 (0.11)	26.8 (0.12)

3 Ischaemic Heart Disease

3.1 Incidence

In this chapter, for reasons of simplicity and clarity, the term 'incidence' is used to refer to coronary events rate, although 'incidence' has a different meaning when used in epidemiology. In fact, the number of first events (fatal and non fatal), whereas coronary event rate includes first and recurrent events.
Table 6 shows data from the WHO-MONICA Project [11] for the age range 35-64 years as mean annual incidence for coronary events rates, mean annual change in 10 years of surveillance and 28-day case fatality; incidence trend mainly depends on risk factors trend, whereas case fatality, including in and out of hospital events, is affected by severity of disease and impact of treatments in acute phase. These data, although collected several years ago and not necessarily representative of the countries, were all collected and validated through the same standardized methodology, therefore they are comparable and still today are considered a gold standard. The WHO-MONICA Project results showed that coronary event rates were higher in populations in Northern, Central and Eastern Europe than in Southern Europe: in men living in Warsaw they were three times higher than they were in Catalonia; in women four times higher. Incidence was falling rapidly in most of the populations in Northern Europe, not falling as fast in the populations in Southern, Central and Eastern Europe. Case fatality was higher in many populations in Central and Eastern Europe than in Northern and Southern Europe. In populations in which mortality decreased, coronary event rates contributed two third and case fatality one third [11].
Data collection for the international MONICA study ended in 1994/95. After that period, some countries continued to collect data simplifying some procedures but ensuring events validation. Within the EUROCISS Project - *European Cardiovascular Indicators Surveillance Set*- [21] an inventory of these AMI population-based registers in Europe was performed (Table 7): these registers cover different age groups (ranging between 25 and 74 years or more) and use different procedures for event definition, therefore data comparison is difficult. The major difference consists in the selection of mortality and hospital discharge codes used for the definition of events: Denmark includes only AMI, Sweden adds acute coronary syndrome (ACS), Finland also sudden death. Some countries include all IHD, and others percutaneous transluminal coronary angioplasty (PTCA) and coronary artery by-pass grafting (CABG) [22]. Problems of temporal and geographic comparisons derive from different coding practices in each country. However, when comparing data from different countries, it is important to highlight differences in event definition as this may help identify in the future standardized procedures and methods for event definition and validation.

Table 6 WHO-MONICA Project: data refer to 13 EU population. Mean annual coronary event rates (fatal and non fatal first and recurrent events) per 100,000 during 10-year registration (mid 1980s-mid 90s) in men and women aged 35-64 years; 28-day case fatality; trend of coronary event rates in 10 years

Country	Population	MEN			WOMEN		
		Coronary event rate (x 100,000)	28-day case fatality (%)	Trend of coronary event rate (%)	Coronary event rate (x 100,000)	28-day case fatality (%)	Trend of coronary event rate (%)
Belgium	Charleroi	487	50.1	0.3	118	59.3	1.1
	Ghent	346	47.4	-3.2	77	58.0	-3.0
Czech Republic	Czech Republic	515	52.8	-0.4	101	53.9	2.1
Denmark	Glostrup	517	52.5	-4.2	140	58.0	-2.5
Finland	Kuopio Province	718	45.7	-6.0	124	38.7	-4.5
	North Karelia	835	48.1	-6.5	145	41.3	-5.1
	Turku/Loimaa	549	48.5	-4.2	94	48.9	-4.5
France	Lille	298	58.7	-1.1	64	69.5	-1.6
	Strasbourg	292	49.0	-2.1	64	57.1	-6.6
	Toulouse	233	40.0	-3.9	36	59.8	-1.7
Germany	Augsburg	286	55.1	-3.2	63	64.6	0.9
	Bremen	361	49.6	-3.4	81	52.0	0.7
	East Germany	370	50.0	-0.5	78	62.8	2.5
Iceland	Iceland	486	36.9	-4.7	99	34.1	-3.7
Italy	Area Brianza	279	40.7	-2.3	42	52.5	-3.5
	Friuli	253	45.1	-0.9	47	49.9	-0.8
Lithuania	Kaunas	498	54.8	1.2	80	53.7	2.7
Poland	Tarnobrzeg Voivodship	461	82.7	1.1	110	88.4	-0.1
	Warsaw	586	59.9	0.8	153	59.2	1.0
Spain	Catalonia	210	60.7	1.8	35	45.5	2.0
Sweden	Gothenburg	363	43.6	-4.2	84	45.4	-3.7
	Northern Sweden	509	36.1	-5.1	119	34.4	-2.4
UK	Belfast	695	41.0	-4.6	188	41.5	-2.4
	Glasgow	777	48.2	-1.4	265	46.4	0.2

Reprinted from the Lancet, 353, Tunstall-Pedoe H, Kuulasmaa K, Mahonen M, et al. for the WHO MONICA project, Contribution of trends in survival and coronary-event rates to changes in coronary heart disease mortality: 10-year results from 37 WHO MONICA Project populations, 1547-57, 1999, with permission from Elsevier

Table 7 Regional population-based AMI/ACS registers in EU countries: age-range, ICD version, mortality and hospital discharge codes used for the record linkage in the definition of coronary event and validation methods

	Sources of information					
Country	**Age range**	**ICD version**	**Mortality ICD codes (*)**	**HDR ICD codes (*)**	**Linkage mortality / HDR**	**Validation**
Belgium Charleroi, Ghent, Bruges	25-69 (Charleroi) 25-74 (Ghent, Bruges)	IX, X	410-414, 428, 798, 799	410-414, 428, PTCA, CAGB	name, date of birth	*ECG, enzymes, symptoms, MONICA*
Denmark	All	VIII,X	410	410	PIN	no validation
Finland	35-85+	X	410, 411, 428, 798, 799	410, 411, PTCA, CABG	PIN	MONICA, ESC/ACC
France	35-74 (since '97)	IX, X	410-414, 428, 798, 799, others	410-414, 428	name, date of birth	MONICA
Germany	25-74	X	410-414, 798, 799	410, 411, PTCA, CAGB	name, date of birth	MONICA, ESC/ACC
Italy	35-74	IX	410-414, 798, 799, others	410-414	name, date of birth	MONICA
Norway	All	X	410	410, PTCA, CABG	PIN	no validation
Spain	25-74	IX	410-414, 428, 798, 799, others	410-414	name, date of birth	MONICA
Sweden	35-74	X	410, 411	410, 411	PIN	MONICA

AMI=Acute Myocardial Infarction, ACS= Acute Coronary Syndrome, ICD=International Classification of Disease, HDR=Hospital Discharge Records, PIN=Personal Identification Number, PTCA=Percutaneous Transluminal Coronary Angioplasty, CABG=Coronary Artery By-pass Grafting, ECG=Electrocerdiogram,
MONICA,=MONItoring Cardiovascular disease, ESC/ACC=European Society of Cardiology/American College of Cardiology
(*) all codes are presented in the ICD-9 revision to facilitate comparison
Source: European J of Public Health 2003; 13 (Suppl 3): 55-60 (updated 2006)

3.2 Hospital discharge diagnoses

Hospital discharge records include fatal and non fatal first and recurrent events; usually, they represent an important source of information at national level for non fatal events.
Hospital discharge diagnoses (main diagnosis) from WHO-HFA [17] were used to calculate crude (all ages) hospital discharge rates for IHD (ICD-10 I20-I25; ICD-9 410-414) and acute myocardial infarction (AMI, ICD-10 I21-I22; ICD-9 410) for the last year available (Table 8). These data are scarce and not validated, therefore analysis of temporal trends is not possible and comparison among countries not completely reliable. Moreover, their interpretation is difficult due to different hospital admission policies, different coding practices and multiple hospital admissions for the same patient. To facilitate comparison at least within the same country, data on IHD, AMI and stroke hospital discharges are reported together with data on all CVD hospital discharges. Great differences exist between hospitalizations for all CVD and for IHD/Stroke. Contrary to common belief that most hospitalizations are for myocardial infarction and stroke, in almost all countries more than half of hospitalizations are not for these diseases. In recent years, there has been a notable increase in the number of hospitalizations for heart failure and arrhythmias, which are common complications of myocardial infarction and require frequent hospitalizations. Availability of data on hospital discharges for these conditions could improve understanding of the patterns of morbidity and future trends in medical care.
To facilitate ranking of the different countries, age-standardized (35-74) AMI hospital discharge rates for men and women in countries with data available were computed from EUROSTAT data and reported in Table 9 [23]. Hospitalization rates in Northern, Central and Eastern Europe are higher than in Southern Europe.

Table 8 Crude hospital discharge rates (per 100,000 inhabitants) from all cardiovascular diseases, ischaemic heart disease, acute myocardial infarction and stroke. Last year available, all ages

Country	Last year	All CVD*	IHD*	AMI**	Stroke*
Austria	2004	4060.8	1035.0	182.1	628.6
Belgium	2004	2302.8	721.8	158.8	378.7
Bulgaria	2005	2839.9	722.2	-	593.3
Croatia	2005	1849.9	502.6	138.3	408.9
Cyprus	2005	738.3	253.0	75.7	108.7
Czech Republic	2005	3742.9	1063.0	211.2	646.8
Denmark	2005	2559.3	822.9	256.0	383.6
Estonia	2004	3386.9	1046.8	-	608.1
Finland	2005	3121.3	923.0	293.7	561.1
France	2004	2233.4	513.7	123.9	218.0
Germany	2004	3125.1	915.9	235.9	421.9
Greece	2001	2432.0	828.7	-	423.6
Hungary	2005	4977.3	997.9	209.9	1394.5
Iceland	2004	1710.3	638.8	169.4	206.1
Ireland	2005	1316.3	450.6	134.3	169.6
Italy	2003	2443.7	598.8	206.1	490.8
Latvia	2005	3635.9	1380.6	243.6	794.8
Lithuania	2005	4569.5	1397.1	200.2	1055.2
Luxembourg	2004	2407.0	865.2	-	174.9
Malta	2005	727.1	271.4	-	54.3
Netherlands	2004	1549.2	555.3	147.9	213.2
Norway	2005	2468.8	952.5	369.3	342.5
Poland	2004	2930.9	888.9	199.4	418.4
Portugal	2005	1239.8	277.2	107.6	329.2
Romania	2004	2881.7	649.4	-	515.5
Slovakia	2005	2679.1	883.6	128.0	518.3
Slovenia	2004	1791.7	392.4	173.6	228.2
Spain	2003	1412.6	362.2	126.9	267.8
Sweden	2005	2457.8	782.8	-	417.4
Switzerland	2004	1828.9	540.5	125.1	206.8
United Kingdom	2003	1452.2	532.5	181.1	224.9

CVD=all cardiovascular diseases, IHD=ischaemic heart disease, AMI=acute myocardial infarction
**Source: WHO-Health for All Database (http://data.euro.who.int/hfadb/)-2007*

** Source: WHO Regional Office for Europe – European Hospital Morbidity Database (http://data.euro.who.int/hmdb/index.php)-2007

Table 9 Age-standardized (standard European population) hospital discharge rates per 100,000 inhabitants for acute myocardial infarction (codes ICD-10 I21-I22) - Men and women aged 35-74 years – year 2003

Country	Men	Women	Men+Women
Belgium	329.90	85.16	207.46
Czech Republic	483.13	168.10	316.33
Denmark	476.37	172.50	321.85
Germany	348.14	111.01	226.95
Ireland	304.56	101.35	202.07
Spain	290.35	64.38	173.45
France	269.18	58.93	160.35
Italy	367.71	93.41	225.36
Cyprus	264.08	41.04	149.00
Lithuania	432.48	146.02	268.96
Malta	151.75	42.05	94.66
Netherlands	323.38	105.28	213.21
Austria	320.03	101.41	206.60
Slovenia	327.77	104.84	211.71
Finland	439.10	143.57	283.30
United Kingdom	313.54	104.91	206.61

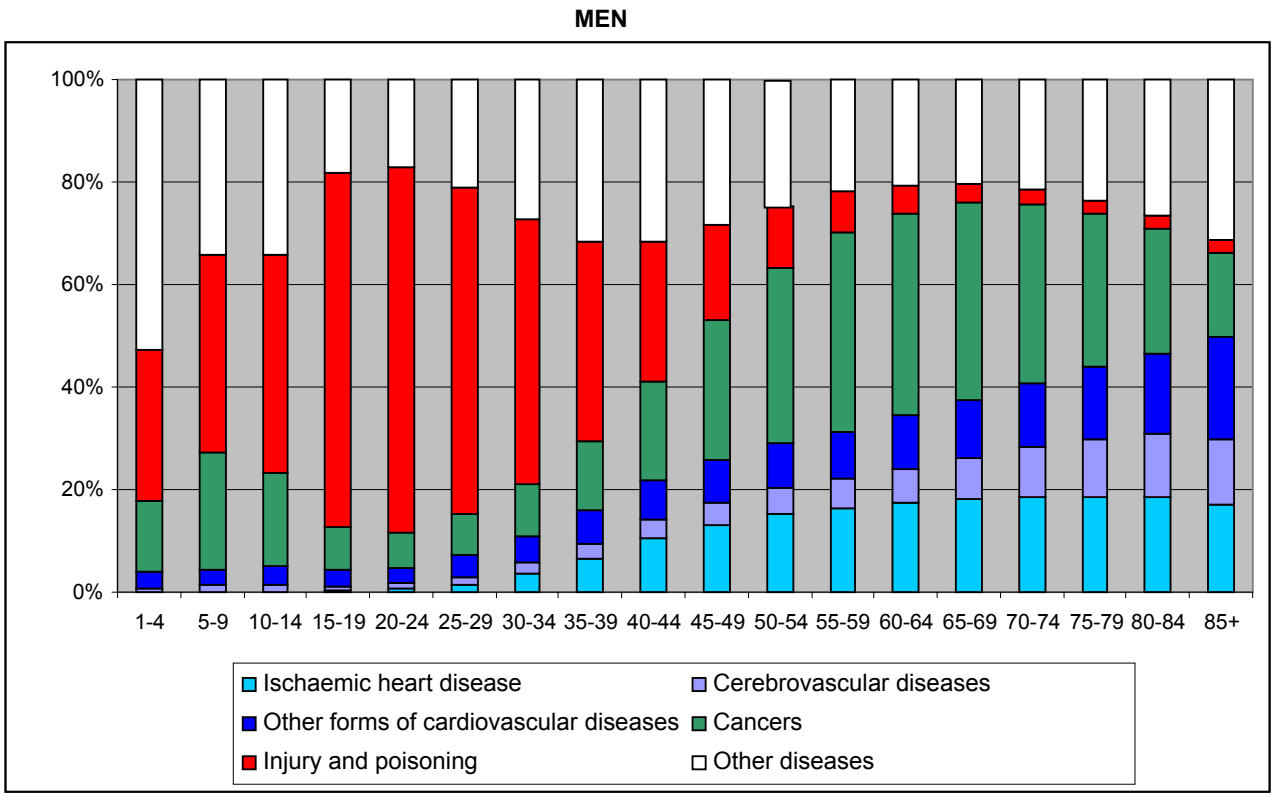
Germany data refer to 2002 (last year available)
Italy, Lithuania, Malta and Slovenia data refer to 2004 (last year available)
Source: EUROSTAT-2007

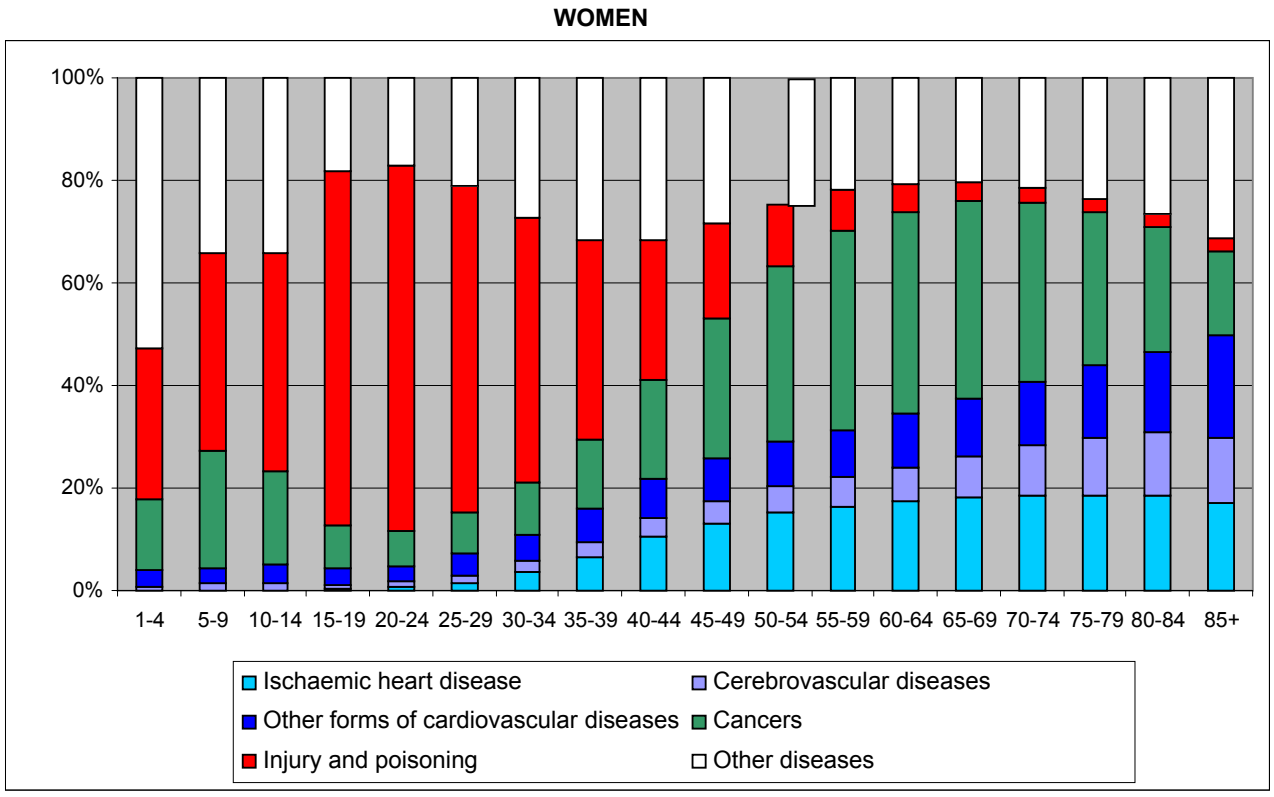
3.3 Mortality

IHD mortality data were analyzed using EUROSTAT database [23].
Following the recommendations of the *EUROCISS Project*, the EUROSTAT data were age-standardized for 35-74 years by direct method using the European population as standard. The age range of 35-74 years was recommended because below the age of 35 events are rare and the age structure above 74 years differs among European countries; over 75 years, CVD mortality becomes increasingly salient, but it is often associated to co-morbidities, which make data validation more difficult. In addition, although prevention benefits all age groups, the most effective preventive measures usually target individuals under 75 years. Therefore it is highly recommended to investigate differences among middle age adults in the various countries in order to implement appropriate preventive actions.
IHD mortality was defined as underlying ICD-10 codes I20-I25 (ICD-9 codes 410-414). Age-specific total mortality rates for the average of the last 3 years available (2001-2003) in the European Union (EU) and the proportion of cause-specific mortality in the different age groups for circulatory system (IHD, stroke and other CVD), cancer and violence were calculated (Fig. 1). IHD accounted for over 744.000 deaths every year: around one in six men and over one in seven women died from IHD [1]. Below the age of 75 years, IHD mortality was higher in men (17%) than in women (12%) and was the most frequent cause of death in women, accounting for more deaths than breast cancer (8%).
In the age-range 35-74 years, IHD accounts for 15% of deaths and percentages increase with age. IHD patterns show a clear East-West gradient with the highest mortality rates in Baltic countries and Eastern Europe. It varies from 42.7 deaths per 100,000 in France to 327.0 deaths per 100,000 in Latvia, being then almost eight times higher (in men 72 deaths per 100,000 in France and 555 in Latvia; in women 16 deaths per 100,000 in France and 167 in Latvia).
Age-standardized (35-74 years) mortality rates were calculated for the last ten years (1994-2003) to estimate trends. To make trends more visible, countries were divided into Baltic countries (Estonia, Latvia, Lithuania), Central Eastern European countries (Czech Republic, Poland, Slovakia), Balkan Eastern European countries (Bulgaria, Hungary, Romania), Northern European countries (Denmark, Ireland, Malta, Finland, Sweden, United Kingdom),

Central European countries (Belgium, Germany, Luxembourg, The Netherlands, Austria, Slovenia) and Southern European countries (Greece, Spain, France, Italy, Portugal). Malta was included among Northern Europe countries because mortality rates are higher compared to those of the Mediterranean countries and the population has similar characteristics to those of populations of Northern Europe. Mortality trends for IHD in men are shown in Figure 2: from 1994 to 2003 mortality rates in the age range 35-74 fell by 38% in Northern Europe (from 300 to 186 per 100,000), 45% in Central Eastern Europe (from 440 to 242 per 100,000), 27% in Balkan Eastern Europe (from 450 to 326 per 100,000), 37% in Central Europe (from 225 to 142 per 100,000), 34% in Southern Europe (from 139 to 91 per 100,000) and 27% in Baltic countries (from 696 to 505 per 100,000). Similar results are found in women (Fig. 3) for which mortality rates fell by 40% in Central Europe (from 73 to 44 per 100,000), 51% in Central Eastern Europe (from 157 to 77 per 100,000), 23% in Balkan Eastern Europe (from 169 to 130 per 100,000), 41% in Northern Europe (from 102 to 61 per 100,000), 36% in Baltic countries (from 231 to 148 per 100,000) and 41% in Southern Europe (from 40 to 23 per 100,000).

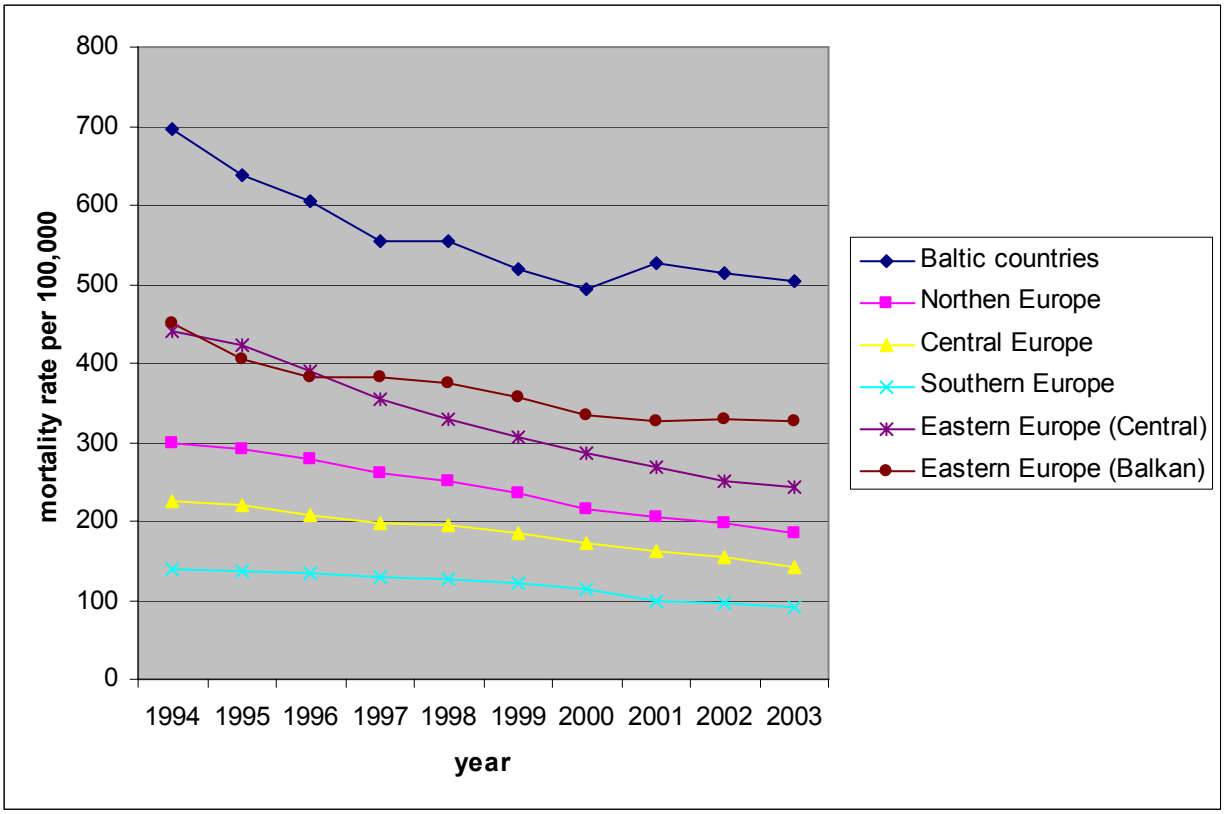
Figure 1 Proportional mortality rate of cardiovascular disease, cancer and violence (injury and poisoning) in EU; 3 year average (2001-2003), by gender





Source: EUROSTAT(http://epp.eurostat.ec.europa.eu)-2007

Figure 2 Age-standardized mortality rates per 100,000. Trends for ischaemic heart diseases (codes ICD-9 410-14)-Men aged 35-74 years



Baltic Countries include: Estonia, Latvia, Lithuania
Northern Europe includes: Denmark, Ireland, Malta, Finland, Sweden, United Kingdom
Central Europe includes: Belgium, Germany, Luxembourg, Netherlands, Austria, Slovenia
Southern Europe includes: Greece, Spain, France, Italy, Portugal
Eastern Europe (Central) includes: Czech Republic, Poland, Slovakia
Eastern Europe (Balkan) includes: Bulgaria, Hungary, Romania

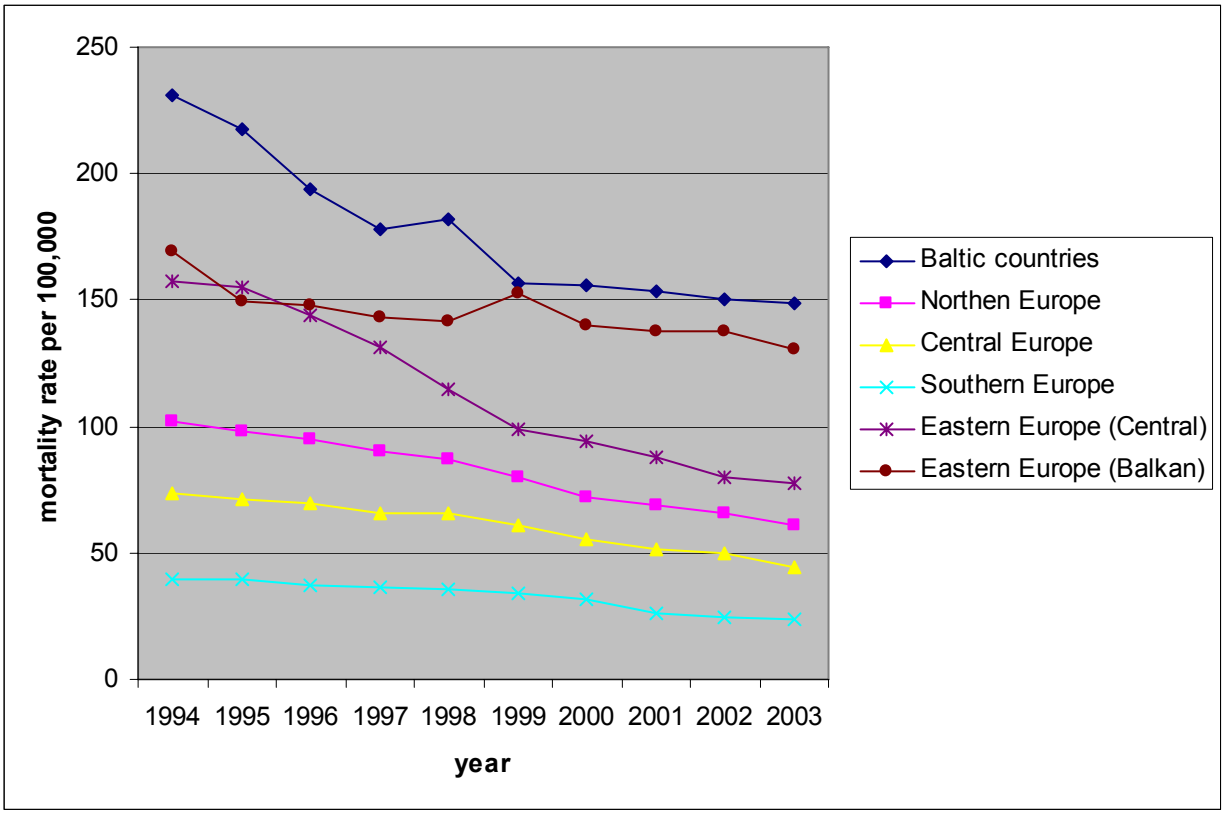
1994 and 1995 Baltic Countries mortality rates are calculated without considering Latvia rates (missing data)
2002 and 2003 Northern Europe mortality rate is calculated without considering Denmark rate (missing data)
1998, 1999, 2000, 2001, 2002 and 2003 Central Europe mortality rates are calculated without considering Belgium rates (missing data)

1994, 1995, 1996, 1997, 1998, 1999, 2000 Southern Europe mortality rates are calculated without considering France rates (missing data)

1994, 1995, 1996, 1997 and 1998 Eastern Europe (Central) mortality rates are calculated without considering Poland, and Slovakia rates (missing data)
1994 Eastern Europe (Balkan) mortality rate is calculated without considering Bulgaria and Romania rates (missing data)
1995, 1996, 1997 and 1998 Eastern Europe (Balkan) mortality rates are calculated without considering Romania (missing data)

Source: EUROSTAT(http://epp.eurostat.ec.europa.eu) -2007

Figure 3 Age-standardized mortality rates per 100,000. Trends for ischaemic heart diseases (codes ICD-9 410-14)-Women aged 35-74 years



Baltic Countries include: Estonia, Latvia, Lithuania
Northern Europe includes: Denmark, Ireland, Malta, Finland, Sweden, United Kingdom
Central Europe includes: Belgium, Germany, Luxembourg, Netherlands, Austria, Slovenia
Southern Europe includes: Greece, Spain, France, Italy, Portugal
Eastern Europe (Central) includes: Czech Republic, Poland, Slovakia
Eastern Europe (Balkan) includes: Bulgaria, Hungary, Romania

1994 and 1995 Baltic Countries mortality rates are calculated without considering Latvia rates (missing data)
2002 and 2003 Northern Europe mortality rate is calculated without considering Denmark rate (missing data)
1998, 1999, 2000, 2001, 2002 and 2003 Central Europe mortality rates are calculated without considering Belgium rates (missing data)

1994, 1995, 1996, 1997, 1998, 1999, 2000 Southern Europe mortality rates are calculated without considering France rates (missing data)

1994, 1995, 1996, 1997 and 1998 Eastern Europe (Central) mortality rates are calculated without considering Poland, and Slovakia rates (missing data)
1994 Eastern Europe (Balkan) mortality rate is calculated without considering Bulgaria and Romania rates (missing data)
1995, 1996, 1997 and 1998 Eastern Europe (Balkan) mortality rates are calculated without considering Romania (missing data)

Source: EUROSTAT(http://epp.eurostat.ec.europa.eu) -2007

4 Stroke

4.1 Incidence

Data from the WHO-MONICA Project [24] are reported for the age range 35-64 years as mean stroke event rates derived from the last 3 years of surveillance (Table 10). Annual change in stroke events and 28-days case fatality are also reported. The WHO definition of stroke, based on clinical findings (symptoms, signs and clinical examination) and then not dependent on access to more sophisticated diagnostic techniques (Computed Tomography Scan [CT-Scan] and Magnetic Resonance Imaging [MRI]), was used in the WHO-MONICA Project. Stroke event rate, which includes fatal and non fatal in- and out-of-hospital coronary events, was higher in populations in Northern Europe (Lithuania, Finland, Northern Sweden); for those living in Lithuania is three times higher than it is in Italy. The results of the WHO-MONICA Project showed that changes in stroke mortality, whether declining or increasing, were principally attributable to changes in case fatality rate rather than to changes in incidence: the quality of acute stroke care varies between countries and an improvement in initial diagnosis, treatment and rehabilitation programmes may reduce case fatality. How much of this reduction was attributable to changes in the management of stroke or changes in disease severity cannot be established through the MONICA Project [25].
Nowadays, considering only the age range 35-64 would lead to the exclusion of a large number of patients suffering from CVD.

Table 10 WHO-MONICA Project 6 EU population. Age-standardized average attack rate per stroke events (fatal and non fatal) per 100,000: mean of the last 3 years of the 10-year surveillance in men and women ages 35-64 years; 28-day case fatality; average annual trend in 10 years of stroke events

Country	Population	MEN			WOMEN		
		Stroke event rate (x 100,000	28- day case fatality (%)	Annual Trend %	Stroke event rate (x 100,000	28- day case fatality (%)	Annual Trend %
Denmark	Glostrup	160	20	-4.3	90	22	-1.9
	Kuopio Province	310	16	-2.5	130	16	-4.9
Finland	Nort Karelia	257	20	-1.6	117	20	-0.7
	Turku/Loimaa	228	17	-1.2	108	24	-1.3
Italy	Friuli	121	24	-0.7	59	31	-0.6
Lituania	Kaunas	347	24	1.5	182	26	2.0
Poland	Warsaw	171	40	0.2	93	44	0.6
	Gothenburg	149	18	1.5	72	25	-0.4
Sweden	Northern Sweden	219	12	0.0	136	17	1.9

Source: C. Sarti, B. Stegmayr, H. Tolonen et al., Stroke 2003, 34:1833-184

4.2 Hospital discharge diagnoses

The ICD morbidity codes for stroke (ICD-10 I60-I69, G45; ICD-9 430-438) were used as main hospital discharge diagnoses. Data from the WHO-HFA [17] were used for stroke; these data are scarce, therefore temporal trends were not analyzed. All ages crude rates from WHO-HFA are reported in Table 8. Their interpretation is difficult due to various factors such as multiple hospital admissions for the same patient (sequelae of stroke) and different hospital admission policies and coding practices. The use of diagnostic technologies, such as CT-Scan and MRI, has greatly improved the accuracy of diagnoses of hospitalized cerebrovascular events allowing delineation of the location and type of lesion. Nevertheless, data on hospital discharges for ischemic and haemorrhagic stroke separately are still not available.
To facilitate comparison among countries with available data, age-standardized (35-84 years) hospital discharge rates for men and women for the last year available (2003) were computed from EUROSTAT and reported in Table 11: hospitalization rates in Northern, Central and Eastern Europe are higher than in Southern Europe [23].

Table 11 Age-standardized (standard European population) hospital discharge per 100,000 inhabitants

Cerebrovascular disease - Men and women aged 35-84 years - year 2003

	Men	Women	Men+Women
Belgium	113.30	73.73	93.29
Czech Republic	320.58	165.45	240.18
Denmark	186.50	126.31	156.44
Germany	181.00	114.95	147.92
Ireland	109.16	72.58	90.99
Spain	106.89	53.55	79.65
France	100.70	56.57	78.26
Italy	142.45	90.25	115.61
Lithuania	454.91	429.65	439.82
Malta	20.57		14.31
Netherlands	87.30	70.36	78.89
Austria	235.39	148.07	190.67
Slovenia	122.82	63.91	93.07
Finland	291.52	158.48	224.41
United Kingdom	86.05	62.05	73.87

Germany data refer to 2002 (last year available)
Italy, Lithuania, Malta and Slovenia data refer to 2004 (first year available
Source: EUROSTAT-2007

4.3 Mortality

In most European countries death from stroke has declined by 30-50% since 1975, but in Eastern Europe countries, stroke mortality has remained stable or slightly increased [26-29].
Despite the decline in mortality, the annual number of cases of stroke is expected to increase within the next few decades, mainly due to a growth in the elderly population, which will lead to an increase in the health burden of stroke and consequent increase in economic costs [30].
EUROSTAT data were analyzed to obtain mortality rates [23]. Stroke mortality was defined as underlying ICD-10 codes I60-I69, G45 (ICD-9 codes 430-438). Following the EUROCISS

Project recommendations, age-standardized mortality rates for the age groups 35-74 and 35-84 years separately were calculated for the average of the last 3 years available in the Member States of the EU (Table 12). In men, mortality varies from 60 deaths per 100,000 in France to 399 deaths per 100,000 in Romania, being then almost seven times higher. In women it varies from 36 deaths per 100,000 in France to 297 deaths in Bulgaria, being then almost eight times higher. In the age range 75-84 years stroke events doubled in both men and women: this demonstrates that stroke is a disease which mainly affects the elderly.

The last ten years (1994-2003) were selected to estimate mortality trends. To make trends more visible, countries have been divided into Baltic countries (Estonia, Latvia, Lithuania), Central Eastern European countries (Czech Republic, Poland, Slovakia), Balkan Eastern European countries (Bulgaria, Hungary, Romania), Northern Europe (Denmark, Ireland, Malta, Finland, Sweden, United Kingdom), Western Europe (Belgium, Germany, Luxembourg, The Netherlands, Austria, Slovenia) and Southern European countries (Greece, Spain, France, Italy, Portugal). In the age-range 35-84 years, all cardiovascular disease accounted for 40% of total mortality and stroke accounted for 10%. In this age range, mortality rates are higher in men than in women and percentages increase with age. Mortality trends for stroke in men are shown in Fig. 4: from 1994 to 2003 mortality rates in the age range 35-84 fell by 63% in Central Europe (from 133 to 49 per 100,000), 40% in Southern Europe (from 136 to 82 per 100,000), 21% in Northern Europe (from 110 to 87 per 100,000), 34% in Central Eastern Europe (from 273 to 180 per 100,000) and 6% in Baltic countries (from 298 to 279 per 100,000). Mortality rates increased by 10% in Balkan Eastern Europe (from 324 to 357 per 100,000).

In 2003, mortality rates in Central Europe were almost seven times lower than in Balkan Eastern Europe.

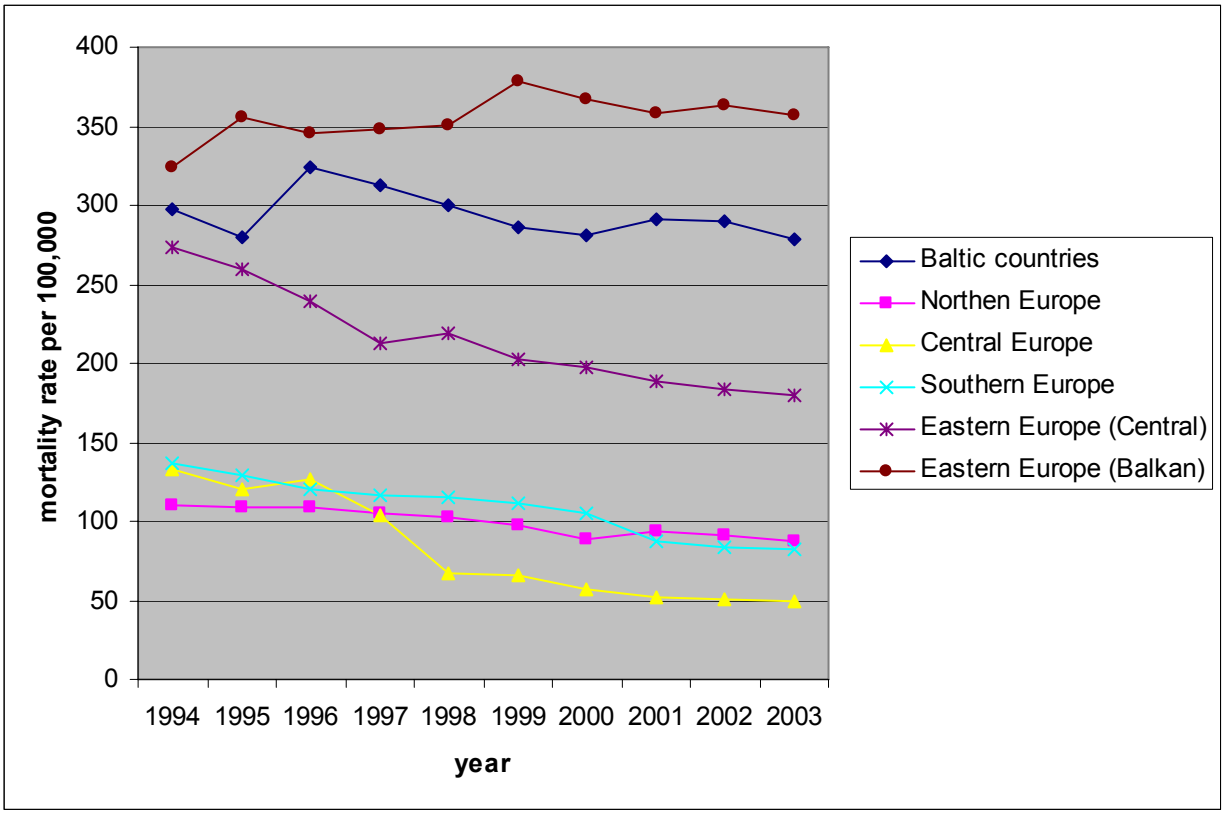
Similar results can be found in women (Fig. 5) for which mortality rates fell by 39 % in Central Europe (from 89 to 55 per 100,000), 46% in Southern Europe (from 100 to 54 per 100,000), 21% in Northern Europe (from 87 to 69 per 100,000), 13% in Baltic countries (from 218 to 189 per 100,000) and 37% in Central Eastern Europe (from 194 to 122 per 100,000). In 2003, mortality rates in Southern Europe were more than four times lower than in Balkan Eastern Europe. Mortality rates increased by 21% in Balkan Eastern Europe (from 203 to 246 per 100,000).

Table 12 Age-standardized (standard European population) cerebrovascular mortality rates per 100,000 men and women aged 35-74 and 35-84 years. 3 years average (2001 - 2003)

	Men 35-74	Women 35-74	Men 35-84	Women 35-84
Belgium	51.33	33.68	98.21	69.80
Bulgaria	219.91	124.61	412.28	297.85
Czech Republic	105.78	61.80	195.66	140.88
Denmark	53.05	38.12	94.90	70.14
Germany	44.47	25.92	81.92	56.10
Estonia	199.94	101.63	292.36	189.04
Ireland	41.24	28.09	81.92	61.72
Greece	70.63	45.38	135.53	119.51
Spain	43.06	23.19	78.25	52.04
France	34.95	18.25	60.59	36.51
Italy	43.04	25.59	85.68	58.20
Latvia	258.95	146.83	388.82	267.11
Lithuania	140.17	82.70	213.30	150.47
Luxembourg	57.15	44.25	95.56	80.33
Hungary	122.26	60.76	181.79	108.61
Malta	57.93	33.36	107.37	77.09
Netherlands	42.45	29.49	79.53	58.97
Austria	44.43	28.04	84.98	60.36
Poland	122.30	69.75	182.32	126.05
Portugal	102.72	58.04	189.71	129.26
Romania	268.40	173.40	399.12	295.15
Slovenia	84.70	43.47	140.56	85.53
Slovakia	104.38	50.89	167.81	100.85
Finland	59.43	33.26	100.06	67.83
Sweden	41.14	27.65	79.25	57.79
United Kingdom	96.92	72.56	183.01	147.76

Belgium mortality rate is calculated considering the years 1994-1996 (last years available)
Denmark mortality rate is calculated considering the years 1999-2001 (last years available)
Italy mortality rate is calculated considering the years 2000-2002 (last years available)
Source: EUROSTAT-2007

Figure 4 Age-standardized (standard European population) mortality rates per 100,000 Cerebrovascular diseases (codes ICD-9 430-38) - Men aged 35-84 years



Baltic Countries include: Estonia, Latvia, Lithuania
Northern Europe includes: Denmark, Ireland, Malta, Finland, Sweden, United Kingdom
Central Europe includes: Belgium, Germany, Luxembourg, Netherlands, Austria, Slovenia
Southern Europe includes: Greece, Spain, France, Italy, Portugal
Eastern Europe (Central) includes: Czech Republic, Poland, Slovakia
Eastern Europe (Balkan) includes: Bulgaria, Hungary, Romania

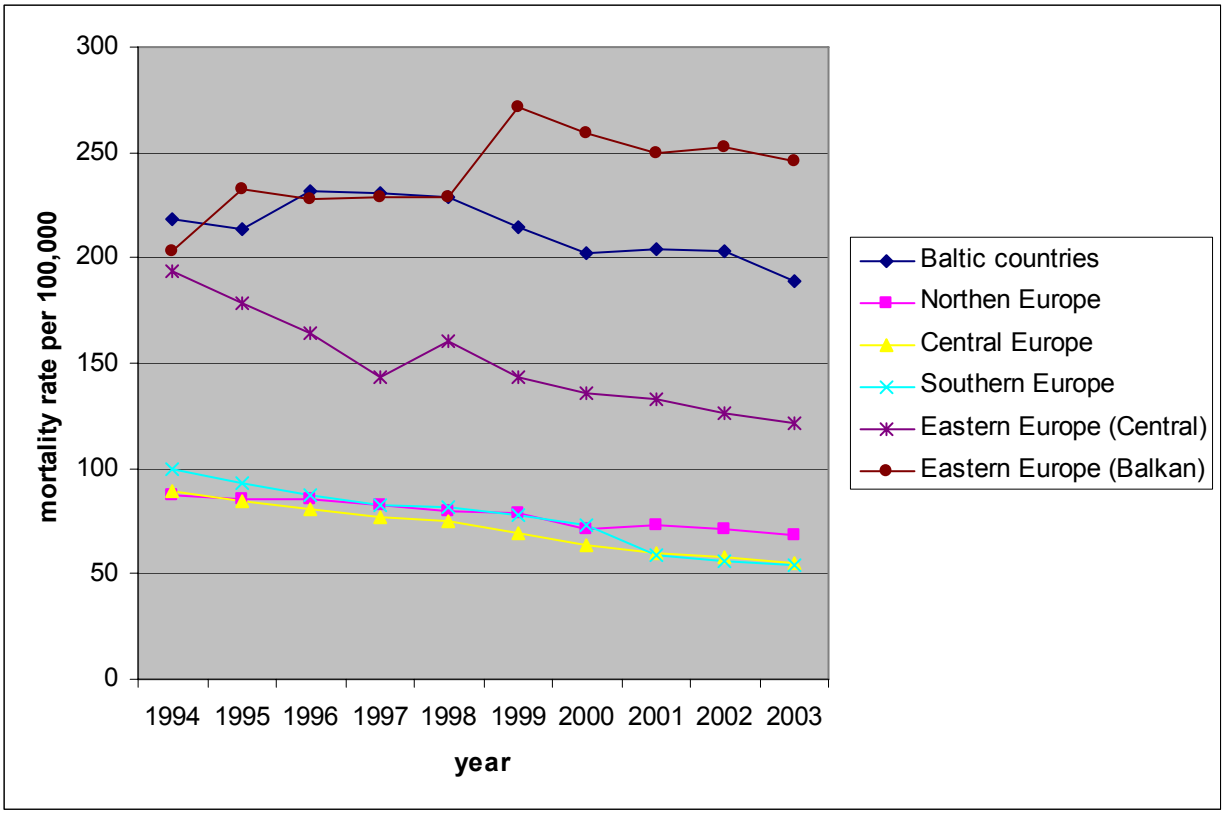
1994 and 1995 Baltic Countries mortality rates are calculated without considering Latvia rates (missing data)
2002 and 2003 Northern Europe mortality rate is calculated without considering Denmark rate (missing data)
1998, 1999, 2000, 2001, 2002 and 2003 Central Europe mortality rates are calculated without considering Belgium rates (missing data)

1994, 1995, 1996, 1997, 1998, 1999, 2000 Southern Europe mortality rates are calculated without considering France rates (missing data)

1994, 1995, 1996, 1997 and 1998 Eastern Europe (Central) mortality rates are calculated without considering Poland, and Slovakia rates (missing data)
1994 Eastern Europe (Balkan) mortality rate is calculated without considering Bulgaria and Romania rates (missing data)
1995, 1996, 1997 and 1998 Eastern Europe (Balkan) mortality rates are calculated without considering Romania (missing data)

Source: EUROSTAT(http://epp.eurostat.ec.europa.eu) -2007

Figure 5 Age-standardized (standard European population) mortality rates per 100,000 Cerebrovascular diseases (codes ICD-9 430-38) - Women aged 35-84 years



Baltic Countries include: Estonia, Latvia, Lithuania

Northern Europe includes: Denmark, Ireland, Malta, Finland, Sweden, United Kingdom
Central Europe includes: Belgium, Germany, Luxembourg, Netherlands, Austria, Slovenia
Southern Europe includes: Greece, Spain, France, Italy, Portugal
Eastern Europe (Central) includes: Czech Republic, Poland, Slovakia
Eastern Europe (Balkan) includes: Bulgaria, Hungary, Romania

1994 and 1995 Baltic Countries mortality rates are calculated without considering Latvia rates (missing data)
2002 and 2003 Northern Europe mortality rate is calculated without considering Denmark rate (missing data)
1998, 1999, 2000, 2001, 2002 and 2003 Central Europe mortality rates are calculated without considering Belgium rates (missing data)

1994, 1995, 1996, 1997, 1998, 1999, 2000 Southern Europe mortality rates are calculated without considering France rates (missing data)

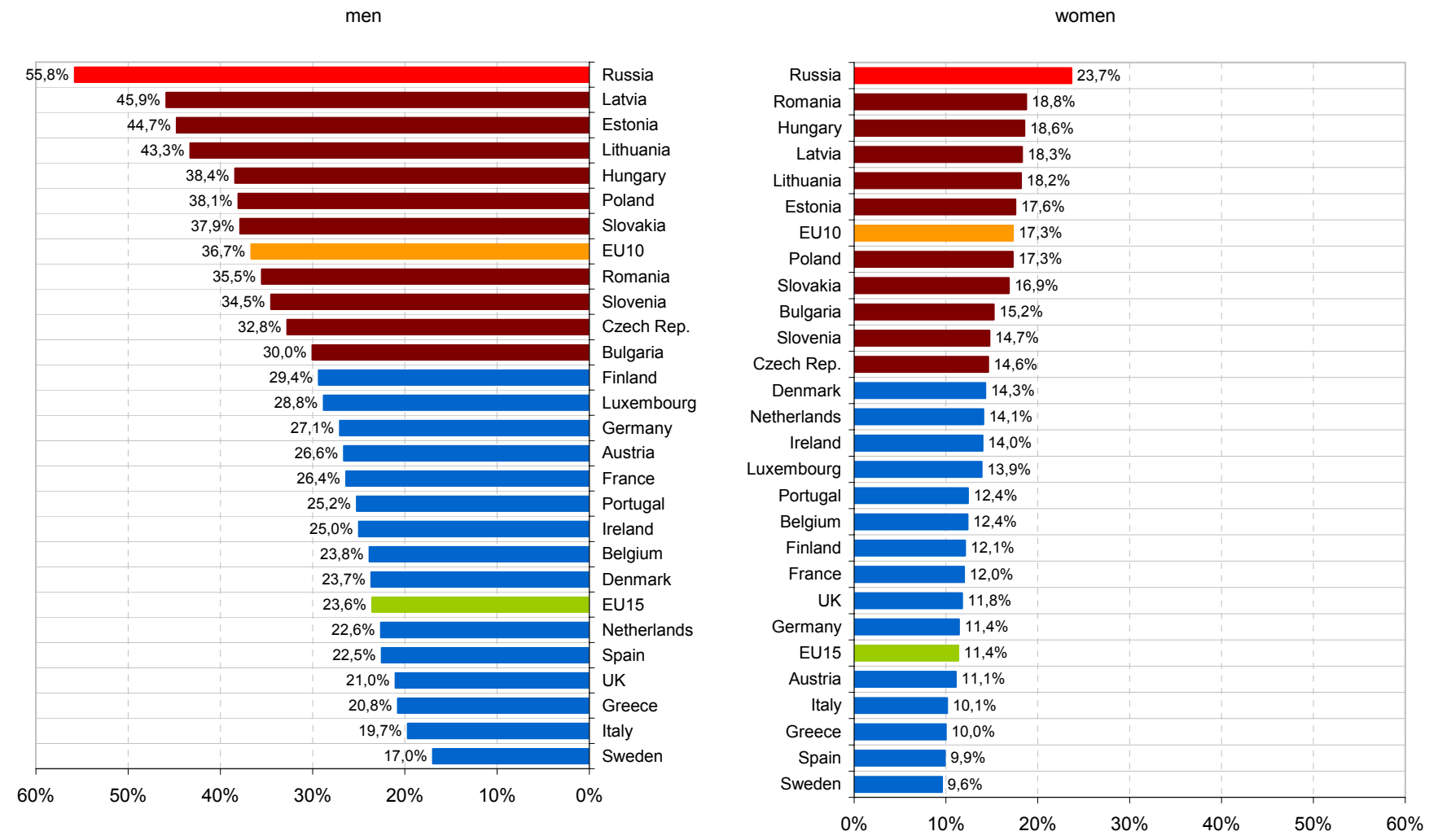
1994, 1995, 1996, 1997 and 1998 Eastern Europe (Central) mortality rates are calculated without considering Poland, and Slovakia rates (missing data)
1994 Eastern Europe (Balkan) mortality rate is calculated without considering Bulgaria and Romania rates (missing data)
1995, 1996, 1997 and 1998 Eastern Europe (Balkan) mortality rates are calculated without considering Romania (missing data)

Source: EUROSTAT(http://epp.eurostat.ec.europa.eu) -2007

5 CVD Premature Death (20-64 years)

The gap in premature mortality of young and middle-aged adults (20-64 years) most adequately defines inequalities in access to health in the European Union member states after its enlargement at the beginning of 21st century.[2] Morbidity and mortality from CVD are the essential contributor to this gap [31-34].
The aim of the HEM Project[3] is the epidemiological analysis of CVD mortality[4] in EU countries, with particular attention paid to development of situation after 1990.
The focus was mainly laid on adult premature mortality (Fig. 6), defined as mortality in the life span between the age 20 and 64.

Figure 6. Premature mortality: percentage of deaths in the age group 20-64 years - 2002



Belgium 1997, Denmark 2001

Source: WHO mortality statistics (http://www.who.int/whosis/mort/download/en/index.html)

The choice of the upper age boundary is connected to the fact that in European countries the usual working age limit is 65. Another important argument for this choice was the dramatic decline of infant mortality in Europe; in all European countries, including Eastern Europe, death before 20 (proportional mortality) became very rare (only few percent of Europeans are dying before this age).
The analysis showed that mortality from CVD is the biggest contributor to the health gap between Western and Eastern part of European Union[5] (Table 13). In men that contribution averaged 40% of the life expectancy difference in the age group 20-64, what constituted 1.7 years. In women that share was 47% (0.7 years).

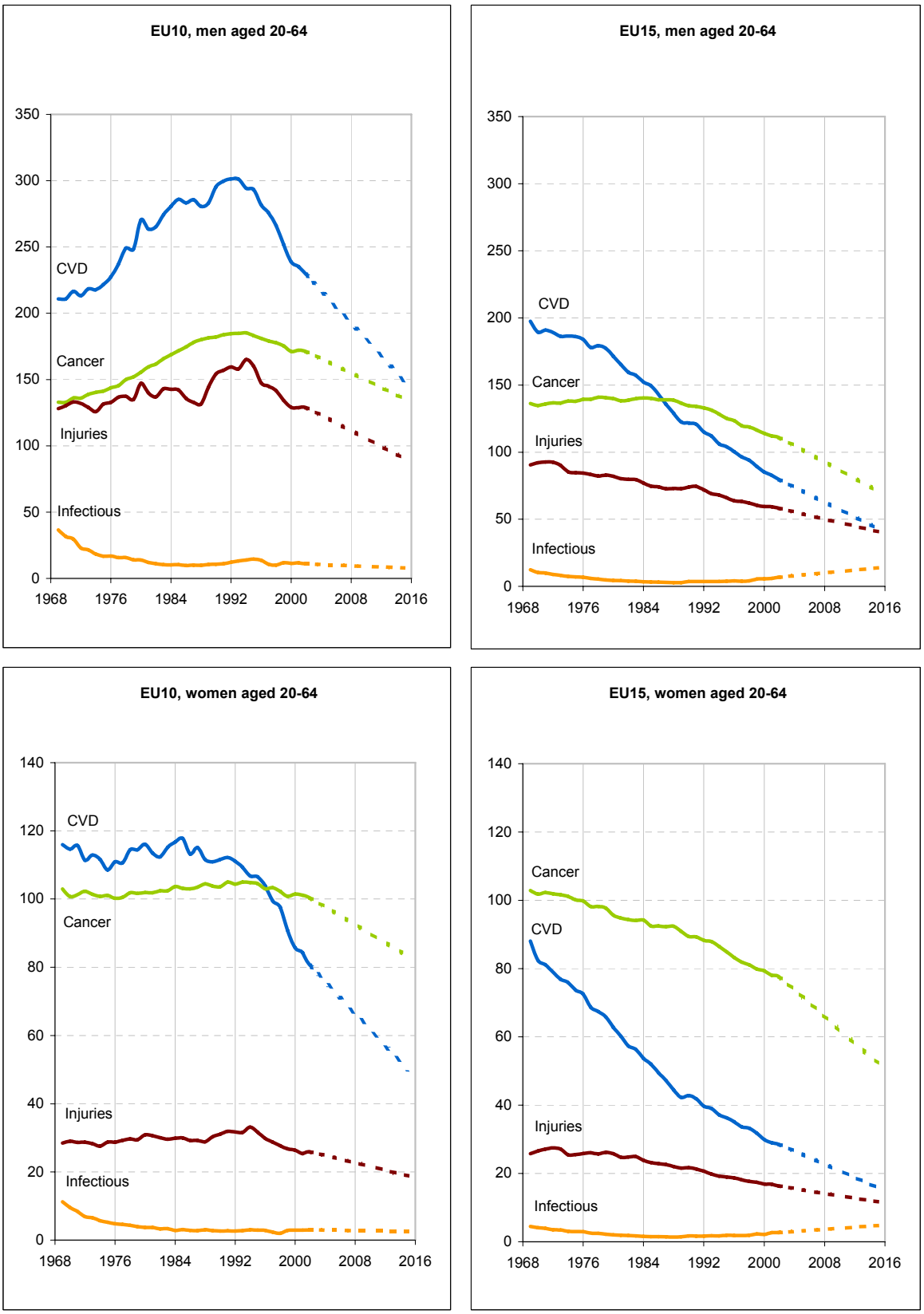
Table 13 Contribution (years of life) of selected causes of death to the difference in expectation of life between EU10 and EU15, 2002

	cvd	cancer	injuries	infectious	other	Totals
MEN						
	1.7	0.7	1.0	0.1	0.8	4.2
Difference in life expectancy between ages 20 and 64:	**40%**	16%	23%	1%	19%	
Total life expectancy at birth difference:						6.8
WOMEN						
	0.7	0.4	0.2	0.0	0.3	1.5
Difference in life expectancy between ages 20 and 64:	**47%**	24%	11%	0%	18%	
Total life expectancy at birth difference:						4.7

Mortality from CVD at the background of other main causes of death in 1969-2002 and prognosis for 2015, EU10 and EU15, age 20-64 (Fig. 7).

Historically, in the EU10 CVD was a predominant cause of death in men; CVD mortality was increasing until early 1990s, and then the rates began to decline dramatically. The prognosis for 2015 shows continuation of that favorable trend. In the EU15 CVD mortality has been dramatically decreasing for the whole period of observation. It was predominant cause of death until mid 1980s when the CVD mortality rates crossed with rates of cancer, which became the first cause of death.
In EU10 CVD was predominant cause of death also in women until mid 1990s and until that time was showing stagnation. After 1995 the CVD mortality rates began to decrease, crossed with rates of cancer, which became the first cause of death, and this decrease is expected to continue until 2015.
In EU15 CVD mortality has been the second cause of death for the whole period of observation, and has been declining steeply at that time. This decrease is expected to continue until 2015. Predominant cause of premature adult death for women has been cancer, which is slowly declining over the whole studied period.

Figure 7. Mortality time trends from selected causes in Europe (standardized rates per 100,000 population).



Source: WHO mortality statistics (http://www.who.int/whosis/mort/download/en/index.html)

Four different patterns in CVD mortality time trends in Europe (Fig. 8-10)

CVD mortality trends in calendar time are substantially different for the EU15 countries and the EU10 countries. In that respect, in the EU15 there was observed an extraordinary, constant decline of CVD mortality since 1970s in both genders. In Austria there was observed plateau of CVD mortality until mid 1980s in men, since then the rates began to decline. In Denmark plateau until early 1980, then steady decrease. In Greece there was plateau oscillating at the level of 100/100,000 for the whole period of observation. In Spain plateau until late 1970s, since then rates began to decline. In Sweden plateau until mid 1980s, then decline. In UK plateau until early 1980s, since then rates began to decline. In the remaining EU15 countries there was a steady decline since 1970. In women there was observed constant decline for the whole period of observation in all EU15 countries except for Belgium, where constant decline was until early 1990s there was a plateau observed; and Portugal, where there was plateau until 1975, then constant decline.

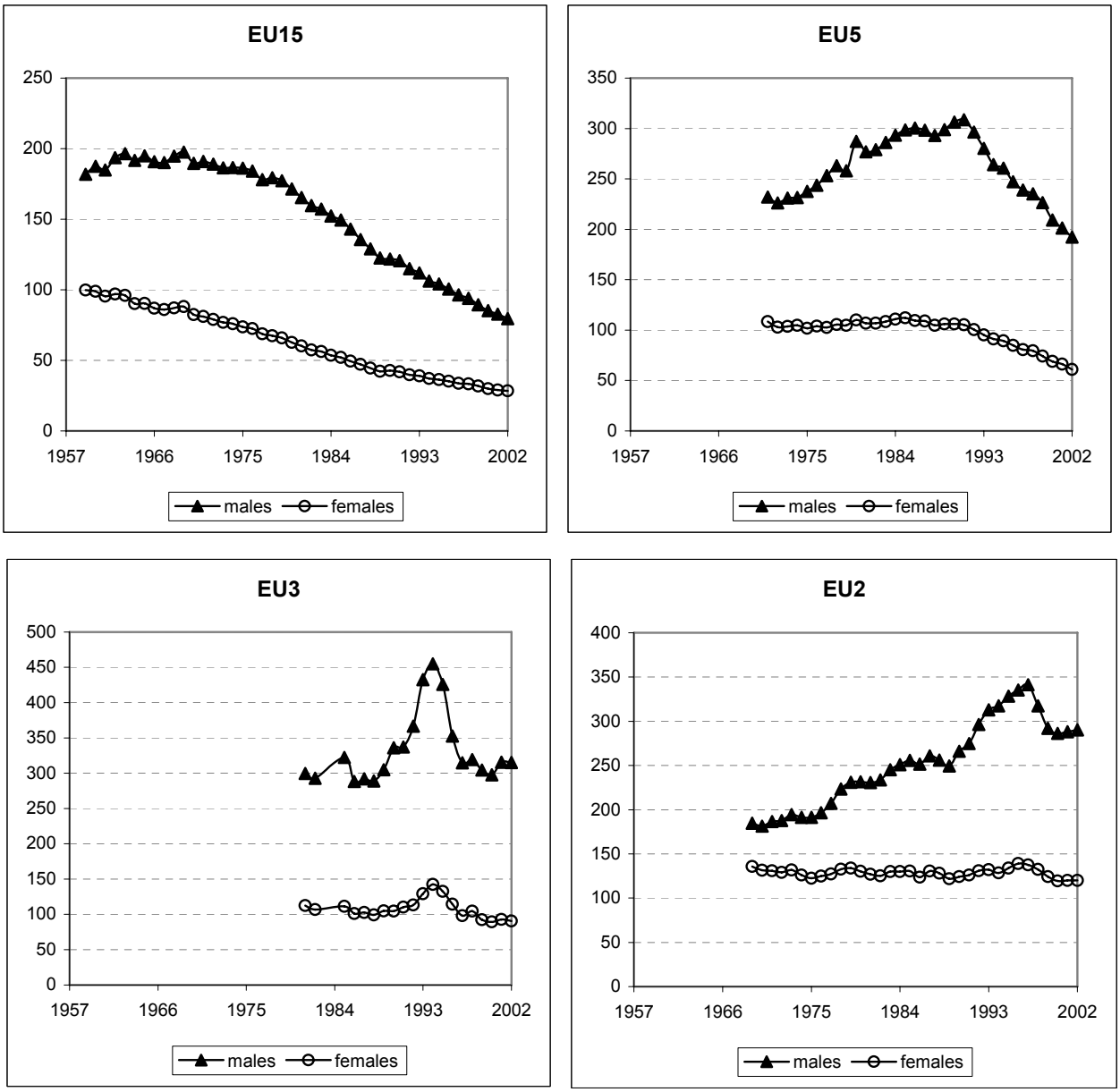
At the same time until 1990s there was an increase of CVD morbidity and mortality in Central and Eastern European countries.

After 1990 in majority of populations form Eastern part of European Union (Czech Republic, Hungary, Poland, Slovakia, Slovenia – EU5) the unfavorable trend reversed rapidly and CVD mortality began to decline. The pace of that decline is similar or even faster than the one observed in Western Europe. In men decline was observed in all countries around 1990s, it was slightly delayed in Hungary and began favorably earlier in Slovenia. In women generally there was a plateau observed until mid 1980s and then the decline was observed.

In the Baltic States – EU3, the increase was much more dramatic and took place in the period 1984-1994, after the peak it declined sharply and since 1997 the CVD mortality is showing plateau. The same pattern was observed in Estonia, Latvia and Lithuania in both sexes.

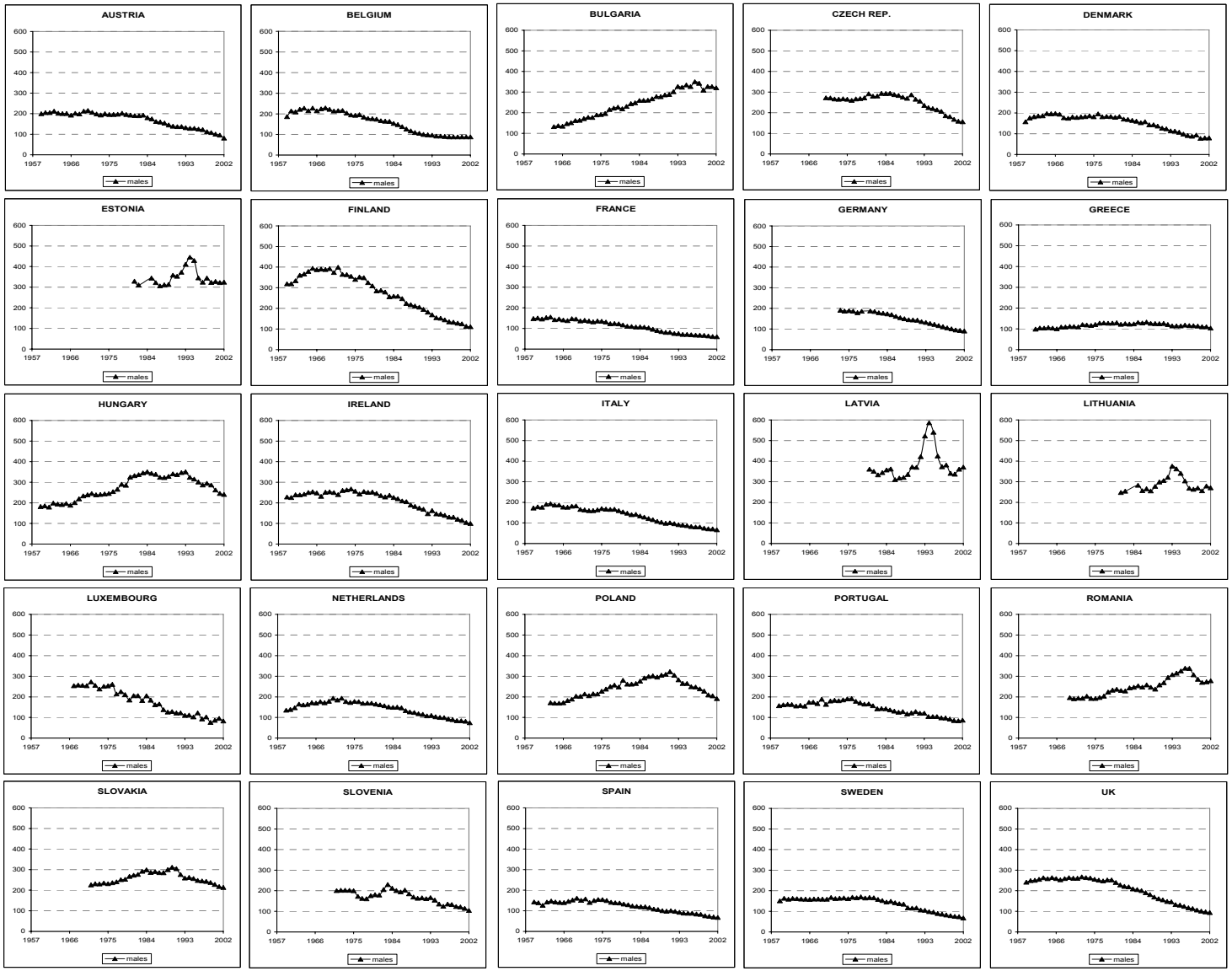
In Romania and Bulgaria – EU2, the increase of CVD mortality was steady and constant until 1998. Since then, rates are showing plateau.

Figure 8. CVD mortality at age 20-64 (standardized rates / 100,000 population)



Source: WHO mortality statistics (http://www.who.int/whosis/mort/download/en/index.html)

Figure 9. CVD mortality in men at age 20-64 (standardized rates / 100,000 population)



Source Figure 9 and 10: WHO mortality statistics (http://www.who.int/whosis/mort/download/en/index.html)

Figure 10. CVD mortality in women at age 20-64 (standardized rates / 100,000 population)

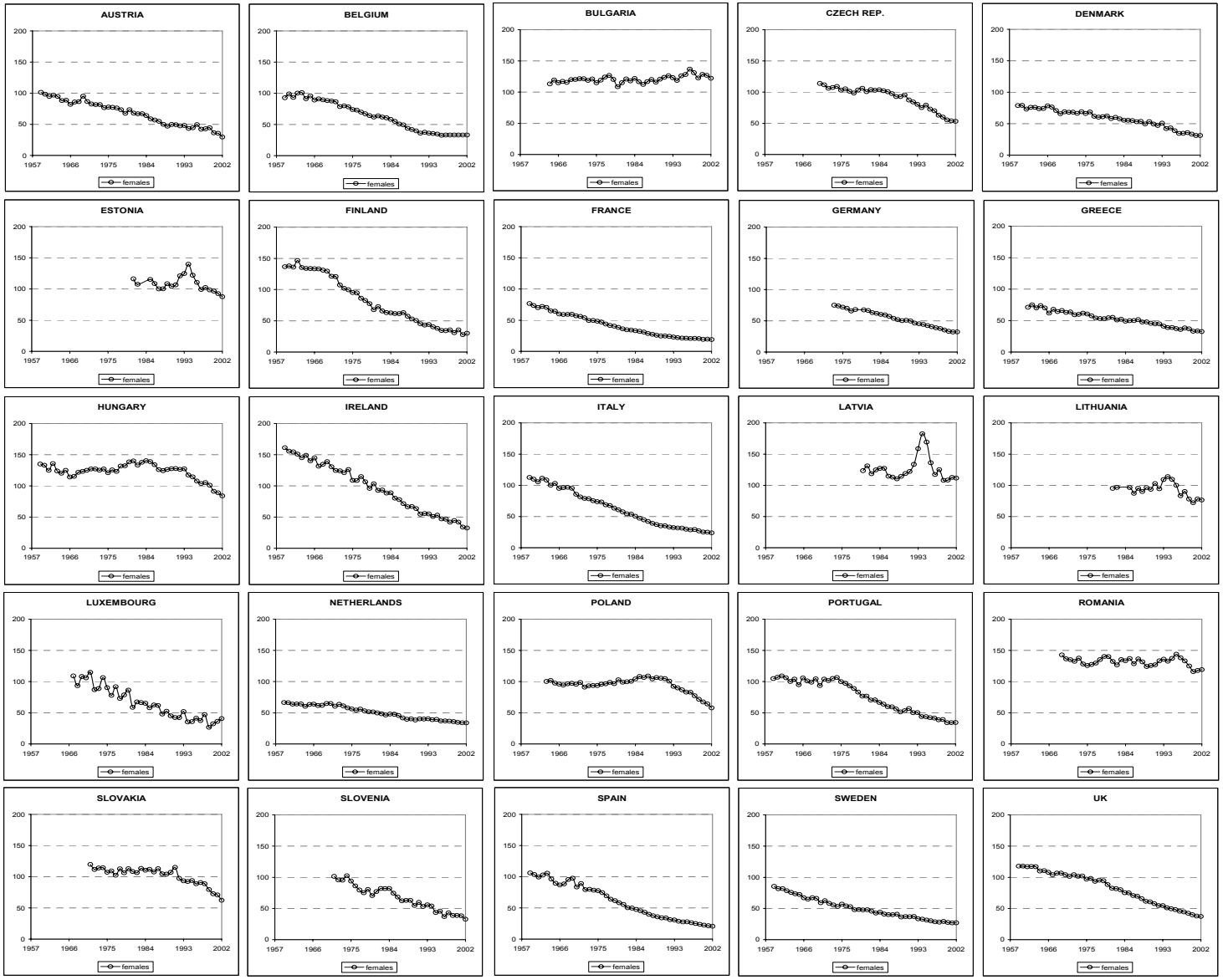
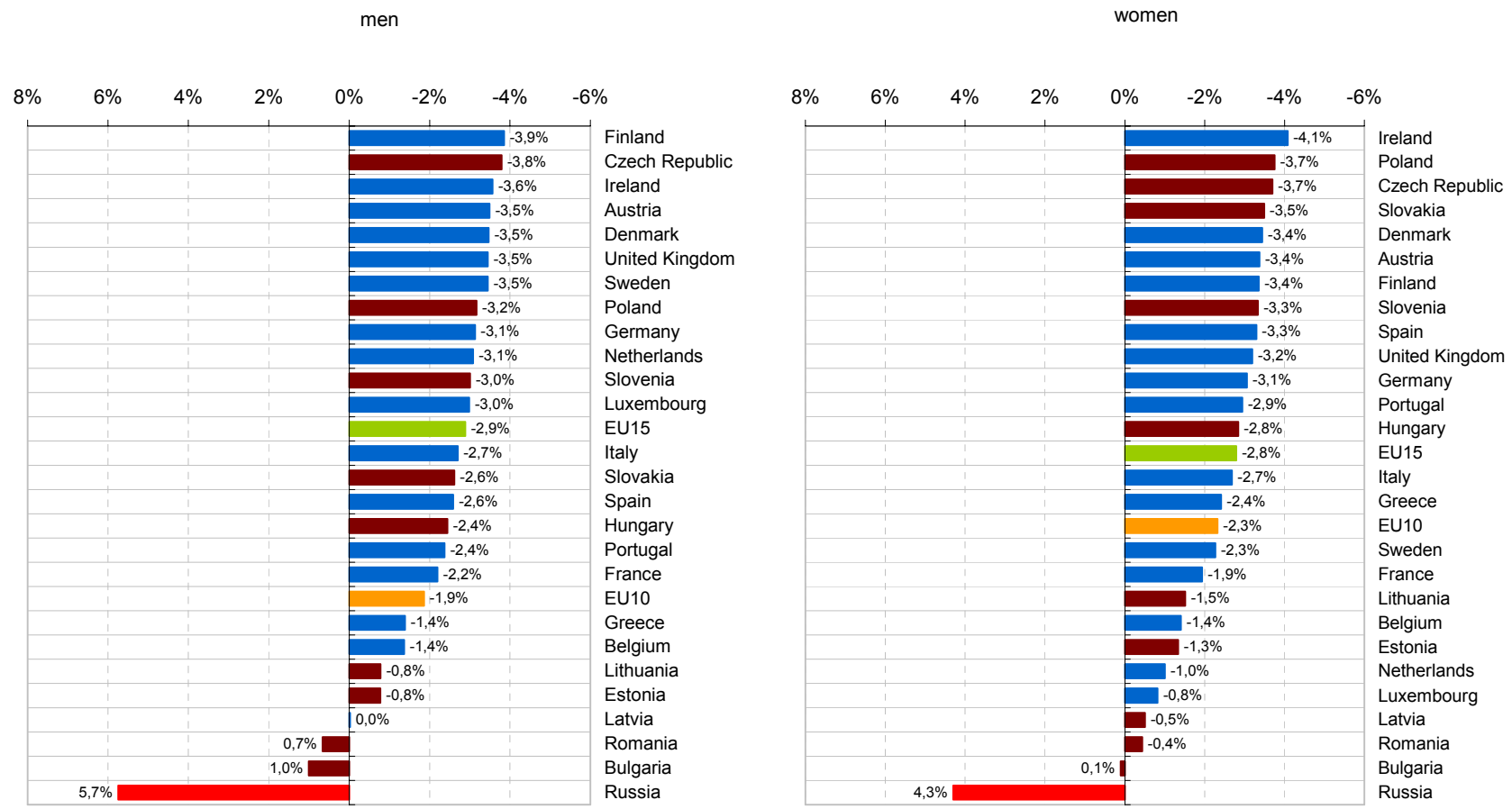


Figure 11: Rank list of annual percent changes in cardiovascular mortality in European Union between 1990 and 2002, age group 20-64



Changes in CVD mortality in groups of countries, men

EU5:	-3,1%
EU3:	-0,5%
EU2:	0,8%

Changes in CVD mortality in groups of countries, women

EU5:	-3,5%
EU3:	-1,1%
EU2:	-0,3%

Source: WHO mortality statistics (http://www.who.int/whosis/mort/download/en/index.html)

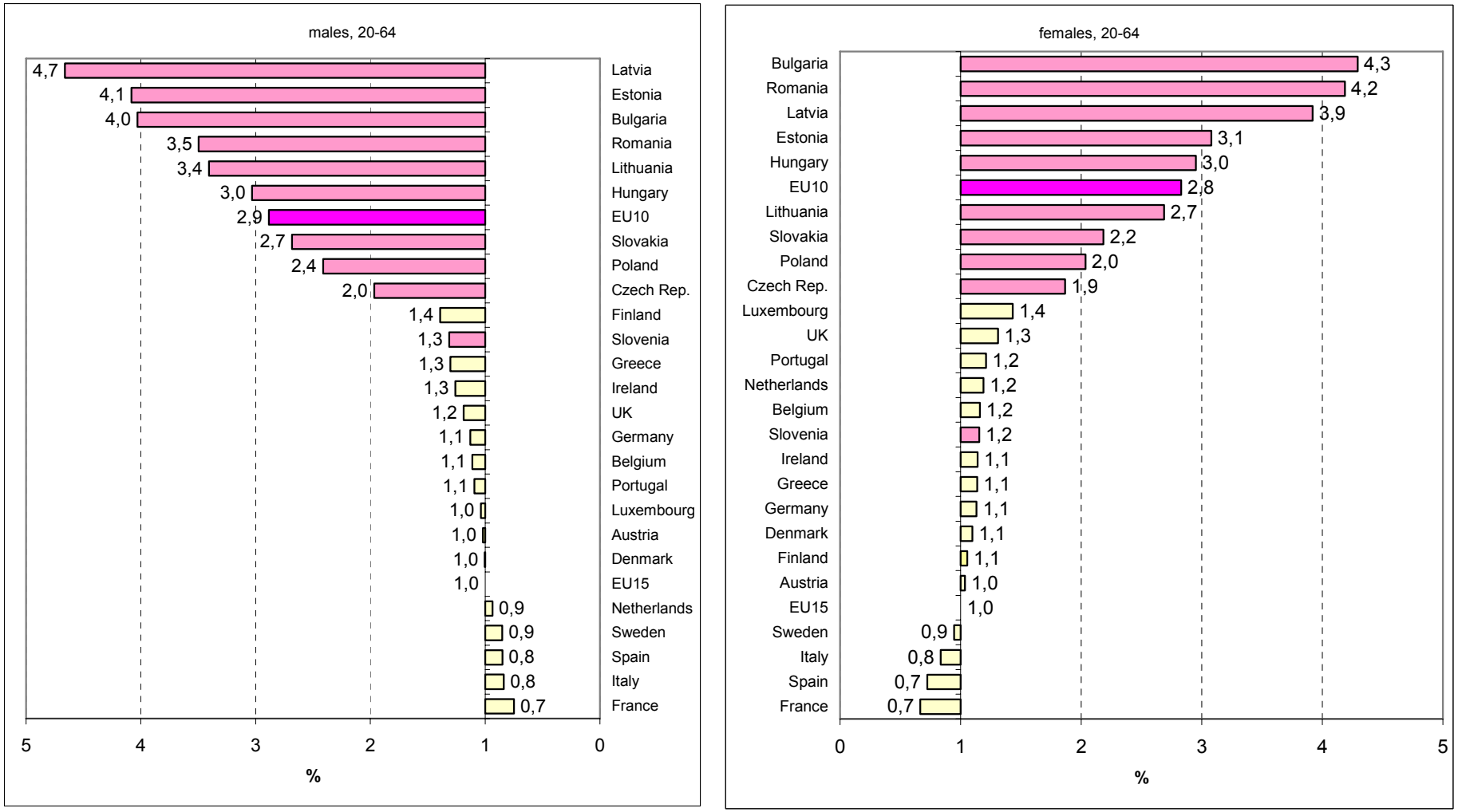
Annual pace of CVD mortality changes between 1990 and 2002 in Europe (Fig. 11)

Figure 11 shows annual percentage change in CVD mortality rates in the 20-64 age group between the year 1990 and 2002 for particular European countries. Generally comparing the year 1990 with 2002 we observe decline in all countries except in Bulgaria in both genders, and Romania in men only (what contrasts with situation development in Russia). In whole Europe the pace of decline was not higher than 4% annually. There is no east-west gradient observed in both genders. Generally the CVD mortality declined faster annually in the EU15 than in the EU10, however in the EU10 there is significant time trends dichotomy observed.
In the EU5 countries the pace of that decline averaged 3.1% in men, and was higher than EU15 (average decline: 2.9%). The highest tempo of decline was observed in Finland (3.9%), Czech Republic (3.8%) and Ireland (3.6%). In Austria, Denmark, UK and Sweden the annual change was at the level of 3.5%. Another five countries had the pace higher than EU15 average: Poland (3.2%), Germany (3.1%), Netherlands (3.1%), Slovenia (3.0%) and Luxembourg (3.0%). The slowest pace of CVD mortality decline was observed in Greece (1.4%), Belgium (1.4%), Lithuania (0.8%) and Estonia (0.8%), whereas in Latvia there was almost no change observed. In Romania and Bulgaria there was observed increase of CVD mortality during studied period by about 1% annually.
Similarly, also in women of the EU5 countries the pace of that decline was higher than EU15 average decline (3.5% and 2.8% respectively). The highest tempo of decline was observed in Ireland (4.1%), Poland (3.7%), Czech Republic (3.7%) and Slovakia (3.5%). In Denmark, Austria, Finland, Slovenia, Spain, UK and Germany the annual change was at the level above 3%. Another two countries had the pace higher than EU15 average: Portugal (2.9%) and Hungary (2.8%). The slowest pace of CVD mortality decline was observed in Netherlands (1.0%), Luxembourg (0.8%), Latvia (0.5%) and Romania (0.4%). In Bulgaria there was observed increase of CVD mortality during studied period by about 1% annually.

Ratio of CVD mortality in Europe in 2002 in reference to EU15 (Figure 12)

In Latvia, Estonia and Bulgaria CVD mortality in men was more than 4 times higher than the EU15 average. In Romania, Lithuania and Hungary that ratio exceeded 3. Slovakia, Poland and Czech Republic, had ratios between 2 and 3. There were several countries where CVD mortality was lower then EU15; these were France, Italy Spain, Sweden, and Netherlands. Remaining countries had ratios between 1 and 1.4.
In Bulgaria and Romania, the CVD mortality in women was more than 4 times higher than the EU15 average, whereas in Latvia it was almost 4. In Estonia, Hungary and Lithuania that ratio was about 3. In Slovakia, Poland and the Czech Republic the CVD was twice as high as the EU15 average. In France, Spain, Italy and Sweden the CVD mortality was lower than EU15 average. The remaining countries had ratios between 1 and 1.4.

Figure 12. Ratio of CVD mortality in EU countries when compared to EU15



Source: WHO mortality statistics (http://www.who.int/whosis/mort/download/en/index.html)

6 Conclusions

Despite the importance of CVD, in terms of frequency, distribution, and possibility of prevention, few and scarcely comparable data are available. Although death certificates are not coded according to the same procedures and methods in all EU countries, mortality data are available and quality check is routinely performed. On the contrary, most data on hospital discharges are not validated, therefore they are not completely reliable; moreover hospital admission policies vary over time and space. Whereas mortality data refer to a unique and unquestionable event, hospital discharges, given the frequent complications (heart failure, arrythmias) following an acute event, often include multiple hospitalizations for the same patient.

Innovations in diagnostic technologies have facilitated diagnosis at earlier phases in the course of the natural history of disease or in presence of less severe tissue damage. The use of new biomarkers, such as the routine introduction of new myocite damage markers (troponins), has obliged to rethink the concept of myocardial necrosis and to review the definition of an acute myocardial infarction; MRI and CT-Scan have increased the number of diagnosed events; stroke units have been shown to improve significantly both the functional outcome and the case fatality after stroke; nosological and coding changes in international disease classification pose new challenges for the comparability of disease indicators. All these factors may have an influence in producing spurious trends of disease frequency, severity, prognosis and variations in medical practice, leading to wrong conclusions and decisions if not properly controlled with the adoption of updated and valid epidemiological methods [35].

The implementation of population-based registers of coronary and cerebrovascular events in representative areas of the country adopting common validation methods and standardized methodologies for definition of events may help produce comparable indicators and better understand CVD trend across Europe.

The importance of improvements in cardiovascular risk factors such as quit smoking, adopt healthy diet and make regular physical activity was underlined in a recent study looking at the decline in IHD mortality over a 20-year period in England and Wales: between 1981 and 2000, 58% of the decline was attributable to reductions in major risk factors, principally smoking, whereas treatment of individuals including secondary prevention explained the remaining 42% of the mortality decline [36]. The authors of this study also estimated the life-years gained as a result of cardiological treatments and changes in cardiovascular risk factors level: 4 times that number of life-years was generated by reduction of major risk factors, principally smoking, cholesterol and blood pressure levels; in contrast, adverse trends were generated by diabetes, obesity and physical inactivity.

The declining trends of mortality during the late 1970s and 1980s suggest that acute stroke events have become milder and that the prevalence of stroke survivors is increasing. This decline is only partly attributed to an improvement in the control of hypertension. There is evidence suggesting that a decrease in the prevalence of some environmental factors (dietary salt intake and saturated fat) has contributed more than pharmacological treatment [20].

Falling mortality rates have resulted in longer life spans; however, it is recognized that trends do not change equally across countries. For this reason, it is important to monitor disease trends, treatments and risk factors in order to improve public health through planning and implementing preventive actions in the different countries.

CVD, although complex, can be treated through low-cost means, such as risk factors reduction or through more expensive treatments, such as invasive surgery. Innovations in medical, invasive and biological treatments contribute substantially to the escalating costs of health services and it is therefore urgent to have reliable information on the magnitude and distribution of the problem both for adequate health planning and clinical decision making with correct cost-benefit assessments.

One of the first low-cost steps is to reduce smoking among men and women because the health benefits of smoking cessation occur faster for CVD than for other diseases. Then policies that prevent and reduce smoking will have immediate and large benefits for reducing CVD mortality.
Anyway, it should be noted that these policies, although important, would target only 20-30% of adult population. On the contrary, strategies to encourage people to adopt healthy diet and make physical activity are usually addressed to the overall population. In particular, it is advisable to encourage healthy lifestyle since childhood and throughout the life span in order to assure adulthood with favourable risk profile and without need of pharmacological treatment (primordial prevention).
Finland provides one of the best-documented examples of community intervention. In 1972, Finland had the world's highest CVD mortality rate. Planners examined the policy and environmental factors contributing to CVD and sought appropriate changes, such as increased availability of low-fat dairy products, antismoking legislation and improved school meals. They used the media, schools, worksites, sports, education and agricultural to educate residents. After five years, significant improvements were documented in smoking, cholesterol and blood pressure. By 1992, CVD mortality rates for men aged 35-64 years had dropped by 57%. The program was so successful that it was expanded to include other lifestyle-related disease. Twenty years later, major reductions in CVD risk factor levels, morbidity and mortality were attributed to the Project [15].
Prospective epidemiological studies emphasized that known risk factors account for more than ¾ of cases of CVD; these studies demonstrated that most individuals with IHD have at least 1 or more antecedent risk factors [37] and optimal levels of known risk factors are associated with very low CVD risk [38]. Low risk individuals live longer and are eligible for low medical care expenditures in the last years of life [39]. Across Europe with its ageing population there is a pressing need to cope with costs increase and make prevention and treatment a priority to reduce the growing health burden and lessen its socio-economic impact [40].
The European Union Council Conclusions, adopted under the Irish Presidency (January - June 2004) called upon the European Commission as well as the Member States to ensure that appropriate action is taken to address CVD. The Luxembourg Declaration [41], adopted under the Luxembourg Presidency, established an agreement among representatives of National Ministries of Health, European and National representatives of Cardiac Societies and Heart Foundations, to pursue vigorously the initiation or strengthening of comprehensive cardiovascular disease prevention plans and to ensure that effective measures, policies and interventions would be in place in all European countries. High-level EU documents emphasize the importance of acting both at a population and at individual level to reduce the impact of CVD. The purpose of protecting health and improving quality of life in the European population by reducing the impact of CVD is registered in the EU Treaty.
In 2007, the European Heart Network, with the collaboration of the European Commission and the WHO launched the first European Heart Health Charter designed to prevent CVD in Europe and invited international and national organizations to sign the Charter, to commit to combating early death and suffering from CVD through prevention and to act on the 2000 Valentine's Declaration: *"Every child born in the new millennium has the right to live until the age of at least 65 without suffering from avoidable cardiovascular disease"*.

Footnotes

1 http://www.cuore.iss.it/eurociss/en/progetto/progetto.asp
2 EU countries were divided into two groups:
EU15: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, UK – EU members before May

2004 and EU10: Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia – new EU members after enlargement in May 2004
In the analysis of CVD mortality the new EU member states were additionally divided into three groups taking into account directions of CVD mortality trends:
EU5: Czech Republic, Hungary, Poland, Slovakia, Slovenia – entered EU in May 2004;
EU3: Estonia, Latvia, Lithuania – the former Soviet Union countries, entered EU in May 2004;
EU2: Bulgaria, Romania – entered EU in January 2007.
Data for Russia as a control country are presented

3 www.hem.waw.pl

4 ICD7-A: A070, A079-A086, ICD7-B: B022, B024-B029 - ICD8-A: A080 -A088, ICD8-B: B025-B030, ICD9 BTL: B25-B30, ICD9 FSU: CH07, ICD10 MTL1: 1064, ICD10: I00-I99

5 In this analysis the EU15 is usually treated as the western part of European Union, whereas EU10 is treated as eastern part of European Union

Reference List

1 Petersen S, Peto V, Rayner M, Leal J, Luengo-Fernandez R and Gray A. European cardiovascular disease statistics 2005. BHF: London.

2 Keys A, Aravanis C, Van Buchm F, et al. The diet and all causes death rate in the Seven Countries Study. Lancet 1981; 11:58.

3 Tyroler HA, Heyen S, Bartel A. Blood pressure and cholesterol as coronary heart disease risk factors. Arc Intern Med 1971; 128:907-14.

4 Kagan A, Popper J, Rhoads G. Factors related to stroke incidence in Hawaii Japanese The Honolulu Heart Study. Stroke 1982; 11:14-21.

5 Mariotti S, Capocaccia R, Farchi G. Differences in the incidence rate of coronary heart disease between North and European cohorts of the Seven Countries Study as partially explained by risk factors. Eur Heart J 1982; 3:481-7.

6 Breteler MMB, Van Swieten JC, Bots ML, Grobbee DE, Claus JJ, Van Den Hout JHW et al. Cerebral white matter lesions, vascular risk factors, and cognitive function in a population based study: The Rotterdam Study. Neurology 1994; 44:1246-52.

7 Sauvaget C, Tsuji I, Aonuma T, Hisamichi S. Health-life expectancy according to various functional levels. JAGS 1999; 47:1326-31.

8 Sans S, Kesteloot H, Kromhout D on behalf of the Task Force. The burden of cardiovascular diseases mortality in Europe. Task force of the European Society of Cardiology on Cardiovascular mortality and morbidity statistics in Europe. Eur Heart J 1997; 18: 1231–48.

9 Kesteloot H, Sans S, and Kromhout D. Dynamics of cardiovascular and all-cause mortality in western and Eastern Union between 1970 and 2000. Eur Heart J 2006; 27: 107-113.

10 Pisa Z, Uemura K. Trends of mortality from ischaemic heart disease and other cardiovascular diseases in 27 countries, 1968-1977. World Health Stat Q. 1982;35 (1):11–47.

11 Reprinted from the Lancet, 353, Tunstall-Pedoe H, Kuulasmaa K, Mahonen M, et al. for the WHO MONICA project, Contribution of trends in survival and coronary-event rates to changes in coronary heart disease mortality: 10-year results from 37 WHO MONICA Project populations, 1547-57, 1999, with permission from Elsevier.

12 Keys A. Seven Countries. A Multivariate Analysis of Death and Coronary Heart Disease. Harvard University Press Cambridge, Massachusetts and London, England 1980.

13 Bosma A, Marmot MG, Hemingway H, Nicholson AC, Brunner E, Stansfeld SA. Low job control and risk of coronary heart disease in Whitehall II (prospective cohort) study. BMJ 1997; 314:558.

14 Reprinted from The Lancet, 355, Kuulasmaa K et al. for the WHO MONICA Project. Estimation of contribution of changes in classic risk factors to trends in coronary-event rates across the WHO MONICA Project population, 675-687, 2000, with permission from Elsevier.
15 Puska P, Tuomilehto J, Nissinen A, Vartiainen E (eds). The North Karelia Project. 20 Year Results and Experiences. National Public Health Institute, 1995.
16 Stamler J,. Low risk—and the "No more than 50%" myth/dogma. Arch Intern Med 2007, 167:537-539.
17 WHO HFA-DB [http://www.euro.who.int/hfadb] (accessed on 12.07.07).
18 Lamon-Fava S, Wilson PW, Schaefer EJ,. Impact of body mass index on coronary heart disease risk factors in men and women. The Framingham Offspring Study. Arterioscler Thromb Vasc Biol. 1996; 16(12): 1509-15.
19 World Health Organization (2002) The World Health Report 2002. Reducing risks, Promoting Healthy Life. Geneva: World Health Organization.
20 Tolonen H, Mahonen M, Asplund K, rastenyte D, Kuulasma K, Vanuzzo D, Tuomilehto J for the WHO MONICA Project. Do trends in population levels of blood pressure and other cardiovascular risk factors explain trends in Stroke event rates? Comparisons of 15 populations in 9 countries within the WHO MONICA stroke project. Stroke 2002; 33:2367-2375.
21. The EUROCISS Project Research Group (2006): EUROCISS Project final report 2003 updated May 2006 [http://www.cuore.iss.it/eurociss/en/rapporto03/rapporto2003.asp] (accessed on 12.07.07)
22 Eurociss working group: Coronary and Cerebrovascular Population-based Registers in Europe: are morbidity indicators comparable? Results from the EUROCISS Project on behalf of the EUROCISS Working Group. Eur J Public Health 2003; 13 (Supplement 3); 55-60.
23 EUROSTAT [http://epp.eurostat.ec.europa.eu] (accessed on 12.07.07).
24 WHO MONICA Project [http://www.ktl.fi/monica/] (accessed on12.07.07).
25 Sarti C, Stegmayr B, Tolonen H, MAhonen M, Tuomilehto J, Asplund K, for the WHO MONICA Project. Are changes in mortality from stroke caused by changes in stroke event rates or case fatality?. Stroke 2003; 34:1833-1841.
26 Asplund K. Stroke in Europe: widening gap between East and West. Cerebrovasc Dis 1996; 6: 3-6.
27 Khaw K. Epidemiology of stroke. Journal of Neurol, Neurosurg and Psychiatry 1996; 61: 333-338.
28 Stegmayr B, Harmsen P, Rajakangas AM et al. Stroke around the Baltic Sea: incidence, case fatality and population risk factors in Denmark, Finland, Sweden and Lithuania. Cerebrovasc Dis 1996; 6:80–88.
29 Stegmayr B, Asplund K. Exploring the declining case fatality in acute stroke. Population-based observations in the northern Sweden MONICA Project. J Intern Med 1996; 240 (3):143-9.
30 European Federation of Neurological Societies Task Force. Neurological acute stroke care: the role of European neurology. Eur J Neurol 1997; 4: 435-441
31 Zatonski W, McMichael AJ, Powles JW. Ecological study of reasons for sharp decline in mortality from ischaemic heart disease in Poland since 1991. BMJ 1998 Apr 4;316(7137):1047-51.
32 Zatonski W, Jha P. The Health Transformation in Eastern Europe after 1990: A Second Look Cancer Center and Institut of Oncology, Warsaw; 2000. Available from: http://www.hem.home.pl/index.php?idm=58,59&cmd=1 .
33 Zatonski WA, Willett W. Changes in dietary fat and declining coronary heart disease in Poland: population based study. BMJ 2005 Jul 23;331(7510):187-8.
34 Zatonski W. The East-West Health Gap in Europe--what are the causes? Eur J Public Health 2007 Feb 13;17(2):121
35 The EUROCISSS Project Research Group. Cardiovascular Surveillance: The EUROCISS Project. EJCPR 2007; 14 (Suppl 3): S1-S61.

36 Law MR, Frost CD, Wald NJ. By how much does dietary salt reduction lower blood pressure? III: analysis of data from trials of salt reduction. BMJ 1991; 302:819-824.
37 Greenland P, Knoll MD, Stamler J,. Neaton JD, Dyer AR,. Garside DB, and. Wilson PW. Major risk factors as antecedents of fatal and nonfatal coronary heart disease events. JAMA 2003; 290: 891-897.
38 Palmieri L, Donfrancesco C, Giampaoli S, Trojani M, Panico S, Vanuzzo D, Pilotto L, Cesana G, Ferrario M, Chiodini P, Sega R, and Stamler J. Favorable cardiovascular risk profile and 10-year coronary heart disease incidence in women and men: results from the Progetto CUORE. Eur J Cardiovasc Prev Rehabil 2006; 13:562–570.
39 Daviglus ML, Liu K, Pirzada A, Yan LL, Garside DB, Greenland P, Manheim LM, Dyer AR, Wang R, Lubitz J et al. Cardiovascular risk profile earlier in life and Medicare costs in the last year of life. Arch Intern Med 2005; 165:1028-34.
40 Strong K, Mathers C, Leeder S, Beaglehole R (2005): Preventing chronic diseases: how many lives can we save? Lancet 366: 1578-82.
41 http://www.ptkardio.pl/files//file/luxembourgdeclarationfinal.pdf (accessed on 15 January 2008).

4 Autism Spectrum Disorders

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1 Introduction

1.1 Definition of Autism Spectrum Disorders

In 1943 Leo Kanner described Infantile Autism as a clinical condition characterised by “a profound lack of affective contact” and “repetitive, ritualistic behaviour, which must be of an elaborate kind”. Frequent changes since Kanner’s first clinical description with the intention to develop a consistent case definition have created a wider and complex group of diseases/conditions known as Autism Spectrum Disorders (ASDs).

ASDs include the classical Autism described by Kanner and other clinical conditions like Asperger’s syndrome, Fragile X Syndrome, Landau-Kleffner Syndrome, Rett syndrome, childhood disintegrative disorder, and PDD-NOS (pervasive developmental disorder not otherwise specified). In the last five years, research has shown that many people with autistic behaviours have related but distinct disorders:

- **Asperger’s Syndrome** is characterized by concrete and literal thinking, obsession with certain topics, excellent memories, and being 'eccentric'. These individuals are considered high functioning and are capable of holding a job and of living independently.
- **Fragile X Syndrome** is a form of mental retardation in which the long arm on the X chromosome is constricted. Approximately 15% of people with Fragile X Syndrome exhibit autistic behaviours. These behaviours include: delay in speech/language, hyperactivity, poor eye contact, and hand-flapping. The majority of these individuals function at a mild to moderate level. As they grow older, their unique physical facial features may become more prominent (e.g., elongated face and ears), and they may develop heart problems.
- People with **Landau-Kleffner Syndrome** also exhibit many autistic behaviours, such as social withdrawal, insistence on sameness, and language problems. These individuals are often thought of as having 'regressive' autism because they appear to be normal until sometime between ages 3 and 7. They often have good language skills in early childhood but gradually lose their ability to talk. They also have abnormal brain wave patterns which can be diagnosed by analyzing their EEG pattern during an extended sleep period.
- **Rett Syndrome** is a degenerative disorder which affects mostly females and usually develops between six and eighteen months of age. Some of their characteristic behaviours include: loss of speech, repetitive hand-wringing, body rocking, and social withdrawal. Those individuals suffering from this disorder may be severely to profoundly mentally retarded.
- **Williams Syndrome** is characterized by several autistic behaviours including: developmental and language delays, sound sensitivity, attention deficits, and social problems. In contrast to many autistic individuals, those with Williams Syndrome are quite sociable and may have heart problems.
- **Childhood disintegrative disorder (CDD)** this is a condition occurring in 3 to 4 year olds which is characterized by deterioration, over several months, of intellectual, social, and language functioning. Also known as disintegrative psychosis or Heller's syndrome. This rather rare condition was described many years before autism but has only recently been 'officially' recognized. With CDD children develop a condition which resembles autism but only after a relatively prolonged period of clearly normal development. Although apparently rare the condition has probably been frequently incorrectly diagnosed. CDD is usually associated with severe mental retardation. There also appears be an increased frequency of EEG abnormalities and seizure disorder.

- **Pervasive Developmental Disorder, Not Otherwise Specified (PDD-NOS)** is a 'sub threshold' condition in which some - but not all - features of autism or another explicitly identified. PDD-NOS is often incorrectly referred to as simply 'PDD', the term PDD refers to the class of conditions to which autism belongs. PDD is not itself a diagnosis, while PDD-NOS is a diagnosis. The term PDD-NOS; also referred to as 'atypical personality development', 'atypical PDD' or 'atypical autism', is included in DSM-IV to encompass cases where there is marked impairment of social interaction, communication, and/or stereotyped behaviour patterns or interest, but when full features for autism or another explicitly defined PDD are not met.

1.2 Current Health Information on Autism Spectrum Disorders

Autism Spectrum Disorders seem to be on the increase as evidenced by several authors. However, there is no Europe-wide information on the prevalence. Difficulties such as lack of consistency in diagnosis, lack of agreement on case definition and differences in case finding methods have contributed to this. Equally, in Europe, the social and economic burden of ASD has not been adequately recorded, as epidemiological figures are unreliable and inconsistent.

It is well accepted in the scientific community that early and intensive education can help children with ASD to develop and learn new skills. Prognosis is greatly improved if a child is placed into an intensive and highly structured educational program by age two or three. Earlier identification of children with ASD could increase the effectiveness of their treatment.

The project **'European Autism Information System'** (EAIS) was selected for co-funding in 2005 by the European Commission. There are two specific objectives of this project: (1) to develop mechanisms for obtaining systematic, reliable and consistent data for ASD in Europe and (2) to strengthen the early diagnosis of ASD. In the 2006 Public Health Programme, a second project in the area of ASD entitled **European Network for Surveillance of risk factors on Autism and Cerebral Palsy** (ENSACP) was selected for co-funding. The network will develop guidelines for identification of ASD and CP pre- and perinatal risk factors.

In this chapter we will address achievements and advances of the EAIS project, expected contribution from the ENSACP project and gaps in the knowledge of ASD issues in Europe.

1.3 Historical overview: important past trends/developments

Autism Spectrum Disorders (ASD) is a lifelong neuro-developmental disorder due to neurobiological conditions. One of the main difficulties in estimating prevalence of ASD, in a historical perspective, is the fact that our understanding of autism has changed over the past decade. One of the changes has been the appreciation that several closely-related disorders exist; they share the same essential features but differ on specific symptoms, age of onset, or natural history. These disorders mentioned above are now conceptualised as ASDs.

Cross-sectional studies suggest that the evidence supporting an increasing rate of autism in the UK and the US has gathered strength. Although both the nomenclature and the criteria set used to define autism have changed over the years, these changes are not so great as to prevent comparative analysis and do not explain major differences in reported prevalence over time. The major source of variability in reported autism rates comes from incomplete ascertainment in young age cohorts, which limits the ability to detect an underlying and rising secular trend. Reviews that have downplayed the rising trend have overemphasized unimportant methodological problems and failed to take into account the most relevant biases in survey methodologies. Point prevalence comparisons made within and across surveys conducted in specific geographic areas, using year of birth as a reference for trend

assessment, provide the best basis for inferring disease frequency trends from multiple surveys.

On May 9th, 1996, the European Parliament launched an official Declaration in which it urged the Commission to fully support any effort and project to develop the rights of people with autism. Finally, at the beginning of 2006 the EAIS project approved by the Commission the previous year began its work.

Since 2005, ASD has been included in both the 'Rare Diseases' and 'Major and Chronic Diseases' Task Forces of the European Commission, and although some conditions or syndromes within the spectrum can be categorised as rare diseases, there is an argument for no longer categorising ASD as such. Indeed, the public health burden of these disorders is now a considerable one.

It is important to mention that from April 2008, the Welsh Assembly Government is implementing a 10yr 'ASD Strategic Action Plan for Wales'. This all-age government strategy includes the appointment of a national implementation manager, the recruitment of lead co-ordinators for autism in each of Wales' 22 Local Authorities, and extensive training of a range of health, social care and education and commissioning practitioners plus awareness-raising work with related areas including mental health, the criminal justice system and the general public. The strategy is being benchmarked and will be monitored by a stakeholder group. Wales is the first European country to have adopted such a policy in support of people affected by ASD.

2 Health determinants/risk factors

Controversy about the plausible interaction between genetic and environmental risk factors for ASD is still unresolved. The study of risk factors has contributed to the prevention of other health problems e.g. cardio-vascular diseases, diabetes and cancer.
In ASD several conditions have been found to be potential risk factors. Most of the risk factors have been identified in clinical studies by using different methods and populations. The inconsistent retrieval of data in these studies has made a direct comparison of risk factors very difficult. Considering the ongoing collection of ASD data, several of the EU countries have underlined the need for manuals in order to ensure the largest impact of the data quality. By following specific manuals, it will be possible to compare data between the EU countries, and thereby increase the chance of identifying unique and strong risk factors for ASD.

A systematic review of prevalence studies has contributed to explaining some of the influences on variation among prevalence estimates. Over half of the variation among study estimates can be explained by the age of the children screened, the diagnostic criteria used, and the country studied. Other important factors were whether the study was in a rural or urban location and whether cases were assessed prospectively or retrospectively. The impact of these known factors on prevalence estimates should now be further investigated as they may be acting as proxies for other influences on prevalence.

The European Network of Surveillance on Risk Factors for Autism and Cerebral Palsy (ENSACP) project proposes to construct a preliminary guide that can be used to standardize the collection process of cerebral palsy (CP) and ASD data in the EU. This will be done by comparing datasets from five countries: Sweden, The Netherlands, England, France, and Denmark. Risk factors found in more than one of the populations as well as risk factors found to be associated in only one population will be included in the guide. The reason for including the unique factors in the guide is that the lack of association in other populations can be due

to different criteria or methods and not necessarily because of a direct lack of association. This needs to be tested.

3 Incidence/prevalence

3.1 Incidence

The incidence of autism and other pervasive developmental disorders (PDD) was studied in the United Kingdom [1] over the period from 1998 to 2001. There were changes in the age-standardised incidence ratios from 35 (95% CI: 27-47) in 1991 to 365 (95% CI: 314-425) in 2001. The increase for PDD was around ten-fold; but the increase in autism was also striking. The authors conclude that better ascertainment of diagnosis is likely to have contributed to this increase but that a real increase cannot be ruled out.

3.2 Prevalence

Prevalence rates have been estimated in different European countries but due to the different methodologies and definitions used, it is not possible to make comparisons. A study published in 2004 [2] looks at the different surveys carried out worldwide and suggests a precautionary approach and that the raise in incidence of autism should be a matter of urgent public concern.

In the United States of America, the Centres for Disease Control and Prevention (CDC) carried out a prevalence study in 2002. This study included approximately 10 percent of U.S. eight-year-old children born in 1994 from 14 states. A total of 407,578 children were involved and 2,685 eight-year-olds (65.88 per 10,000) were identified as having an ASD. The data were reported by the Autism and Development Disabilities Monitoring (ADDM) Network. The previous study, developed in 2000, found ASD rates ranged from one in 222 children to one in 101 eight-year old children in the six communities studied. The 2002 study found ASD rates ranging from one in 303 to one in 94 among eight-year old children. The average finding of 6.6 and 6.7 per 1,000 eight-year-olds translates to approximately one in 150 children in these communities. This is consistent with the upper end of prevalence estimates from previously published studies, with some communities having an estimate higher than those previously reported in U.S. studies.

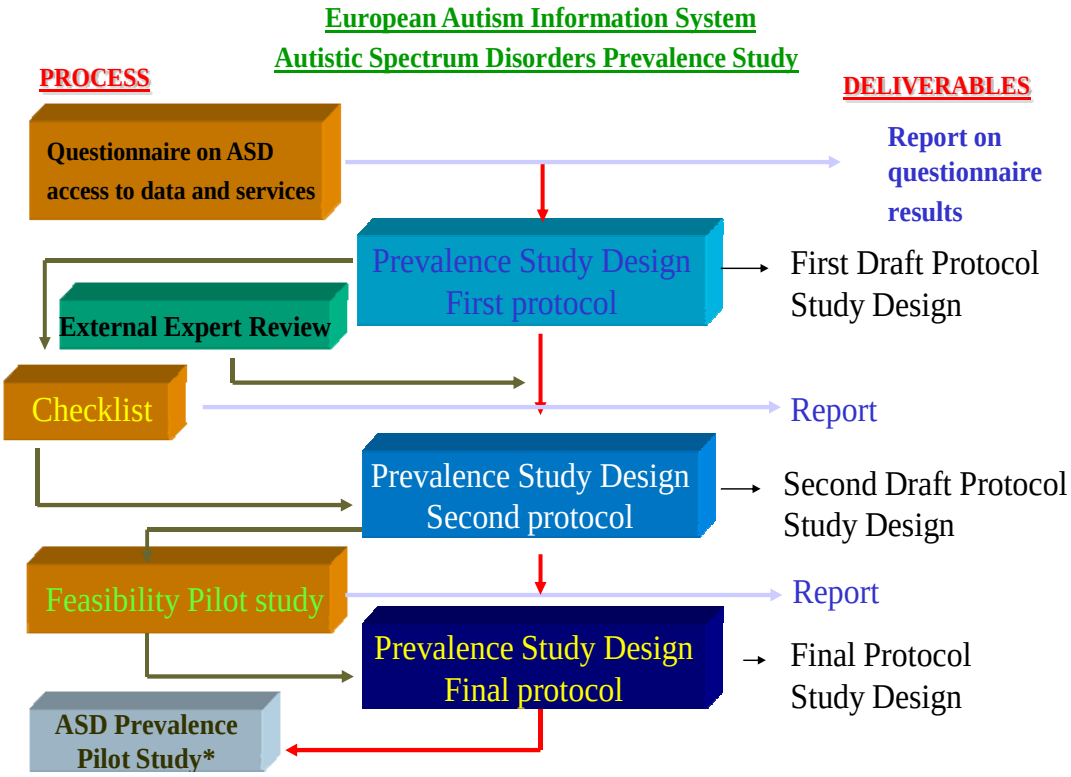
The central aim of the EAIS project is to have an agreed information system to record ASD data. This data, recorded in common format across the EU, will provide the strongest, most robust evidence, available to determine both the prevalence and financial burden of the disease and to monitor ongoing trends in these areas.

The project sets out the work being developed towards a final protocol that will enable us to obtain valid information about ASD prevalence in several European countries as well as harmonized methods for planning an ASD prevalence study in Europe. A parallel study will be designed to estimate the financial burden of ASD in Europe. This is a relevant action as there is no such existing Europe-wide information at present and such a study requires thorough planning for implementation after the current project.

3.3 Development of a European ASD prevalence estimate protocol

The following scheme describes the strategy already designed and agreed for development of ASD prevalence estimates; see Figure 1 (below)

Figure 1



Field Studies: This scheme contains three field studies in order to get maximum consensus as well as feasibility for the final prevalence study. The first field study, already carried out, consisted of developing a specific questionnaire on both ASD access data and services. This questionnaire has been distributed among partners. We have received 10 responses from the following European countries / regions: France (Rhone- Alpes / Isere Region), Malta, Bulgaria, England, Poland Denmark, Italy, Spain, Czech Republic and Scotland (Highland Region).

Preliminary results have been presented in two EAIS meetings (Luxembourg, Sep, 2006; London, Feb, 2007) and a final report as well as a paper for publishing in a peer review journal is being prepared. [3]

The second field study will result from the checklist analysis. After building the first prevalence study design, a checklist will be developed for obtaining more detailed information from those countries/regions that express their willingness to participate in the pilot prevalence study. The checklist study will also provide inputs that could lead to the introduction of modifications in the prevalence study design. If so, this second draft of the prevalence study design will be analysed in a feasibility study in those countries/regions which meet all criteria previously stated in the checklist. This third field study, namely feasibility study, will provide the more important and detailed information for building the final prevalence study protocol.

The final protocol will be tested in a large pilot study for a full year and will provide an estimate of the ASD prevalence in some European countries/regions.

Some important issues have been considered in ASD prevalence studies within the scope of the EAIS project. All the existing prevalence studies, including those using more comprehensive and reliable methods lead us to the following conclusions:

- Prevalence is increasing, possibly not only due to increased awareness among population and professionals.
- There is no consensus on an accurate and valid prevalence figure for all regions and all stages. Age of children, case ascertainment procedure and type and level of development of regions explored seem to be the most important variables that influence in this estimate figure.
- There is no consensus with regard to the preferable age at which to measure prevalence, the most frequently chosen ranging from 4 to 10 years. This is due to the fact that 4 years is the age when ASD can be diagnosed without excessive problems and 10 years is the limit for diagnosing Asperger's Syndrome. [4] CDC measures the prevalence at the age of 8 years old because that age shows the highest peak of prevalence. [5]
- Case detection and case diagnosis require quality control of the processes
- A prevalence study needs well trained teams and validated tools

Existing ASD surveillance in Europe was reviewed as part of the EAIS project and is mentioned in the Report on the 'Autism Spectrum Disorders Prevalence Data and Accessibility to Services' Questionnaire (Q-EAIS). [3] This information has been analysed and gaps will be identified and addressed, including the development of a functional common case definition and recommendations for a common European data collection system. A pilot study will be conducted to evaluate recommendations and validate data. The system can then be commissioned and those accessing can receive training using the distance learning platform which is being developed as part of the EAIS project.

4 Morbidity

There are no available comparable data on morbidity in ASD in Europe. Controversy exists in the management of the disorder and cannot be entered into within the context of this report.

An epidemiological survey conducted by Fombonne [6] mentions epilepsy as the most frequent comorbid condition followed by hearing or visual impairments, cerebral palsy, Downs Syndrome, tuberous sclerosis and Fragile X Syndrome, among others.

Increased levels of early diagnosis are crucial to successful management of ASD. In the EAIS project, all available tools for early diagnosis will be evaluated and evidence-based arguments will be proposed to operate from a single and unified diagnostic approach.

It is not possible to comment on the current health service usage per Member State in ASD as the case identification system is very weak and variable from country to country. It has been observed that there are very wide inequalities in terms of waiting lists for diagnosis, in countries where such services exist, often in the private sector and through Parents' Groups. This situation is profoundly felt in other countries where very few or no diagnostic services for ASD exist.

Within the context of the EAIS, efforts have been made to develop a questionnaire to provide basic information about such services in Member States. This work could be further developed and promoted to gain more knowledge in this area.

5 Mortality

Although a higher mortality risk has been observed in autism compared with the general population, as far as we are aware no deaths have been directly attributed to any of the conditions included in the ICD-10 code. Elevated death rates are due to several causes, including seizures, accidents and respiratory diseases among people with severe learning disability.[7]

6 Other Outcomes of EAIS Project

6.1 European Autism Alliance

The European Autism Alliance (EAA) is an association to be created as part of the European Autism Information System (EAIS) project. The EAA is to be a sustainable association committed to providing information on:

- early detection and diagnosis of autism for professionals
- management of data systems (surveillance)
- prevalence and financial burden of autism spectrum disorders in the EU
- issues surrounding public awareness of ASD.

The creation of the EAA is a strategy to continue the work of the project in a sustainable manner and to ultimately provide a centre of excellence conforming to the most rigorous international scientific standards. The realisation of this goal has already laid its foundations, as the main actors in the project are among the world leaders in their disciplines. It is essential that the fruits of this high level collaboration of experts in the field of autism epidemiology should not be lost at the conclusion of the EAIS project's lifetime.

The role of the EAA will include:

- training (including an on-line distance learning platform)
- distribution of software and information systems
- providing a forum for health information professionals and managers, policy makers, ministries of health, academic and research organisations.

In this way, it is envisaged that the EAA will continue the work of the EAIS project, by offering services to government and non-governmental institutions of Europe reflecting the findings and recommendations of the EAIS project. The EAA will be run as a non-profit organisation, financed by membership fees, income-generating services (such as training activities) and grants.

6.2 Financial Burden of ASD

Another aspect of the EAIS project is the study of the Financial Burden of ASD. In a recent report by one of the project partners, the economic consequences of Autism in the UK were calculated.[8] The findings reveal that children with autism cost £2.7 billion (Euros 3.8 billion) annually, yet for adults the figure is £25 billion (Euros 36.2 billion) - over eight times as much. For adults with autism the highest costs are those generated by health and social care provision (59%), followed by lost employment (36%) and family expenses (5%). These findings give an up-to-date indication of the overall economic cost of autism in the UK.

7 Conclusion

Reports of increased prevalence of Autism Spectrum Disorders (ASD) from 4 per 10,000 to 66 per 10000 children in the last 20 years have alerted the scientific community and public health sector. Although both the nomenclature and the classification criteria used to define autism have changed over the years, these changes do not prevent some comparative analysis and do not fully explain the major differences in reported prevalence over time. The methodology to measure prevalence and the case definition of ASD in Europe is still not fully harmonized, while in many of the newer Member States there is very little or no information available on ASD. This situation needs to be addressed and the EAIS project is in the process of developing a protocol for a harmonised ASD information system in Europe.

Tools have been developed for early detection and diagnosis of the disorders, particularly in the United States of America and Great Britain. At European level, however, the early detection and diagnosis of children with autism varies enormously from country to country. Among other factors, this depends on the number of trained personnel and the health services structure and whether or not ASD is actively screened for; in this chapter we have highlighted the fact that attention to ASD is lacking in most Member States.

There is no general policy for education and health services for people and families affected by ASD in Europe. The initiative by the Welsh Assembly to implement a ten-year Strategic Action Plan for ASD is to be applauded and promoted among European countries.

Reference list

1 Smeeth, L. et al., (2004). Rate of first recorded diagnosis of autism and other pervasive devlopmental disorders in United Kingdom general practice, 1998 to 2001. BMC Medicine

2 Blaxill, M.F., (2004). What's Going On? The Question of Time Trends in Autism. Public Health Reports, Nov-Dec.

3 Posada, M., Garcia Primo, P., Ferrari, M.F., (2007). European Autism Information System (EAIS) Report on the 'Autism Spectrum Disorders Prevalence Data and Accessibility to Services' Questionnaire (Q-EAIS)

4 McConachie H, Le Couteur A, Honey E. (2005) Can a diagnosis of Asperger syndrome be made in very young children with suspected autism spectrum disorder? J Autism Dev Disord 35(2):167-176.

5 Turner, Lauren M.; Stone, Wendy L.; Pozdol, Stacie L. (2006) Follow-up of children with autism spectrum disorders from age 2 to age 9. Autism 10(3):243-265.

6 Fombonne, E., (2005). Epidemiology of autistic disorders and other pervasive developmental disorders. Journal of Clinical Psychiatry 2005, 66 (suppl. 10)

7 Sánchez-Valle, E. et al., (2007). Estimating the Burden of Disease for Autism Spectrum Disorders in Spain in 2003. Journal of Autism and Development Disorders, 10.

8 Knapp M, Romeo R, Beecham J, (2007). The economic consequences of autism in the UK. Foundation for People with Learning Disabilities, London.

5 CANCER

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(See the Acknowledgments at the end of this chapter)

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5.1 Introduction

Cancer affects around 3,2 million Europeans each year, the most common forms of the disease being lung, colorectal and breast cancer [1]. Due to the ageing of the population in Europe, cancer incidence cases are expected to increase [1] thus constituting a major public health issue for Europe to tackle. Amongst many important efforts in the public health fields are the European Cancer Programme and the European Code Against Cancer [2, 3], carriers of developments in the reduction of cancer risk and recommendations on cancer screening [4].

One of the European Commission (EC)'s strategies is the promotion of a standardized collection of a list of health indicators in all Member States (MSs) [5]. More information is available on cancer than for other diseases, thanks to a long established tradition of cancer registration in the majority of MSs. A list of cancer health indicators was developed by the EUROpean Cancer Health Indicator Project – EUROCHIP-1(2001-2003) – via the establishment of a multidisciplinary network of more than 130 experts from all EU-15 MSs [6]. Cancer indicators were selected by criteria of reliability, comparability, easy collection, and faculty of country representation. EUROCHIP-1 made available a comprehensive list of indicators covering key cancer aspects i.e. burden, prevention, standards of care and cure rates [6]. The picture of cancer in Europe offered large regional inequalities in incidence, survival and mortality, reflecting the difficulties of European MSs to modify health systems to reduce the risk of cancer, improve control, and bring results research to a benefit for all citizens and patients. Aims of the EUROCHIP-2 were to improve the organization and accessibility of information in Europe and create a discussion on cancer control priorities at European level [7]. With EUROCHIP-2 specific studies were activated in the majority of EU MSs with focus on European cancer health inequalities.

This chapter presents the situation of cancer in Europe using most recent available data published by European projects and international agencies. Sub-chapters introduce the main aspects to be considered in cancer control with boxes providing major indicator definitions derived from the EUROCHIP-1 study [6] and focus paragraphs on related activities among those activated by the EUROCHIP-2 project.

The conclusions of the work highlight the innovations that should be adopted in cancer control in view of the latest epidemiological evidence and presents the cancer priorities included in the recommendations on health that the EU Portuguese Presidency prepared.

5.2 Information: the role of cancer registries

A well-functioning cancer information system is vital to ensure correct information on cancer incidence, survival and prevalence. Such information system must include:

- the availability of population-based data;
- the completeness of data collection in all European countries;
- the standardisation of data collection methods, as to allow comparison across Europe.

The major role of a cancer information system is played by "population-based cancer registries" (CRs), i.e. centres working on comprehensive records of patients diagnosed cancer in the population they cover. In some countries, CRs cover the entire population, while in others coverage only extends to limited geographical areas used as representative. CRs provide data for epidemiology, evaluation studies (i.e. screening programme evaluation), case-control and cohort studies, social analyses, etc.

The European Network of Cancer Registries (ENCR) and the International Agency on Research on Cancer (IARC) produce estimates of cancer incidence at national level [1, 8-11]. Moreover IARC regularly publishes the book "Cancer Incidence in Five Continents" [12] which includes observed data from European CRs.

Table 5.2 shows the coverage of cancer registration in Europe, as reported in “Cancer Incidence in Five Continents”. At the time of writing, Greece and Luxembourg had not yet established a cancer registry, while other countries were not included in the publication by IARC.

No cancer control plans can be implemented without a complete information system and it is therefore vital that the work of population-based cancer registries is better encouraged both for what concerns the allocation of governmental funds and via the modifications of data protection laws now in place and constituting an impediment to the adequate functioning of cancer registration (i.e. making the cancer survival estimates impossible).

One of the objectives in EUROCHIP-2 was the improvement of the cancer information and the following actions were developed:

- promotion of the discussion of cancer registry implementation in Greece. EUROCHIP and the Hellenic Centre for Diseases Control & Prevention (HCDCP) organized a meeting in May 2007 underlying the importance to develop a pilot study in a small area. A proposal for the urgent initiation of a pilot study was submitted by HCDCP to the Ministry of Health in June 2007 and was accepted in October 2007. HCDCP estimates starting time in January/February 2008
- discussion on the issue of cancer registry implementation in Luxembourg, A meeting was organised in March 2007 and in July 2007 a national steering committee was officially charged by the Minister of Health to organize a cancer registry
- submission of recommendations to the Network of Competent Authorities in support of cancer registration in Europe [7]
- sponsor of educational activity of nine researchers from Eastern Europe to the course “Cancer survival: principles, methods and applications” (London, 3-7 April 2006) [7]
- organization of pilot studies analyzing the possibility of collecting indicators on cancer treatment delay and compliance with cancer guidelines using CRs data (see paragraph 5.1).

Table 5.2 Cancer registry (CR) diffusion in Europe

COUNTRIES	CR included in CIVC[#]		CR included in CIVC[#] with care in interpreting data[1]		None CR
	National	Regional (Nr of CRs)	National	Regional (Nr of CRs)	
EU MEMBER STATES					
AUSTRIA	X	X (2)			
BELGIUM		X (1)		X (1)	
BULGARIA			X		
CYPRUS			X		
CZECH REPUBLIC	X				
DENMARK	X				
ESTONIA	X				
FINLAND	X				
FRANCE		X (11)			
GERMANY		X (7)			
GREECE					X [2]
HUNGARY					X [3]
IRELAND	X				
ITALY		X (22)			
LATVIA	X				
LITHUANIA	X				
LUXEMBOURG					X [4]
MALTA	X				
THE NETHERLANDS	X	X (2)			
POLAND		X (2)		X (1)	
PORTUGAL		X (1)		X (1)	
ROMANIA					X [5]
SLOVAKIA	X				
SLOVENIA	X				
SPAIN		X (11)			
SWEDEN	X				
THE UNITED KINGDOM		X (11)			
EEA COUNTRIES					
ICELAND	X				
NORWAY	X				
SWITZERLAND		X (7)			
OTHER EUROPEAN COUNTRIES PRESENT IN CIVC					
BELARUS			X		
CROATIA	X				
RUSSIA		X (1)			
SERBIA	X				

[#] CIVC: Cancer Incidence in Five Continents - IXth edition [12].
[1] CIVC underlined that some care is required in the analysis of CR data for some sites or all cancer sites
[2] Greece: a proposal for the urgent initiation of a pilot study was submitted to the Ministry of Health in June 2007
[3] Hungary: regional CR not included in CIVC
[4] Luxembourg: in July 2007 a national steering committee was officially charged by the Minister of Health to organize a cancer registry
[5] Romania: national registration required by law since 2002

5.3 Incidence

Incidence is the main epidemiological measurement of cancer occurrence. This indicator describes the burden with which cancer compares in a population. Cancer incidence is the main indicator able to define which are the priorities of cancer control in primary prevention and early diagnosis. Box 5.3 synthesizes main characteristics of the cancer incidence indicator, as prepared by EUROCHIP-1.

Box 5.3 Cancer incidence rate indicator

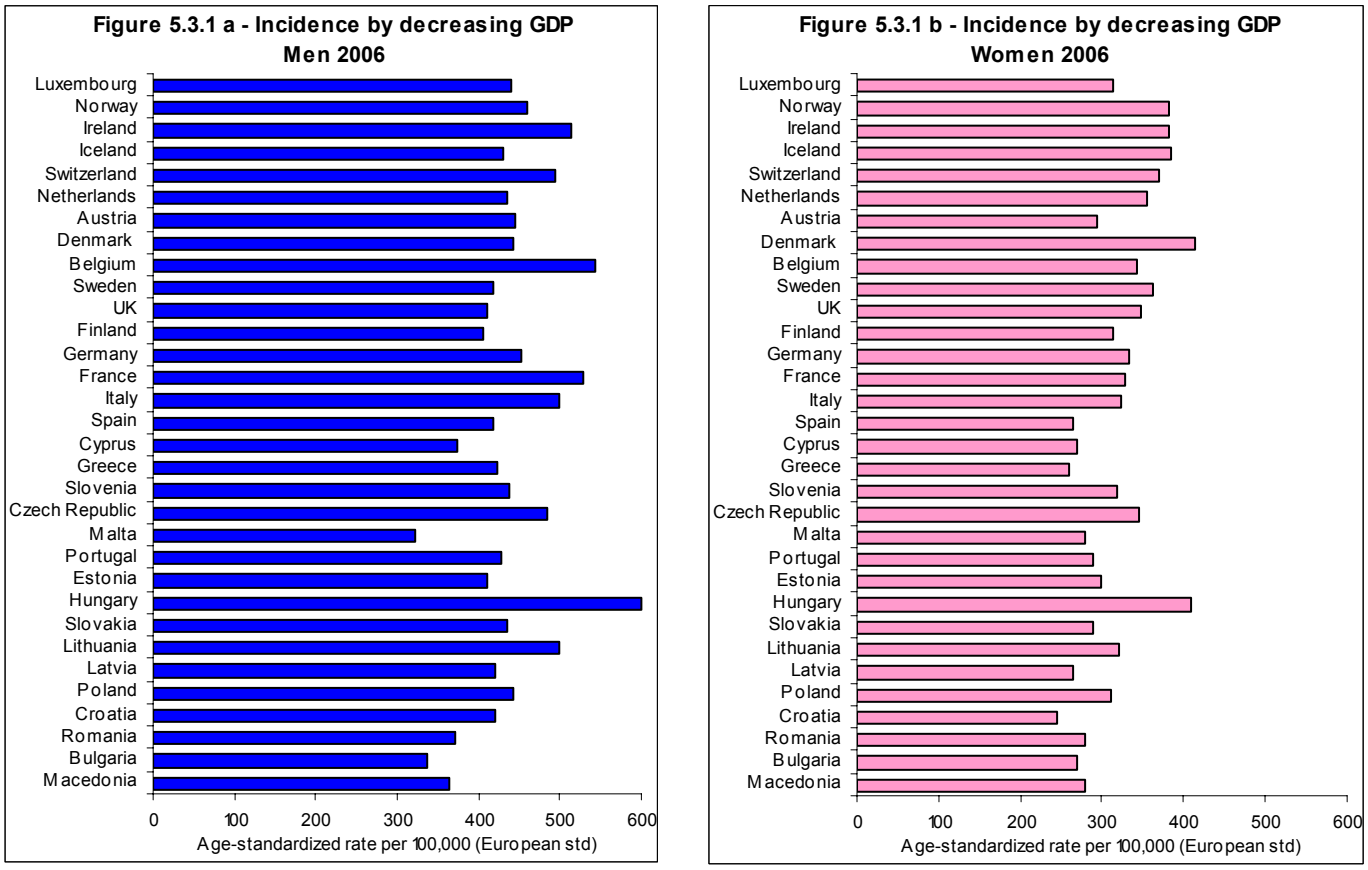
Cancer incidence rate	
Generic definition	Number of new cases diagnosed in a time interval / Person years at risk in the interval
Rationale	Main epidemiological measurement of cancer occurrence
Utility	Basic measure of cancer burden
Caveat	Affected by screening activities and quality of cancer registration
Main source of information	Population-based cancer registries (CRs), bodies finalized to collect information of all cancer cases diagnosed in the population covered by them
European/ international projects	International Agency on Research of Cancer centralized periodically data for "Cancer Incidence in 5 Continents" [12]. The last volume IX covered the period 1998-2002
Databanks	GLOBOCAN [8-10]: national *estimates* of cancer incidence in 1998, 2000, 2002, 2004 [11] and 2006 [1]. EUROCIM [13]: CR *observed* incidence data up to 1998

In 2006 2,351,000 new cases were estimated in EU-25 [1]. Age-standardised cancer estimated incidence rates for all cancers tend to be directly related to Gross Domestic Product (GDP). Maximum and minimum age-standardized incidence estimated rates for all cancers in 2006 (Figure 5.3.1) were for men in Hungary and Malta (598 vs 322 new cases per 100,000 respectively) and for women in Denmark and Greece (413 and 259 new cases per 100,000 respectively). Figures 5.3.2 and 5.3.3 show that estimated incidence rates for all cancers are increasing both in men and in women in all European macro-areas. In men, Southern Europe reached in 2006 the incidence levels of Western Europe while in women differences among the macro-areas reduced between 1998 and 2006. Incidence rates for all cancers were highest in Western Europe for men (482 new cases per 100,000) and in Northern Europe for women (351 per 100,000) in 2006.
Table 5.3 shows the percentages of major cancer site specific incidence rates on the incidence rates for all cancers in 2006. In Europe, the most common form of cancer in men and women was female breast cancer (16% of all cancer incidence) followed by colorectal and lung cancers (12% of all cancer incidence each). In Europe more than 50% of cancer cases are due to colorectal, lung, female breast, uterus and prostate cancers. In men, prostate cancer was the principal cancer site in all macro-areas except for Eastern Europe where lung cancer was yet the most frequent cancer. In women, breast cancer was the most frequent site followed by colorectal cancer in all macro-areas except for Eastern Europe where breast cancer was followed by uterus cancer. Colorectal cancer constitutes an important burden in all macro-areas both in men and in women. Moreover, cancer is mainly a disease of older age and as the life expectancy of MSs is also increasing, MSs are experiencing a cancer epidemic [14]. The following points emerge from these data:

1 increasing cancer incidence rates make primary prevention a cancer control priority
2 primary prevention priorities should focus on known tobacco, diet, alcohol and physical activity health determinants as indicated by available scientific evidence as relevant for cancer increasing risks
3 about uterus cancer, secondary prevention (screening) actions are to be implemented in Eastern Europe (see paragraph 5.1)

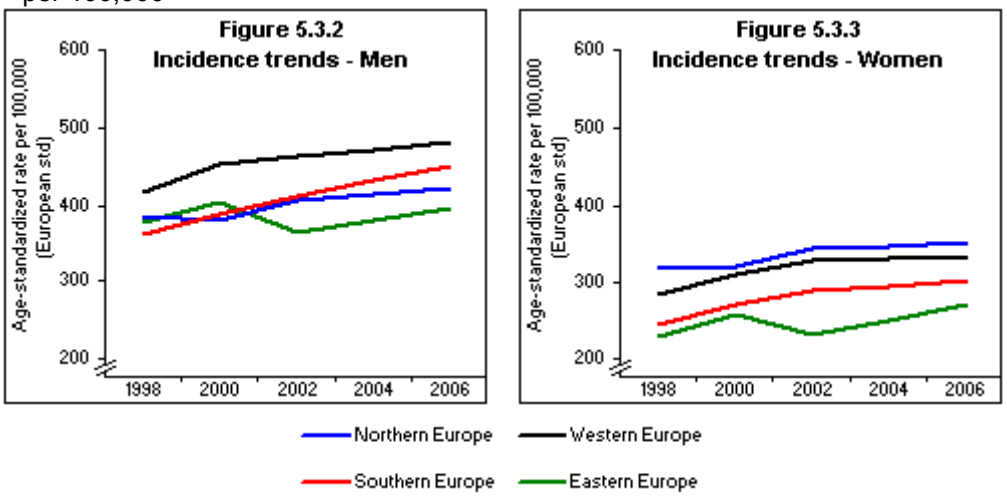
4 the rapid increase in prostate cancer incidence is related to the currently widespread PSA (Prostate-Specific Antigen) test outside organised screening programmes not presently recommended due to the lack of demonstrated efficacy.

Figure 5.3.1 Age-standardized cancer incidence *estimates* (European standard) for all cancers except non-melanoma skin cancers (ICD-10 codes* C00–97 excl C44), ordered by decreasing Gross Domestic Product**. Rates per 100,000



Source: Ferlay J *et al* [1] available on http://ec.europa.eu/health/ph_information/dissemination/diseases/cancer_en.htm
* ICD10: International Classification of Diseases, 10th revision. ** Source: EUROSTAT.

Figures 5.3.2 and 5.3.3 Age-standardized cancer incidence *estimates* (European standard) for all cancers except non-melanoma skin cancers (ICD-10 codes* C00–97 excl C44). Rates per 100,000



Figures reconstructed by using different sources. Sources for 1998, 2000, 2002: Globocan [8-10]. Source for 2006: Ferlay J *et al* [1] available on http://ec.europa.eu/health/ph_information/dissemination/diseases/cancer_en.htm
Northern Europe: Sweden, Finland, Denmark, Estonia, Latvia, Lithuania, the United Kingdom, Ireland, Iceland, Norway; *Western Europe*: the Netherlands, Belgium, Luxembourg, Germany, France, Austria, Switzerland; *Southern Europe*: Italy, Spain, Portugal, Greece, Malta, Cyprus, Slovenia; *Eastern Europe*: Slovakia, the Czech Republic, Hungary, Poland, Bulgaria, Romania

Table 5.3 Percentages of cancer site incidence rates on incidence rates for all cancer. 2006

	ICD-10*	Northern Europe	Western Europe	Southern Europe	Eastern Europe	Europe
Men						
Colorectal cancer	C18-21	13%	14%	11%	13%	13%
Lung cancer	C33-44	13%	14%	17%	21%	17%
Prostate cancer	C61	28%	25%	20%	12%	19%
Women						
Colorectal cancer	C18-21	10%	12%	10%	10%	11%
Lung cancer	C33-44	9%	6%	5%	7%	7%
Breast cancer	C50	34%	37%	34%	24%	31%
Uterus cancer	C53-55	8%	8%	9%	16%	11%
Men and women						
Colorectal cancer	C18-21	12%	13%	10%	12%	12%
Lung cancer	C33-44	11%	10%	11%	14%	12%
Breast (W) cancer	C50	17%	19%	17%	13%	16%
Uterus (W) cancer	C53-55	4%	4%	4%	8%	6%
Prostate (M) cancer	C61	13%	12%	10%	5%	9%

European area subdivision as indicated in footnotes of Figures 5.3. Source: Ferlay J *et al* [1] availbale on http://ec.europa.eu/health/ph_information/dissemination/diseases/cancer_en.htm
* ICD10: International Classification of Diseases, 10th revision.

5.3.1 Focus on health determinants: the role of diet and physical activity

At European level efforts were conceived against tobacco, occupational carcinogens, environmental pollution, asbestos, etc. Since the recent years the promotion of a healthy diet and physical activity were included in the World Health Organisation (WHO) and EC primary prevention priorities.
In the last 40 years important evidences have arisen suggesting that diet significantly affects the onset of chronic-degenerative pathologies, pain of the economically-developed world. Association between diet and cancer was studied over a long period and research has now reached a critical turning point. Ecological studies of the 60's, many case-control studies started in the 70's, large perspective studies that begun in the 80's with dietary surveys and bio-banks and, finally, the dietary campaigns of the 90's all contributed to the conclusion that over one third of cancers could theoretically be preventable through changes of eating habits [14]. Other important evidences in the fields of cardiovascular and degenerative diseases led to the implementation of public health plans on dietary prevention and promotion of physical activity.
In the framework of policies against chronic diseases, in 2005 the European Commission published the Green Paper "Promoting healthy diets and physical activity", as a result of a public consultation with questions to European citizens, researchers, health planners, industries, etc [15]. Contributes indicated that in this field, both at Pan-European and Member State level, a multi-sectorial approach is essential, involving areas such as

agriculture, transport and urban planning, and a range of stakeholders (also in private sectors) across national, regional and local levels [16]. Also stressed by the Green Paper is the importance of internationally recognised key messages on healthy diet: i.e. increase fruit & vegetables consumption; limit total fat and/or saturated fat intake; follow a balanced diet; increase whole grain, starchy or fiber-rich products consumption; reduce sugar and soft drinks consumption; reduce salt intake; reduce size of portions [16]. Some of them were included in the European Code Against Cancer [3].
At the same time WHO diffused the "Gaining health" programme [17] focused on seven health determinants (the majority linked to healthy diet and physical activity): high blood pressure, tobacco, alcohol, high blood cholesterol, overweight, low fruit and vegetable intake, and physical inactivity. The programme conveys six key messages:

- Prevention throughout life is effective and must be regarded as an investment in health and development
- Society should create health-supporting environments, also making healthy choices easier choices
- Health and medical services should respond to the actual disease burden and increase health promotion
- People should be empowered to promote their own health and be active partners in managing diseases
- Universal access to health services and promotion: disease prevention is central to achieve health equity
- Governments at all levels should build healthy policies and ensure action across all concerned sectors.

It is auspicable that the Gaining Health Programme is implemented in all EU countries. At the moment of writing Denmark, Lithuania, Italy, Sweden, the United Kingdom and the Netherlands started to implement it [17]. In 2007, for instance, the Italian Government approved the programmatic document "Guadagnare salute" [18] coordinated by the CCM (Italian Disease Control Centre). In Italy, EUROCHIP-2 organized a group of researchers, health planners, consumers and stakeholders to work on the diffusion to general public, journalists and health planners, of new, accurate and independent information on the relation between diet/physical activity and chronic-degenerative diseases and on scientifically proved preventive actions. This group collaborates with CCM for the implementation of the "Guadagnare salute" programme in Italian regions and will try to diffuse the programme to other EU countries through the EUROCHIP Network.

5.4 Cancer Screening

For cancer in general, early diagnosis means major probability to be cured or at least to increase survival time. For some cancers specific diagnostic procedures were considered cost-effectiveness to be offered in organised programmes to the entire asymptomatic population in order to prevent mortality from the diseases by means of detecting cancer at early stage or a disease before it has become cancer. By detecting and treating pre-cancers organised screening programmes can also prevent incidence of the invasive disease. The international scientific community suggests to promote organised population-based screening methods for the following malignancies: mammography for female breast cancer, pap smear for cervical cancer and faecal occult blood for colorectal cancer. In 2003 the European Council published recommendations to MSs for the implementation of organised screening programmes [4] for cervical cancer precursors (no earlier than 20 years of age and no later than 30); for breast cancer (women aged 50-69) and for colorectal cancer (people aged 50-74). Specific programmes and projects have been implemented in Europe (ECN, EUNICE) producing guidelines, promoting educational activity, etc.
Table 5.4 shows the current diffusion of organised screening programmes in the European countries [1].

Table 5.4 Diffusion of organised screening programs in Europe[§]

	Population-based cancer screening programs						
	Breast		Cervix		Colorectal		
	Natl.	Reg.	Natl.	Reg.	Natl.	Reg.	Notes
SWEDEN	X		X			P	Colorectal screening under Health Technology Assessment study
FINLAND	X		X			X	Colorectal screening (2004-) being extended nationally: currently 170 of 400 municip.
DENMARK		X	X				
ESTONIA	X		X				
LATVIA							Opportunistic screening for cervical cancer
LITHUANIA	X		X			P	Colorectal screening planned from 2008
UNITED KINGDOM	X		X			X	Colorectal screening (2006-) currently regional, gradually extending to national coverage
IRELAND		X	P				
NETHERLANDS	X		X			X	Colorectal screening pilot in two regions
BELGIUM	X						Opportunistic screening for cervical cancer, colorectal screening pilot under discussion
LUXEMBOURG	X					P	Opportunistic screening for cervical cancer
GERMANY	X						Breast cancer study starting in 2008
FRANCE	X					X	Opportunistic screening for cervical cancer
AUSTRIA		P					Five regional pilots to be evaluated 2008. Opportunistic screening for all three cancers
ITALY		X		X		P	
SPAIN	X					P	Opportunistic screening for cervical cancer
PORTUGAL		X		X			
GREECE							Opportunistic screening for breast and cervical cancers
MALTA							Opportunistic screening for all three cancers
CYPRUS	X						Opportunistic screening for cervical cancer. Colorectal screening will start in 2007
SLOVENIA			X				Opportunistic screening for breast cancer
SLOVAKIA	P		X		P		
CZECH REPUBLIC		X					
HUNGARY	X		X			P	
POLAND	X		X		P		Opportunistic colorectal screening (partially by invitations): colonoscopy-based since 2000
BULGARIA							Opportunistic screening for breast and cervical cancer
ROMANIA							Opportunistic screening for all three cancers
EEA countries							
ICELAND	X		X				
NORWAY	X		X				
SWITZERLAND		X					Opportunistic screening for cervical and colorectal cancer

X - population-based mass cancer screening programs in place at national (Natl.) or regional (Reg.) level; P - Pilot study.

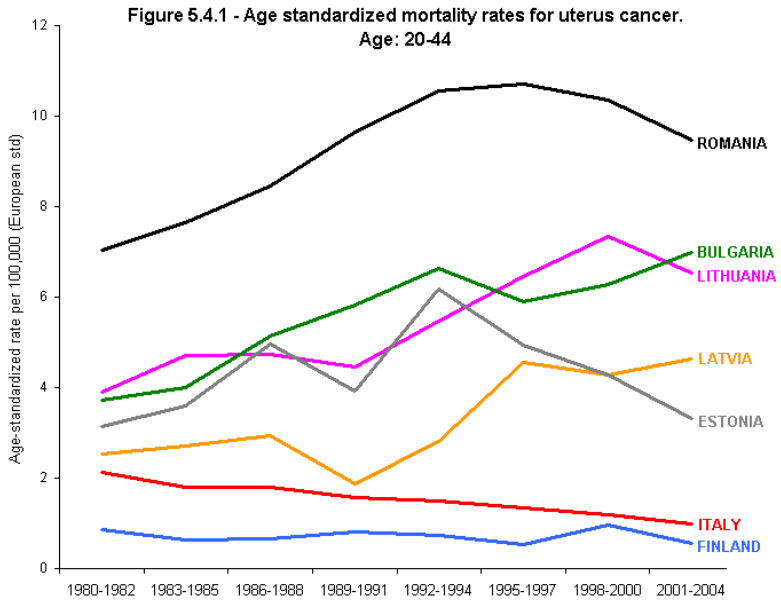
§ Table reconstructed by the EUROCHIP-2 network and presented by Professor M. Coleman for the EU Portuguese Presidency conference Health Strategies in Europe, Lisbon, July 2007

5.4.1 Focus on cervical cancer screening in five European countries

Figure 5.4.1 shows the trends of uterus cancer mortality in age 20-44[2] in some European MSs. In Italy and Finland as in the majority of western European countries a substantial decrease in cervical cancer mortality rates was observed, while in some Eastern European and Baltic countries trends were inversed. The level of mortality was less than 1 death per 100,000 in countries like Italy and Finland, against 9-10 deaths per 100,000 in Romania, 6 deaths per 100,000 in Bulgaria and Lithuania and 3-4 deaths per 100,000 in Estonia and Latvia. Most of these deaths are avoidable through the implementation of organised screening programmes (OSP) as pap smear allow the detection of disease before it has become cancer. The activity of EUROCHIP-2 against avoidable deaths focused on the creation of specific pressure groups and studies in five MSs to identify the major problems/barriers for the implementation or improvement of screening. Major EUROCHIP results [7] in the interested countries are described below:

- Bulgaria: OSP not in place. It was estimated that considering a target population of 1.8 million (age 25-60) and a screening interval of 3 years, the screening costs should be 3 million € per year. This cost has to be compared with the 16 million Euros employed for treatment costs of cervical cancers in Bulgaria (year 2001). Specific surveys were implemented to assess level of information and grounds for OSP implementation in the country, as well as to evaluate the standard of the cytological laboratories.
- Romania: OSP not in place. Assessment study underlined the high difficulty to implement OSP in the near future due to inadequate structures, education, registration. However in 2007, legislative changes occurred in Romania in the field of health, including cancer registration and cervical cancer screening.
- Latvia: OSP not in place. Under the EUROCHIP umbrella, a workgroup was established with Latvian oncologists, gynaecologists, general practitioners, stakeholders and health planners. Two informative documents were submitted to the Latvian Health prompting the reorganization of existing opportunistic screening, and the institution of a central mass-screening registry. OSP to start in January 2009
- Estonia: OSP in place since 2006. The adherence of the population is under 20%. Comparison with other countries suggests the possibility that 30 deaths and 100 incident cases of cervical cancer per year can be avoided. Improved OSP can be achieved through a study on the low attendance rates, through new legislation for a screening registry, divulgation of information on screening activities among health professionals and gynaecologists, and by subsidizing a reference laboratory.
- Lithuania: OSP started in 2004 without a centralized invitation system. Under EUROCHIP, a pilot study was organized to evaluate results of the centralized invitation system in one municipality in Lithuania. More than 800 of invitation were distributed via mail and by nurses in February in March 2007. Matched to the results of the year 2006, the number of women attending the programme increased almost twice (614 compared to 362).

Figure 5.4.1 Age-standardized mortality (European standard) for uterus cancer in the age 20-44[§]. Rates per 100,000



Sources: WHO [20].

[§] On the basis of overall national death certificates, it is not possible to analyze mortality from cervical cancer in Europe, since 20-65% of deaths from uterine cancer in largest countries are still certified as uterus unspecified [19]. To estimate cervical cancer mortality we used death rates for uterine cancers (ICD-10 C53-55) in women aged 20-44, since most deaths from uterine cancer below the age of 45 years arise from the cervix. Consequently, in these ages overall uterus cancer mortality is a proxy for cervical cancer mortality.

5.5 Survival

Together with the number of new cases (incidence) and deaths (mortality), information on the survival of all patients after a cancer diagnosis is a key indicator of cancer control. Box 5.5 synthesizes main characteristics of cancer relative survival indicator used in international comparisons.

Box 5.5 The cancer relative survival indicator

Cancer relative survival rate	
Generic definition	Ratio of the observed survival rate in the group of patients to the expected survival rate in a demographically comparable subset of the general population
Rationale	It reflects the survival experience of cancer patients, after removing the effects of non cancer causes of death. It is recommended for geographical and temporal comparisons
Utility	Basic epidemiological measure of cancer burden
Caveat	It is an artificial measure
Main source of information	Population-based cancer registries (CRs)
European projects	EUROCARE-1 [21] regarded patients diagnosed in 1978-84 (followed up to 31/12/89); EUROCARE-2 [22]: patients diagnosed in 1985-89 (fu to 31/12/1994); EUROCARE-3 [23]: patients diagnosed in 1990-94 (fu to 31/12/1999); EUROCARE-4 [24]: patients diagnosed in 1995-99 (fu to 31/12/2003)
Databanks	EUROCARE-4 [24] regards data from 83 CRs in 23 European countries

Table 5.5.1 shows 5-year age- and case-mix relative survival for all cancers combined (5-year relative survival), by country, ranked by decreasing Total National Expenditure on

Health (TNEH). Data show that 5-year relative survival tends to be related to TNEH: countries at high TNEH have high levels of survival, countries with low TNEH have low level of survival. Denmark and UK had lower survival than countries with similar TNEH. Finland and Spain had better survival than expected from its moderate health expenditure.

Table 5.5.1 5-year relative survival adjusted for age-mix and case-mix by country for all cancers

Country	Men %	Women %
Switzerland	43.5	56.7
Germany	44.1	55.6
France	44.5	57.9
Norway	40.0	54.9
Austria	47.5	57.9
Denmark	33.5	51.3
The Netherlands	42.7	55.7
Sweden	42.5	57.6
Italy	41.2	55.6
Finland	41.4	55.8
England	37.1	50.8
Spain	43.9	57.1
Wales	34.8	47.3
Scotland	35.6	49.5
Slovenia	31.2	47.0
The Czech Republic	32.3	46.0
Slovakia	29.7	43.6
Poland	25.2	40.5
Estonia	29.9	43.1

Source: EUROCARE [www.eurocare.it]. Countries are ordered by total national expenditure (TNEH). TNEH expressed as per capita purchased power parity (1995).

Table 5.5.2 shows the trend during 1991-2002 in age-adjusted 5-year relative survival in five European regions for some cancers as recently published by EUROCARE. Patients in Eastern Europe had the highest improvement in survival for colorectal cancer from 30,3% to 44,7% and female breast cancer from 60% to 72,4% although survival in Eastern Europe remained lower than in the other European areas. For lung cancer, survival increased for all areas. For cervical cancer, survival remained stable in the UK and Ireland, and Western Europe, and slightly increased in Eastern, Northern, and Southern European countries.

Table 5.5.2 5-year period survival profiles (%) from 1991 to 1999, by geographical area and cancer site. Survival are age-adjusted

Colorectal (M+F)	1991-93	1994-96	1997-99
Northern Europe	53.3	56.0	58.7
UK and Ireland	45.0	47.5	50.5
Western Europe	54.6	56.1	57.3
Southern Europe	48.6	52.2	55.1
Eastern Europe	30.3	34.1	42.3

Lung (M+F)	1991-93	1994-96	1997-99
Northern Europe	9.7	10.5	11.8
UK and Ireland	7.2	7.8	8.0
Western Europe	12.9	14.1	14.6
Southern Europe	10.2	10.9	12.5
Eastern Europe	6.1	7.4	9.8

Breast (F)	1991-93	1994-96	1997-99
Northern Europe	80.1	81.1	83.0
UK and Ireland	70.3	73.1	76.3
Western Europe	75.6	77.6	79.9
Southern Europe	76.9	78.9	81.7
Eastern Europe	60.0	63.8	72.4

Cervix	1991-93	1994-96	1997-99
Northern Europe	64.5	67.1	64.8
UK and Ireland	59.2	60.0	58.3
Western Europe	64.1	65.7	63.8
Southern Europe	62.2	64.1	65.7
Eastern Europe	50.3	53.8	56.1

Source: EUROCARE [www.eurocare.it] *Northern Europe*: Finland, Iceland, Norway, Sweden; *Western Europe*: Austria, Belgium, France, Germany, the Netherlands, Switzerland; *Eastern Europe*: Czech Republic, Poland; *Southern Europe*: Italy, Malta, Slovenia, Spain

EUROCARE-4 [24, 25] shows increases in survival and decreases in geographic differences over time, which are mainly due to improvements in health-care services in countries with poor survival. Although survival increased almost everywhere with time, survival differences (important aspect of European cancer inequalities) persisted: survival was still much worse in Eastern than in the rest of Europe, and within these countries, survival in the UK and Denmark was still low for several cancers. Analysis of survival by TNEH levels show that those countries, as the UK[3] and Denmark, with conspicuously worse outcomes than those with similar TNEH might not be allocating health resources efficiently or adequately. It is also important to stress that European survival differences depending on the health investments are actually difficult to reduce. The main obtainable result is that each country reaches that level of survival permitted to own available resources.

5.5.1 Focus on cancer diagnosis and treatment indicators

As showed earlier, EUROCARE underlined differences in cancer survival across Europe. In the list of EUROCHIP-1, the indicators “Stage at diagnosis” (Box 5.5.1a), “Delay of cancer treatment” (Box 5.5.1b) and “Compliance with guidelines” (Box 5.5.1c) emerged as possibly associated with the wide inter-country variation in cancer survival.

Box 5.5.1a The indicator “Stage at diagnosis”

Stage at diagnosis: percentage of cases with early diagnosis	
Generic definition	Proportion of cases classified as "localised" with the condensed-TNM*
Rationale	Indicator of early diagnosis
Utility	Determinant of treatment and prognosis
Caveat	The expected value of this percentage is cancer site dependent, but comparisons among countries are still informative
Main source of information	Population-based cancer registries (CRs). However, the majority of CRs did not routinely collect these data. In this case, they can be collected by *ad hoc* studies
European projects	This indicator was collected in the “EUROCARE High Resolution” studies (*ad hoc* studies based on CR data surveys) for some cancer sites
Databanks	No databanks available

*Cancer is stated using the TNM classification. The “Condensed-TNM” grouped various stages in “Localised” or “Advanced” stage

Box 5.5.1b The indicator “Delay of cancer treatment”

Delay of cancer treatment	
Generic definition	Time between date of diagnosis (or date first clinical contact) and date of first treatment
Rationale	Treatment delay could be related to: a) individual condition of the patient; b) biological condition of the patient; c) health system deficiencies
Utility	Indicator of health education and/or early diagnosis
Caveat	Comparison between countries has to be done carefully as it is necessary to “correct” this information by the different health systems in various countries
Main source of information	Population-based cancer registries (CRs). However, CRs did not routinely collect these data. They have to be collected by *ad hoc* studies
European projects	EUROCHIP-2 organised pilot studies to assess data collection and availability of this indicator for three cancer sites: breast, colon and rectal cancers
Databanks	No databanks available

Box 5.5.1c The indicator “Compliance with guidelines”

Compliance with guidelines	
Generic definition	Specific items to study compliance were identified for breast, colon and rectal cancers [4]. The indicator will change in the future following new treatments and new guidelines
Rationale	To reflect the compliance with best practice in oncology
Utility	Monitoring the treatment activity
Caveat	Comparison between countries has to be done carefully as the majority of countries does not have national guidelines
Main source of information	Population-based cancer registries (CRs). However, CRs did not routinely collect these data. In this case, they can be collected by *ad hoc* studies
European projects	This indicator was collected in the “EUROCARE High Resolution” studies (*ad hoc* studies based on CR data surveys) for some cancer sites (colorectal and female breast cancers). Moreover, EUROCHIP-2 organised pilot studies to assess data collection and availability of this indicator for three cancer sites: breast, colon and rectal cancers
Databanks	No databanks available

With the CRs of 10 European MSs (Cyprus, the Czech Republic, Finland, France, Poland, Portugal, Slovakia, Slovenia, Spain and the Netherlands), the EUROCHIP-2 Pilot Studies [7] investigated the availability of these indicators for breast and colorectal cancers to assess eligibility for the European Community Health Indicators (ECHI) list. Data collection will indicate availability of the three indicators and ways to improve methodology for the “treatment delay” indicator. Results will be available in 2008.

5.6 Mortality

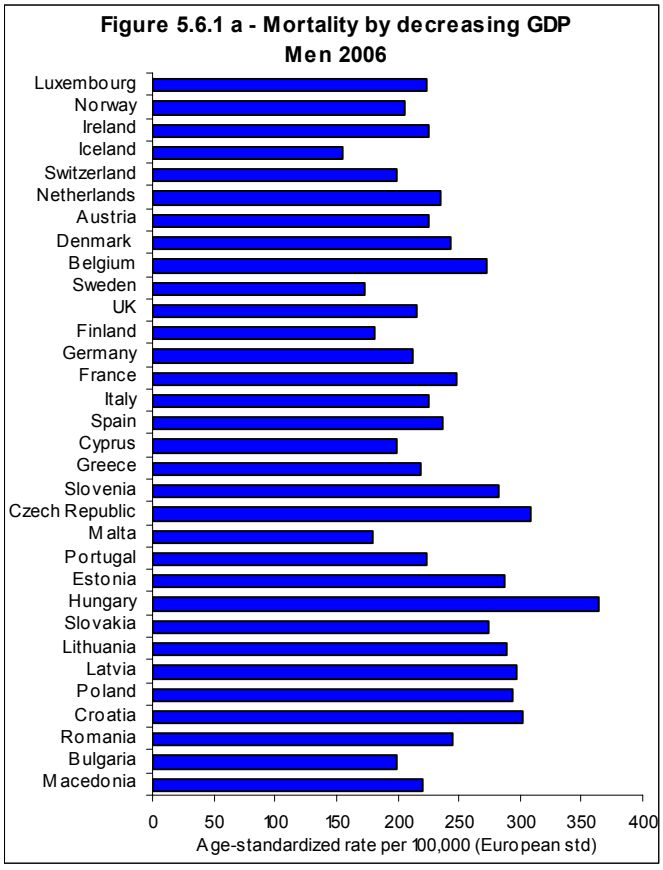
Mortality is the final indicator on cancer presence in the population. Cancer mortality gives information on social burden of the disease and it is useful to define surveillance policies. Box 5.6 synthesizes main characteristics of the cancer mortality indicator including information on databanks.

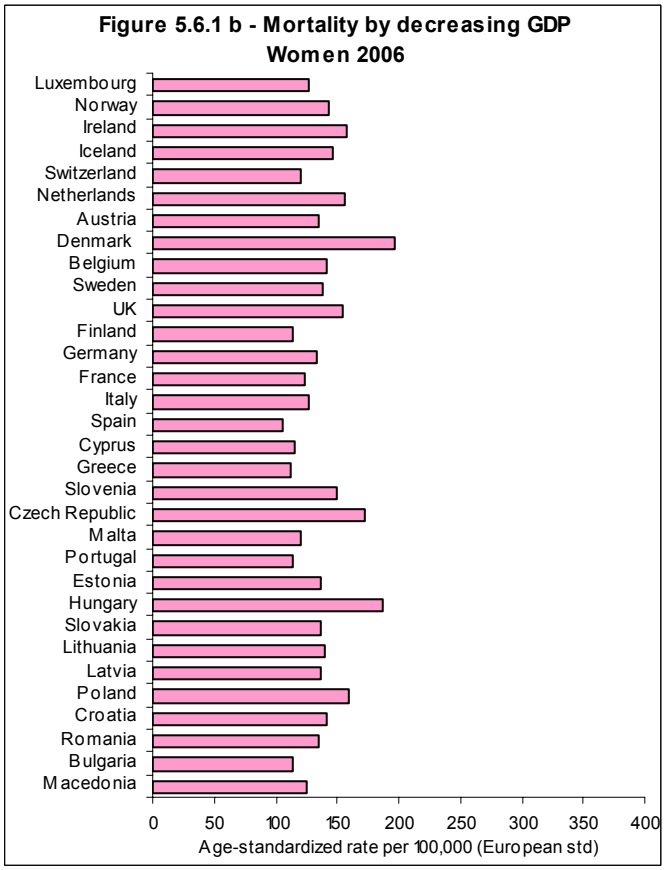
Box 5.6 Cancer mortality rate indicator

Cancer mortality rates	
Generic definition	Number of cancer deaths in a period / Person-years at risk during the same period
Rationale	Cancer mortality
Utility	Epidemiological measure for cancer description
Caveat	
Main source of information	National statistical offices
European/ international projects	WHO make available mortality data per causes of death. IARC produced a web-based databank from which cancer mortality rates are downloadable by population, cancer site, age, calendar year, etc. IARC produced also *estimates* for recent years [1]
Databanks	WHO cancer databank is available at the IARC's web-site: http://www-dep.iarc.fr. It is also downloadable (with data up to year 2001) at the web-site: http://epicancer.iss.it

In 2006 1,165,000 deaths were estimated in EU-25 [1]. Mortality in the EU tends to be inversely related to GDP (particularly in the case of men). Countries at low GDP level tended to show high levels of mortality while countries at high levels of GDP tended to show low mortality. Maximum and minimum age-standardized estimated mortality rates for all cancers in 2006 (Figure 5.6.1) were, for men, in Hungary and Iceland (364 and 155 deaths per 100,000 respectively) and for women, in Denmark and Spain (196 and 107 deaths per 100,000 respectively). In 2004 mortality rates for all cancers were highest in Eastern Europe for men (287 deaths per 100,000) and in Northern Europe for women (155 per 100,000). Figures 5.6.2 and 5.6.3 show that mortality rates for all cancers are decreasing both in men and in women in all European macro-areas except for Eastern Europe where trends are increasing principally for men. Some evidences in mortality data suggest that Eastern European phenomena is firstly related to the lung cancer mortality increase (up to 1995) and, secondly, to the colorectal cancer mortality increase. Formal investigations are required in order to highlight major determinants (lifestyle habits, cancer diagnosis, cancer treatments) of this bad mortality trend in Eastern Europe. Lung cancer was the major killer among male cancers: in 2004 lung cancer mortality rates were yet over 50 deaths per 100,000 in all macro-areas (Figure 5.6.4). In women major killer in 2004 was breast cancer with 20-30 deaths per 100,000 in all macro-areas (Figure 5.6.11).
Figures 5.6b show mortality trends for major cancer sites. Mortality trends change by macro-area and by sex.
Male lung cancer mortality trends (Figure 5.6.4) are strongly decreasing since '80s in Northern Europe, slightly decreasing since the begin of '90s in Southern and Western Europe and since 1995 in Eastern Europe. While female lung cancer mortality trends (Figure 5.6.5) are increasing in all macro-areas (major levels were in Northern Europe while the more evident increase was in Western and Eastern Europe). Colorectal cancer mortality trends (Figure 5.6.6 for men and Figure 5.6.7 for women) are decreasing in Northern and Western Europe (both for men and women), and are increasing in Eastern Europe (for men and women) and in Southern Europe (for men). Stomach cancer mortality trends (Figure 5.6.8 for men and Figure 5.6.9 for women) are decreasing everywhere for both genders. Prostate cancer mortality (Figure 5.6.10) are decreasing in Western Europe, slightly decreasing in Southern Europe, constant in Northern Europe and increasing in Eastern Europe. Female breast cancer mortality (Figure 5.6.11) is strongly decreasing since the end of '80s in Northern Europe, slightly decreasing since the '90s in Southern Europe and since the end of '90s in Western Europe. In Eastern Europe they were quite constant in last decade.

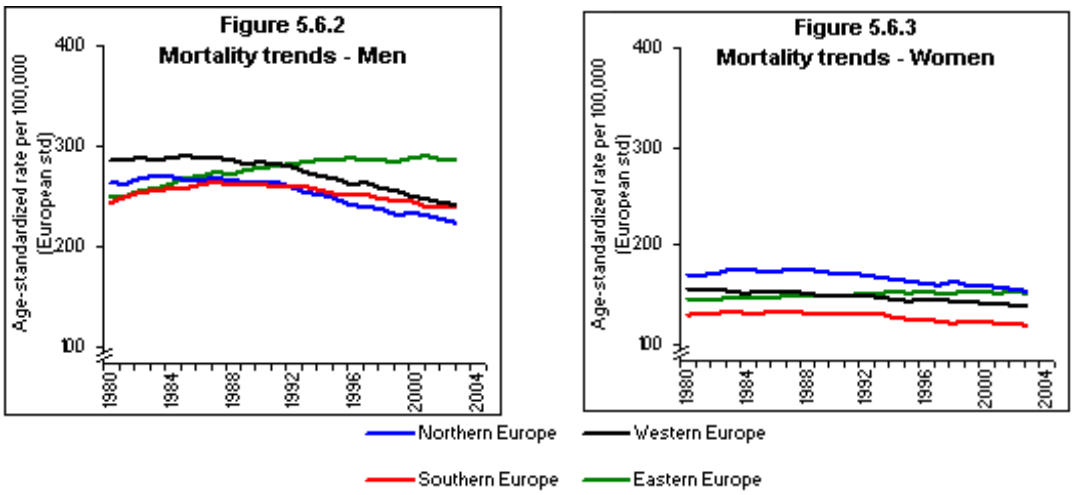
Figures 5.6.1 Age-standardized cancer mortality (European standard) for all cancers except non-melanoma skin cancers (ICD-10* codes C00–97), ordered by decreasing Gross Domestic Product**. Rates per 100,000





Source: Ferlay J *et al* [1] available on http://ec.europa.eu/health/ph_information/dissemination/diseases/cancer_en.htm
* ICD10: International Classification of Diseases, 10th revision. ** Source: EUROSTAT.

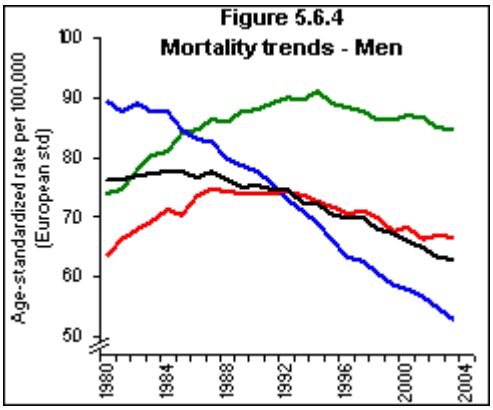
Figures 5.6.2 and 5.6.3 Age-standardized cancer mortality (European standard) for all cancers (ICD-10* codes C00–97). Rates per 100,000

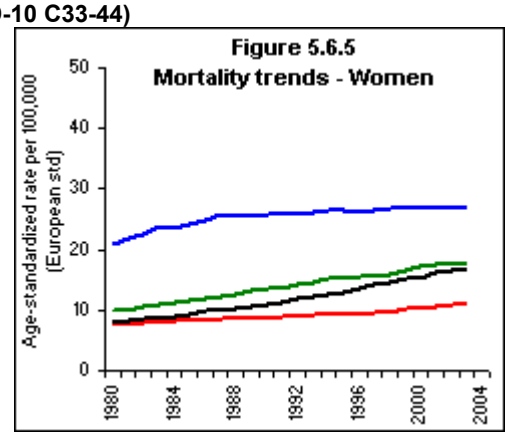


Source: WHO [20].
Northern Europe: Sweden, Finland, Denmark, Estonia, Latvia, Lithuania, the United Kingdom, Ireland, Iceland, Norway; *Western Europe*: the Netherlands, Belgium, Luxembourg, Germany, France, Austria, Switzerland; *Southern Europe*: Italy, Spain, Portugal, Greece, Malta, Slovenia; *Eastern Europe*: Slovakia, the Czech Republic, Hungary, Poland, Bulgaria, Romania

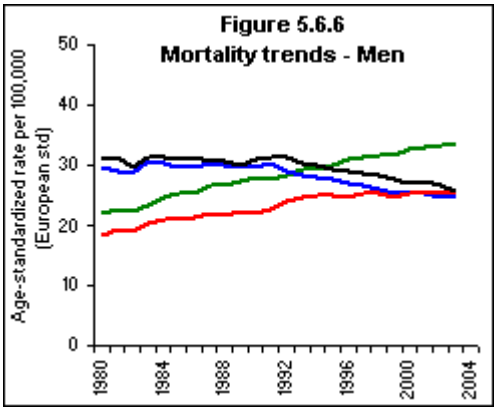
Figures 5.6b. Age-standardized cancer mortality (European standard). Rates per 100,000

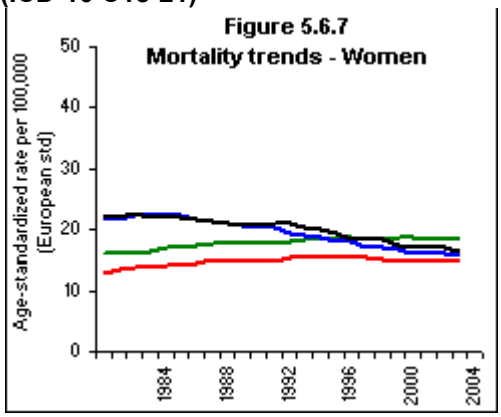
LUNG CANCER (ICD-10 C33-44)



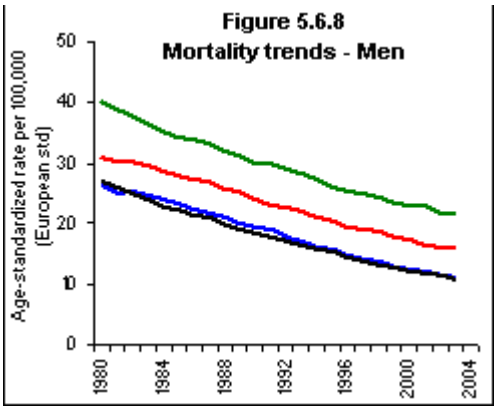


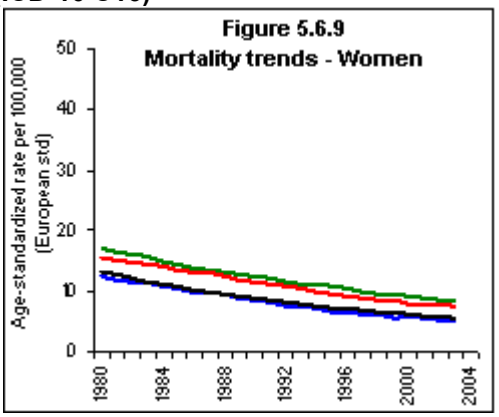
COLORECTAL CANCER (ICD-10 C18-21)





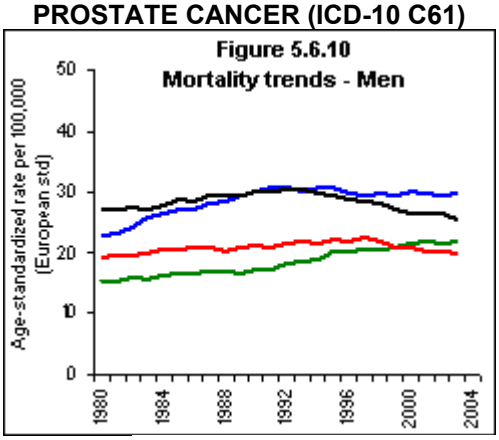
STOMACH CANCER (ICD-10 C16)

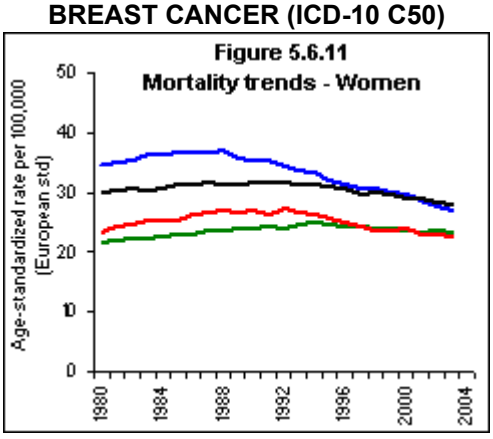




PROSTATE CANCER (ICD-10 C61)

BREAST CANCER (ICD-10 C50)





Northern Europe Western Europe Southern Europe Eastern Europe

Source: WHO [20]. European area subdivision as indicated in footnotes of Figures 5.6a

5.7 Prevalence

Cancer prevalence calculates the total cancer burden in a population and is a useful indicator for planning and allocation of resources. Box 5.7 synthesizes the main characteristics of cancer prevalence.

Box 5.7 Cancer prevalence indicator

Cancer prevalence proportions	
Generic definition	*Total prevalence* is the proportion of subjects living in the population at a given date with past diagnosis of cancer. Prevalence can be also decomposed by disease duration (i.e. 1-, 2-, 5- and 10-year prevalence)
Rationale	Indicates how many people show potential medical, physical, psychological or social problems as a consequence of their cancer
Utility	Epidemiological measure for cancer burden description
Caveat	Total prevalence includes also cancer cured patients
Main source of information	Population-based cancer registries (CRs)
European/ international projects	EUROPREVAL [26] project gave the *observed* total cancer prevalence at 31/12/1992. GLOBOCAN [8-10] gave the *estimates* of 5-year prevalence
Databanks	EUROPREVAL [26] for total prevalence and GLOBOCAN [10] for 5-year prevalence

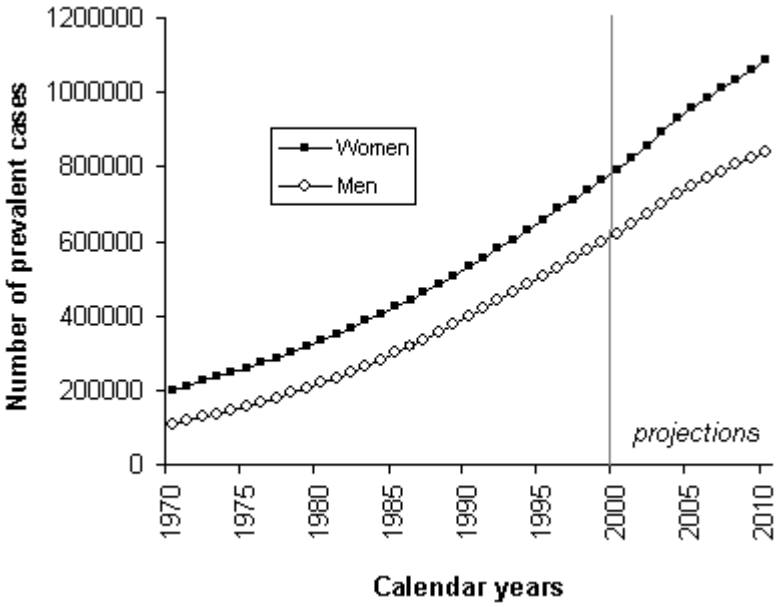
Table 5.7 shows the huge number of 5 year prevalent cases by macro-area in Europe in 2002 according to the GLOBOCAN estimates [10]. These data represent the number of living subjects in 2002 who were diagnosed cancer during the prior 5 years (that is they are a subset of the total prevalence cases). In the EUROPREVAL project [26] the percentage of 5-year prevalence on total prevalence was 42%. Consequently, in Europe we can estimate nearly 14 million of prevalent cases in 2002. No updated data on observed total prevalent cases are available for comparison in all European countries. As an example for the situation of cancer prevalence in Europe, figure 5.7 shows the trend of the cancer prevalent cases estimates in Italy from 1970 to 2010, with a dramatic rate of increase [27]. It is realistic to state that trends similar to those in Italian data are present in the majority of European countries.

Table 5.7 5-year estimated cancer prevalent cases. 2002

	Men	Women	Total
Northern Europe	486,797	596,640	1,083,437
Western Europe	1,253,596	1,323,506	2,577,102
Southern Europe	742,023	724,872	1,466,895
Eastern Europe	314,263	411,104	725,367
Europe	2,796,679	3,056,122	5,852,801

Source: GLOBOCAN [10]. *Northern Europe*: Sweden, Finland, Denmark, Estonia, Latvia, Lithuania, the United Kingdom, Ireland, Iceland, Norway; *Western Europe*: the Netherlands, Belgium, Luxembourg, Germany, France, Austria, Switzerland; *Southern Europe*: Italy, Spain, Portugal, Greece, Malta, Cyprus, Slovenia; *Eastern Europe*: Slovakia, the Czech Republic, Hungary, Poland, Bulgaria, Romania

Figure 5.7 Estimated total prevalence time trends 1970-2010 in Italy by sex for all cancers. Number of prevalent cases, age 0-84 years



Source: I Tumori in Italia (www.tumori.net).

5.8 Cancer and wealth

In the past, in European country populations with high Gross Domestic Product (GDP) (and also higher Total National Health Expenditure - TNEH) incidence was high, mortality low and survival high, while in countries with low GDP incidence was low, mortality high and survival low (analysis on 1992 data) [6]. Table 5.8 shows the average values of most recent data on cancer incidence, mortality and survival (expressed as 5-year relative survival adjusted for age-mix and case-mix for all cancers combined) in the European countries subdivided in tertiles by TNEH in the period 2000-2002. In women, incidence rates for all cancer increases when TNEH increases, while the same relation does not exist for men. The relation in women might be caused by a higher exposure to risk factors in rich countries and also by the recent implementation of an organised breast cancer screening programme [4] (breast cancer being the main female cancer). For men, countries with low TNEH are in the present analysis showing the incidence levels of other countries. As presented in paragraph 5.5 survival is high in countries with high TNEH (for both men and women). Finally, mortality is very high in low TNEH countries, but only for men. In conclusion, in countries with low health investments, showing similar incidence but low survival than rich countries, men die more than in richer countries. In the case of women, countries with low TNEH, low incidence but also low survival show the same mortality levels as rich countries.

Table 5.8 Average epidemiological cancer indicators (for all cancer combined) in European countries subdivided by Total National Expenditure on Health (TNEH) tertiles

Subdivision of European countries by TNEH[a] tertiles ($PPP – 2000-2002)	Cancer incidence[b] 2006		5-year all cancer relative survival[c]		Cancer mortality[d] 2006	
	Men	Women	Men	Women	Men	Women
First tertile[e] TNEH ≤ 1700 $PPP	461.3	309.6	41.8	52.4	274.7	141.1
Second tertile[f] 1827 $PPP ≤ TNEH ≤ 2415 $PPP	462.3	338.2	45.6	55.3	216.6	138.0
Third Tertile[g] TNEH ≥ 2431 $PPP	459.7	359.8	45.0	55.9	215.3	143.1

[a] TNEH source: OECD [28]. PPP: per-capita purchasing power parity ; [b] All cancer standardized incidence rates (European standard) per 100,000. Source: Ferlay J *et al* [1]; available on http://ec.europa.eu/health/ph_information/dissemination/diseases/cancer_en.htm [c]; EUROCARE-4 5-year rellative survival adjusted for age-mix and case-mix for all cancers combined (%). [d] All cancer standardized mortality rates (European standard) per 100,000. Source: Ferlay J *et al* [1]; [e] Countries in first TNEH tertile: Poland, Slovakia (relative survival not available), Hungary (relative survival not available), Czech Republic, Spain, Portugal, Greece (relative survival not available); [f] Countries in second TNEH tertile: Finland, the United Kingdom, Ireland, Italy, Austria, Sweden, Belgium; [g] Countries in third TNEH tertile: the Netherlands, Denmark, France, Iceland, Germany, Luxembourg (relative survival not available), Norway, Switzerland.

5.9 Comments and conclusions

In Europe important differences in cancer outcomes still exist. However, cancer epidemiology in Europe is changing and new information for a more efficient cancer control in Europe is available, suggesting:

- cancer control needs an integrated cancer information system in all MSs and cancer registries are the heart of this system
- primary prevention is no longer a high priority only for wealthy countries, but it has become one for all European countries. Eastern European countries have to promote actions against tobacco following the experience of other European countries and put attention to increasing trends in male cancer mortality. Attention to healthy diet and physical activity should be promoted in all EU countries (at least one third of cancers are related to bad diet and insufficient physical activity)
- organised screening programmes have to be subsidized and implemented in all European countries
- developing cancer diagnostic and treatment services throughout Europe
- cancer prevalence is dramatically increasing. Hence:
  - the needs of cancer patients and prevalent cancer patients (especially elderly patients) are increasing. For this reason it is necessary to have full knowledge of the variation of health services demand as a function of cancer type, patient age and rehabilitation requirements. Once the demand for services is accurately assessed, services can be provided rationally according to available resources [14]
  - the demand for resources to follow-up cancer patients and identify and treat cancer recurrences is increasing. While this is happening, new knowledge is being acquired by genetic research and the reality of cancer is changing. A list of few major killer diseases changed into to a long list of deferent rare diseases, each requiring a specific treatment. These are the problems that an integrated and effective cancer control policy for Europe has to face. The problem of cancer is destined to become more serious in the next decades

and only the EU can promote a wide-ranging debate to find ways of reducing costs while improving cancer services [14].

5.9.1 Focus on recommendations of EU Portuguese Presidency on cancer strategies in Europe

On 12 and 13 July 2007, the EU Portuguese Presidency (July-December 2007) organised in Lisbon the conference "Health Strategies in Europe" (HSE). Parallel sessions on seven major health areas including cancer were organised. Experts from various fields of expertise contributed to the preparation of the recommendations of the Portuguese Presidency to the European Council and the Slovenian Presidency of 2008. [29].
Recommendations for cancer covered the three priority fields of Cancer Plans, Cancer Registries and Cancer Screening Programmes.

Cancer control plans. EU Member States should develop or continue to improve their cancer planning, using an integrated approach and evidence-based strategies in each of the following domains:

- Primary prevention and screening programmes
- Rapid access to diagnostic services and multidisciplinary treatments
- Take account patient preferences
- Coordinate the cancer pathway: diagnosis, treatment, palliation
- Restrict rate or complex procedures to high-caseload services
- Ensure regular audits of performance
- Manage patients' quality of life and provide psychosocial care
- Use existing treatment guidelines "off the shelf" in some countries
- Evaluate cancer outcomes
- Ensure support for research
- Evaluate performance of plan itself.

Cancer registries

- Cancer Registries should inform the evaluation of programmes for: prevention (incidence), screening, treatment (survival)
- Update the EU Directive (1995) to enable population-based registries
- EU should recommend that all MSs make cancer registration statutory
- Set EU standards for registration in countries with no cancer registry.

Cancer screening

- Nation-wide screening programmes should be implemented for: breast cancer in women aged 50 and over (2- to 3 yrs intervals), cervical cancer in women aged 30 and over (5-year interval), colorectal cancer in persons aged 50 and over
- Nation-wide screening should not be implemented for other cancers unless and until the evidence is strong [5]
- Before implementing of a screening programme, predict the public health effects and the costs
- After implementation of screening maintain continuous evaluation of mortality and of screening processes (intermediate outcomes).

Footnotes

1 As reconstructed by the EUROCHIP-2 network and presented by Professor M. Coleman for the EU Portuguese Presidency conference Health Strategies in Europe, Lisbon, July 2007 (see paragraph 5.8.1)

2 On the basis of overall national death certificates, it is not possible to analyze mortality from cervical cancer in Europe, since 20-65% of deaths from uterine cancer in largest countries are still certified as uterus unspecified [19]. To estimate cervical

cancer mortality we used death rates for uterine cancers (ICD-10 C53-55) in women aged 20-44, since most deaths from uterine cancer below the age of 45 years arise from the cervix. Consequently, in these ages overall uterus cancer mortality is a proxy for cervical cancer mortality.

3 EUROCARE-4 survival data are not yet influenced by the actions performed by the UK cancer control plan dated September 2000.

4 In the first years after that a breast cancer organised screening programme becomes effective, the incidence increases as the screening anticipates the diagnosis of breast cancers which, without it, would have been detected later.

5 For this reason PSA diffusion should not be considered a cancer control priority before the possible international consensus achievement on the use of PSA test as a mass-screening method for prostate cancer

Reference list

1 Ferlay J, Autier P, Boniol M, et al. Estimates of the cancer incidence and mortality in Europe in 2006. Ann Oncol 18: 581–92. 2007

2 Boyle P, Veronesi U, Tubiana M, et al. European School of Oncology Advisory report to the European Commission for the "Europe Against Cancer Programme" European Code Against Cancer. Eur J Cancer 31A(9):1395-405. 1995

3 Boyle P, Autier P, Bartelink H, et al. European Code Against Cancer and scientific justification: third version (2003). Ann Oncol 14(7):973-1005. 2003

4 European Council (2003): Council recommendation of 2 December 2003 on cancer screening. http://eur- lex.europa.eu/LexUriServ/site/en/oj/2003/l_327/l_3272003 1216en00340038.pdf

5 http://ec.europa.eu/health/ph_programme/previous_programme_en.htm

6 Micheli A, Capocaccia R, Martinez C, et al. Cancer control in Europe: a proposed set of European cancer health indicators. Eur J Public Health 13(3 Suppl):116-8. 2003

7 http://www.tumori.net/eurochip

8 Ferlay J, Parkin DM, Pisani P: GLOBOCAN: Cancer Incidence and Mortality Worldwide. IARC CancerBase No. 3. Lyon: IARC press. 1998

9 Parkin DM, Bray F, Ferlay J, Pisani P. Estimating the world cancer burden: Globocan 2000. Int J Cancer 94(2):153-6. 2001

10 Ferlay J, Bray F, Pisani P, et al. GLOBOCAN 2002: Cancer Incidence, Mortality and Prevalence Worldwide. IARC CancerBase No. 5. version 2.0. Lyon: IARC press. 2004

11 Boyle P, Ferlay J. Cancer incidence and mortality in Europe, 2004. Ann Oncol 16(3): 481–8. 2005

12 Curado MP, Edwards B, Shin HR, et al. Cancer Incidence in Five Continents, Vol. IX. IARC Scientific Publications No. 160, Lyon: IARC. 2007

13 EUROCIM: The European Cancer Incidence and Mortality Database v 4.0. CD-ROM. European Network of Cancer Registries (ENCR)

14 Micheli A, Berrino F, Paci E, et al. Strategies for cancer control in Italy. Tumori. 2007 93(4):329-36. 2007

15 European Commission: Green Paper “Promoting healthy diets and physical activity: a European dimension for the prevention of overweight, obesity and chronic diseases” http://ec.europa.eu/health/ph_determinants/life_style/nutrition/documents/nutrition_gp_en.pdf

16 European Commission: Report on the contributions to the Green Paper “Promoting healthy diets and physical activity: a European dimension for the prevention of overweight, obesity and chronic diseases” http://ec.europa.eu/health/ph_determinants/life_style/nutrition/green_paper/nutrition_gp_rep_en.pdf

17 http://www.euro.who.int/features/2006/featurencd06/TopPage

18 http://www.governo.it/GovernoInforma/Dossier/salute_progetto/programmema.pdf

19 Levi F, Lucchini F, Negri E, et al. Cervical cancer mortality in young women in Europe: patterns and trends. Eur J Cancer 36(17):2266-71. 2000

20 http://www.who.int/whosis/en/
21 Berrino F, Sant M, Verdecchia A, et al. Survival of cancer patients in Europe: the EUROCARE study. IARC Scientific Publications No. 132. Lyon: IARC press. 1995
22 Berrino F, Capocaccia R, Estève J, et al. Survival of cancer patients in Europe: the EUROCARE-2 Study. IARC Scientific Publications No.151. Lyon: IARC press. 1999
23 Berrino F, Capocaccia R, Coleman MP, et al. Survival of cancer patients in Europe: the EUROCARE-3 study. Ann Oncol 14 (suppl 5): 1-155. 2003
24 Berrino F, De Angelis R, Sant M, et al. Survival for eight major cancers and all cancers combined for European adults diagnosed in 1995-99: results of the EUROCARE-4 study. Lancet Oncol. 8(9):773-83. 2007
25 Verdecchia A, Francisci S, Brenner H, et al. Recent cancer survival in Europe: a 2000-02 period analysis of EUROCARE-4 data. Lancet Oncol. 8(9):784-96. 2007
26 Micheli A, Mugno E, Krogh V, et al. Cancer prevalence in European registry areas. Ann Oncol. 3(6):840-65. 2002
27 De Angelis R, Grande E, Inghelmann R, et al. Cancer prevalence estimates in Italy from 1970 to 2010. Tumori 93(4):392-7. 2007
28 OECD HEALTH DATA 2004, 3rd edition, CD-ROM. OECD, Health Policy Unit, 2005, Paris
29 http://www.eu2007.min-saude.pt/NR/rdonlyres/1CB56F52-F663-4770-9FAA04E838E534CD/9323/MesaRedondacancer1.pdf

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6 Dementia

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1 Introduction

The term “dementia” is used to describe various kinds of brain disorders which all involve the progressive damage and death of brain cells. It is not actually a disease but rather a syndrome (a pattern of symptoms) which may be caused by an almost infinite number of cerebral and extracerebral diseases. Neuro-degenerative diseases and small vessel cerebro-vascular diseases account for most cases of dementia (Kurz, 2002). However, there are over 100 different kinds of dementia, such as Alzheimer’s disease, Pick’s disease, Creutzfeldt-Jakob disease and dementia with Lewy bodies to name but a few. In this report, we will use the term dementia unless referring to a specific form of dementia such as Alzheimer’s disease (which is the most common form) or vascular dementia etc. Information about rare forms of dementia can be found on the Alzheimer Europe website at: http://www.alzheimer-europe.org/?lm1=D76EBF7F6AEA.
A great deal of research is being carried out all over Europe into the mechanisms involved in the development of dementia, risk factors/protective factors and possible future treatments. At this moment in time, there is no curative treatment for dementia although there are a few drugs which treat the symptoms of the disease and temporarily slow down the rate of cognitive decline. Alzheimer associations in Europe are therefore keen to emphasise the importance of social support to people with dementia and their carers in addition to ensuring equal access to anti-dementia drugs for Alzheimer’s disease (AD) throughout Europe.

2 Health determinants/risk factors

Dementia is not a natural part of the ageing process but the likelihood of developing Alzheimer’s disease and many other forms of dementia does increase with age. Dementia rarely occurs in people under 60 years of age. It affects about one person in 20 over 65, one in five over 80 and one in three over 90. According to Alzheimer Scotland (2006), as dementia is more common in older people, delaying the onset of the disease by five years would halve the number of people with dementia. This is extremely important in the light of predicted increases in the number of elderly people in the next few decades.
Numerous studies have examined individual health determinants/risk factors. It is therefore not possible to provide full details of all existing information in this report. For this reason, we will refer to the findings of a review carried out by Weih, Wiltfang and Kornhuber (2007), from the Friedrich-Alexander Institute in Erlangen, Germany, of cohort studies and interventional studies on nutritional and life-style risk factors and primary prevention of Alzheimer’s disease. We will then briefly examine the results of a prospective analysis of risk factors carried out in Canada by Lindsay et al. (2002) involving 6,434 cognitively normal people between 1991 and 1996. According to Weih et al. (2007):

- Cumulative evidence suggests that an active, mentally challenging and social lifestyle might protect against cognitive decline and perhaps AD.
- Similarly, some studies have found that physical exercise may reduce the deficits associated with AD.
- It is unclear whether combined vitamin E and C protects against dementia.
- Low levels of folic acid have been found to double the risk of developing AD but interventional studies to determine whether the progression of mild cognitive impairment (MCI) can be reduced are still underway so this remains unclear.

- Total fat intake and dietary cholesterol was not found to affect risk. One study found that saturated or trans-unsaturated (hydrogenated) fat increased the risk of AD but this finding was not supported by the Rotterdam studies.*
- Fish intake, on the other hand, did have a protective factor (some studies have found that the type of fish eaten is important).
- A Mediterranean diet has been found to protect against AD. This is typically rich in vegetables, fruit, cereals and unsaturated fatty acids with a low intake of saturated fatty acids and moderate fish consumption.
- Most studies conclude that moderate alcohol consumption may protect against AD and that high alcohol consumption increases the risk.
- A high Body Mass Index in middle life is associated with an increased risk of developing AD in later years.
- Smoking has been found to be protective in some studies and a risk factor in others. Nevertheless, it does clearly play a role in the development of cardiovascular disease and stroke.

A prospective analysis of risk factors carried out in Canada by Lindsay et al. (2002), involving 6,434 cognitively normal people, who were followed up between 1991 and 1996, observed a reduced risk of AD associated with the use of non-steroidal anti-inflammatory drugs (35%), wine consumption (50%), coffee consumption and regular physical activity (31% each). For these risk factors, no modification of risk was found by age, sex or ApoE4 allele status. However, a different study carried out by Laurin et al. (2002) did find that regular physical activity was protective against cognitive impairment and Alzheimer's disease for women more so than men. Factors which were found to increase the risk of Alzheimer's disease were increasing age, few years of education and the ApoE4 allele. However, it is still unclear whether fewer years of education actually increases the risk or more years of education provide a kind of "brain reserve" which makes the symptoms less obvious with the result that the disease may go undetected for some time. Moreover, there may be confounding factors (e.g. diet, lifestyle etc.) which are linked to education.

Individual studies have reported gender differences linked to certain health determinants/risk factors. For example, Whitmer (2007) found that the increased risk of dementia associated with being overweight or obese was greater for women than for men. On the other hand, women who drank 3 or more cups of coffee per day were found to perform better on verbal and viso-spatial memory tasks than those who did not. This result was not observed in men. Whilst this beneficial effect did not affect the incidence of dementia, the researchers (Ritchie et al, 2007) do not rule out the possibility that it might prolong the period of mild cognitive decline in women already in the process of developing dementia.

Finally, an interesting study was carried out by Kivipelto et al (2006) which aimed to devise a simple technique to predict the risk of dementia in later life on the basis of risk factors which were present in middle age. The role of certain cardiovascular risk factors (e.g. hypertension, hypercholesterolaemia and obesity) in increasing the risk of dementia was highlighted but the researchers suggest that the technique would benefit from further validation and improvement.

With regard to the above-mentioned health determinants/risk factors, it is clear that there may be differences between Member States linked to different lifestyles. For example, in some countries the percentage of people who are obese, smoke, consume various amounts of alcohol or have a Mediterranean diet may differ. On the other hand, there are likely to be huge differences within countries. Nevertheless, we are unaware of any investigations regarding Member State differences in lifestyles and the incidence of dementia.

* A population-based prospective cohort study involving 7,983 people aged 55 or over between 1990 and 1999 in Ommoord, a suburb of Rotterdam (Hofman et al. 1991)

3 Prevalence and Incidence

A number of studies have been carried out in order to determine prevalence rates for dementia, generally for 5 year age groups and sometimes for men and women separately. However, the rates do not usually differentiate between different forms of dementia or different stages of the disease. Researchers who have attempted to define/calculate prevalence rates include the EURODEM group[*] (Hofman et al., 1991) and Ferri et al.[†] (2005) (on behalf of Alzheimer's Disease International).
EURODEM, which stands for the European Community Concerted Action on the Epidemiology and Prevention of Dementia, pooled data on the prevalence of moderate to severe dementia in several European countries and came up with a set of prevalence rates for men and women between 30 and 59 and in 5 year age groups up to the age of 99.
Ferri et al. (2005), on the other hand, used a DELPHI consensus method. Their work resulted in prevalence rates for men and women combined in 5 year age groups from 60 to 84 and for 85+. Their rates also differed depending on which region each country was classified as belonging to. The region "Euro A" covered countries in Western Europe, "Euro B" included countries in Eastern Europe with a low adult mortality rate and "Euro C", countries in Eastern Europe with a high adult mortality rate.

Using these prevalence rates and the population statistics from EUROSTAT, Alzheimer Europe calculated the estimated number of people with dementia in each country within Europe and in Iceland, Norway, Switzerland and Turkey (please see below).

[*] For more details about this study, please see: Hofman, A. et al. (1991), The prevalence of dementia in Europe: a collaborative study of 1980-1990 findings, International Journal of Epidemiology, Volume 20, No.3, pages 736-748.
[†] For more details about this study, please see: Ferri, CL, Prince, M et al. (2005), Global prevalence of dementia: a Delphi consensus study, The Lancet, Vol. 366, December 17/24/31, 2005

Table 1 The estimated number of people with dementia in Europe*

Country	Age group	Number of people with dementia (EURODEM)	As % of total population	Number of people with dementia (Ferri et al.)	As % of total population
Austria	30-94	104,428	1.27	94,441	1.15
Belgium	30-99	140,639	1.35	127,174	1.22
Bulgaria	30-99	87,797	1.13	76,556	0.99
Cyprus	30-99	6,725	0.9	6,054	0.81
Czech Republic	30-99	105,553	1.03	93,973	0.92
Denmark	30-99	68,430	1.26	62,318	1.15
Estonia (2004)	30-99	15,065	1.12	12,955	0.96
Finland	30-99	65,362	1.25	59,360	1.13
France	30-99	847,808	1.36	760,715	1.22
Germany	30-94	1,118,429	1.36	1,010,245	1.22
Greece	30-99	135,566	1.22	123,700	1.12
Hungary	30-89	100,567	1	88,070	0.87
Ireland	30-94	35,381	0.86	31,940	0.78
Italy	30-99	905,713	1.55	820,462	1.4
Latvia	30-99	25,969	1.13	22,509	0.98
Lithuania	30-99	35,298	1.03	30,169	0.88
Luxembourg	30-94	4,857	1.07	4,370	0.96
Malta	30-89	3,427	0.85	3,148	0.78
Netherlands	30-99	183,485	1.13	165,585	1.02
Poland	30-99	350,511	0.92	300,447	0.79
Portugal	30-94	129,916	1.23	119,308	1.13
Romania	30-99	200,893	0.93	172,130	0.79
Slovenia	30-99	21,788	1.09	19,302	0.97
Slovakia	30-99	44,813	0.83	38,232	0.71
Spain	30-99	583,208	1.36	533,388	1.24
Sweden	30-99	138,641	1.54	128,220	1.42
UK (2004)	30-89	660,573	1.11	621,717	1.04
EU27 TOTAL		**6,120,842**	**1.25**	**5,526,488**	**1.13**
Iceland	30-99	2,845	0.97	2,584	0.88
Norway	30-99	61,077	1.33	56,227	1.22
Switzerland	30-94	97,068	1.31	88,900	1.2
Turkey	30-74	129,715	0.18	78,546	0.11
other countries TOTAL		**290,705**		**226,257**	
GRAND TOTAL		**6,411,547**		**5,752,745**	

*The figures in this table are from 2005 unless stated otherwise

The calculations for the 27 member states of the European Union indicate an estimated 5,526,488 to 6,120,842 people with dementia (depending on which prevalence rates are used). This represents between 1.13 and 1.25 percent of the total population of the 27 member states.

The actual incidence of dementia per 1,000 was estimated by Ferri et al. (2005) as being 8.8 for Western Europe, 7.7 for Eastern Europe with low adult mortality rate and 8.1 for Eastern Europe with high adult mortality rate. In terms of the actual number of new dementia cases per year for 2001, Ferri et al. estimated 0.79 million, 0.21 million and 0.36 million for the three regions respectively. Estimates exist at national level too. For example, Matthews et al. (2005) estimate 163,000 new cases of dementia in England and Wales each year. However,

estimates vary considerably and whilst incidence seems to increase with age, actual estimates vary depending on which cases are included. Some exclude people with no diagnosis of dementia and some do not cover very mild dementia.

4 Morbidity

A Hospital discharge

The majority of people with dementia live at home either on their own or with relatives/friends. In the UK, it is estimated that approximately one third of people with dementia live on their own. Those in the later stages of the disease may eventually go into residential care. Hospital admission is usually avoided if at all possible to provide care in another way. The reason for this is that hospital stays can be very stressful for people with dementia and can have a detrimental effect on their dementia e.g. causing additional distress and disorientation (Department of Health, 2003).
Consequently, in most countries, people with dementia are not cared for in hospital. However, people with dementia may be admitted to hospital for observation, tests or other medical conditions or in the final stages of the disease. In an American study based on 21,251 patients over 60 years of age, who were discharged from a general hospital, only 3.9% had dementia (Constantine et al., 2000). According to this study, people with dementia are often admitted to hospital for different reasons than for people without dementia, namely urinary tract infections, drug psychoses, senile and presenile organic psychotic conditions and behavioural, functional or social complications of dementia. Dementia patients are rarely admitted to hospital primarily for their dementia. Therefore it is complicated to obtain reliable hospital discharge data for people with dementia. Alzheimer Europe is not aware of the availability of statistics on the number of people with dementia discharged from hospital in the different Member States of the European Union.

B Clinical management

Guidelines on the clinical management of dementia exist at European level in the form of the "Recommendations for the diagnosis and management of Alzheimer's disease and other disorders associated with dementia: EFNS guideline" (Waldemar et al., 2007). These guidelines were drawn up by the European Federation of Neurological Societies which described its aim as being "to present a peer-reviewed evidence-based statement for the guidance of practice for clinical neurologists, geriatricians, psychiatrists, and other specialist physicians responsible for the care of patients with dementia."
McShane and Kerr[*] who are in the process of identifying guidelines on the clinical management of dementia throughout Europe in the context of Alzheimer Europe's EuroCoDe project have so far identified guidelines in Estonia, Finland, France, Germany, Greece, Hungary, Italy, the Netherlands, Poland, Romania, Slovenia and the United Kingdom.

No guidelines were found in the Czech Republic, Ireland, Luxembourg or Malta. In Portugal, guidelines from the Italian and British associations of Psychopharmacology are used and the EFNS guidelines are being translated into Portuguese. Guidelines are being developed in Spain but they will not be ready until 2008. The EFNS guidelines are relatively new and information is not yet available on which countries will eventually use them.

[*] Rupert McShane is from the Cochrane Collaboration and Amanda Kerr is from the Nuffield Department of Clinical Medicine University of Oxford John Radcliffe Hospital Headington in the United Kingdom

C Treatment

In 2006, Alzheimer Europe carried out a survey into the availability of anti-dementia drugs in EU Member States. It also investigated restrictions governing the prescription and reimbursement of such drugs. The following table shows which drugs are authorised (A) and which are reimbursed (R) in each country.

Table 2 Authorisation (A) and reimbursement (R) of Alzheimer drugs

Country	Donepezil		Rivastigmine		Galantamine		Memantine	
	A	R	A	R	A	R	A	R
Austria	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Belgium	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bulgaria	Yes	No	Yes	No	Yes	No	Yes	No
Cyprus	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Czech Republic	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Denmark	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Estonia	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Finland	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
France	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Germany	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Greece	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hungary	Yes	Yes	Yes	Yes	No	No	Yes	Yes
Iceland	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ireland	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Italy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Latvia	Yes	No	Yes	No	Yes	No	Yes	No
Lithuania	Yes	Yes	No	No	Yes	No	Yes	Yes
Luxembourg	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Malta	Yes	No	Yes	No	Yes	No	Yes	No
Netherlands	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Norway	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Poland	Yes	Yes	Yes	Yes	Yes	No	Yes	No
Portugal	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Romania	Yes	Yes	Yes	Yes	No	No	Yes	Yes
Slovak Republic	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Slovenia	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Spain	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sweden	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Switzerland	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Turkey	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
United Kingdom	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No

Whilst the four drugs used in the treatment of Alzheimer's disease are available in most countries, each country has its own conditions governing prescription. The following table provides brief details of some of these conditions which incidentally result in some people with Alzheimer's disease not receiving the treatment they need at the time when they most need it.

Table 3 Conditions governing prescription

Country	Initial treatment decision	Continuing treatment decision	Special examinations required	Upper and lower MMSE scores (ACHI)[1]	Upper and lower MMSE scores (memantine)
Austria	Specialist doctors	Specialist doctors	MMSE	26-10	14-3
Belgium	Specialist doctors	Specialist doctors	Diagnostic protocol	>10	15-0
Bulgaria			No reimbursement		
Cyprus			No information		
Czech Republic	Specialist doctors	Specialist doctors	MMSE	20-13	16-6
Denmark	No restrictions[2]	No restrictions	Diagnostic protocol	None	None
Estonia			No information		
Finland	No[3] restrictions	No restrictions	None	None	None
France	Specialist doctors	No restrictions	None	26-10	15-0
Germany	No restrictions	No restrictions	None	None	None
Greece	Specialist doctors	No restrictions	None	None	None
Hungary	Specialist doctors	Specialist doctors	Diagnostic protocol	26-10	18-0
Iceland	No restrictions[4]	No restrictions	Diagnostic protocol	None	None
Ireland	No restrictions	No restrictions	None	None	None
Italy	Alzheimer Evaluation Unit	Alzheimer Evaluation Unit	Diagnostic protocol	26-10	N/A
Latvia			No information		
Lithuania			MMSE	None	20-0
Luxembourg	No restrictions	No restrictions	Diagnostic protocol	26-10	15-0
Malta			No reimbursement		
Netherlands	Specialist doctors	Specialist doctors	Diagnostic protocol	26-10	14-3
Norway	No restrictions[5]	No restrictions	MMSE	> 12	N/A
Poland	No restrictions	No restrictions	MMSE	26-10	N/A
Portugal	Specialist doctors	Specialist doctors	None	None	None
Romania	Psychiatrists and neurologists	Psychiatrists and neurologists	Diagnostic protocol	> 10	> 10
Slovak Republic	Specialist doctors	Specialist doctors	MMSE	24-13	24-13
Slovenia	Specialist doctors	No restrictions	MMSE	26-10[6]	26-10
Spain	Specialist doctors	Specialist doctors	MMSE	None	None
Sweden	No restrictions	No restrictions	None	None	None
Switzerland	No restrictions	No restrictions	MMSE	>10	>3
Turkey	Specialist doctors	No restrictions	None	None	None
United Kingdom	Specialist doctors	No restrictions[7]	MMSE	30-12	N/A

[1] Unless obtained from our member organisations, we included data for upper and lower MMSE scores (in both columns) from Oude Voshaar, R.C. et.al. (2006), Alarming arbitrariness in EU prescription and reimbursement criteria for anti-dementia drugs, International Journal of Geriatric Psychiatry, 21:29-31

[2] Although an application for reimbursement can be made by any doctor on behalf of a patient, the diagnosis must have been made by a specialist (neurologist, psychiatrist or geriatrician).

[3] Any doctor can prescribe anti-dementia drugs, but reimbursement can only be done if the diagnosis has been established by a specialist.

[4] Although prescriptions can be filled in by any doctor, the diagnosis needs to be confirmed by a specialist.

[5] Norway specifies that treatment decisions should be made by a doctor with an interest in and knowledge of dementia, but does not restrict treatment decisions to specialist doctors.

[6] For patients with MMSE scores higher than 26, more extensive neuropsychological examinations have to be carried out that indicate cognitive decline consistent with Alzheimer's disease.

[7] The NICE guidance in existence (September 2006) allows general practitioners to continue treatment under shared care protocols.

A few studies have investigated the number of people with Alzheimer's disease being treated and have revealed that there are important differences between European countries in this respect. A survey reported by Wilkinson amongst 200 carers in 6 different countries found that whilst the majority of doctors prescribed treatment at the time of diagnosis, this varied from 51% of cases in the United Kingdom to 86% of cases in Poland and Spain.

The kind of treatment provided also varies with the vast majority (98%) of people with dementia being offered prescription drugs, either specific Alzheimer treatments or medication to treat mood and behaviour (Wilkinson et al., 2005).
In 2007, Waldemar et al. calculated the number of people with Alzheimer's disease who receive treatment using data obtained from International Marketing Services on the sales of donepezil, galantamine, rivastigmine and memantine and the estimated number of people with Alzheimer's disease (as calculated by Alzheimer Europe using EURODEM prevalence rates and EUROSTAT population statistics). The percentage of people with dementia (diagnosed or undiagnosed) receiving treatment varied considerably from one country to another and Waldemar et al. (2007) found ranges from 97% of people treated in Greece to 3% in Hungary. Generally, the treatment rates were lower in Eastern European countries with only 6% of people treated in Bulgaria, 9% in the Czech Republic and 16% in Poland. Most Western European countries in comparison had much higher treatment rates ranging from 26% in Ireland to 50% in France.

D Survival

We are not aware of the existence of survival rates for dementia in different Member States of the European Union. The same problem exists as for monitoring mortality (please see section 5) in that people with dementia are not always diagnosed and dementia is not always recorded on the death certificate. Survival rates vary considerably depending on the individual and the type of dementia. A project, carried out by relevant experts on behalf of Alzheimer Europe[*], on rare forms of dementia, estimated survival rates for certain forms of dementia. Examples include:

- Familial Alzheimer's disease, from 4 to16 years
- Dementia with Lewy Bodies, from 5 to 7 years
- Sporadic CJD, usually six months, rarely several years
- Pick's disease, an average of 6.3 years for men and 8.4 year for women.

E Disability

As the disease progresses, people with dementia are disabled by cognitive and physical impairments e.g. linked to communication, reasoning, memory, interpretation of information received by the senses, lack of coordination and disorientation, as well as the ability to get dressed, wash and understand what objects are and how they are used. They gradually lose the ability to lead an autonomous life and in the case of severe dementia, become totally dependent on others.
However, when it comes to providing support and services to people with dementia and carers in Europe, the criteria for eligibility are not always based on disability but may be dependent on an assessment of needs, old age, living alone and/or having limited financial resources. But even when support is based on disability, there may be negative consequences for people with dementia. Alzheimer Europe recently carried out a survey into the level of social support in Europe and this survey revealed some information about access to such support and disability (Alzheimer Europe, 2007). In Romania and Latvia, access to certain services/social support is limited to people with Alzheimer's disease who have been officially recognised as being severely disabled but in Romania, the eligibility criteria are not suited to Alzheimer's disease. There are a lot of conditions to be fulfilled so it is difficult for people with dementia to obtain this official recognition and hence access the services they need. In Hungary, people with dementia are not regarded as disabled and therefore not entitled to the benefits provided to disabled people. Austria, on the other hand, pays a care allowance for people with varying degrees of disability and this includes people with dementia. In Germany and Luxembourg, there are long-term care insurances, based on an assessment of needs but in Germany, a substantial need for care must be proven for at least

[*] For further details, please see: http://www.alzheimer-europe.org/index.php?lm1=D76EBF7F6AEA

personal hygiene, eating and preparing food, mobility and housekeeping. According to Freter (2007), this is somewhat biased towards physical disability and does not correspond to the special needs of people with Alzheimer's disease i.e. supervision, motivation, and guidance/support. Since 2002, extra supervision has been available to people with cognitive impairments but this is not an eligibility criterion for access to services.
Clearly, people with Alzheimer's disease and other forms of dementia do have disabilities and it is essential that governments recognise this and ensure that they are not prevented from receiving appropriate services on the basis of discriminatory eligibility criteria and that the services provided respond to the real needs of people with dementia (rather than to the elderly in general or to people mainly with physical disabilities).

5 Mortality

The cause of death differs from one person with dementia to the next because each person is different, the disease process is different and there may be co-existing conditions such as diabetes, cancer or cardiovascular disease. Cox and Cook (2007) identify three distinct groups of people who have dementia at the time of death. These are:

- People who reach the end of life but die from some other identifiable condition, such as cancer, before reaching the final stage of dementia.
- People who reach the end of life with a complex mix of mental and physical problems but where the effect on brain functioning is not as advanced.
- People who reach the end of life and die of the complications of dementia, such as end stage dementia.

However, dementia is rarely recorded as the cause of death and autopsies are not routinely carried out in elderly people with probable dementia. Bronchopneumonia is commonly recorded as the immediate cause of death, sometimes with dementia indicated as a secondary illness (Burns et al., 1990 in De Vries, 2006). A more recent UK study found that dementia was mentioned on 73% of death certificates of people who had had dementia (Keene et al., 2001). In some countries, dementia is not accepted as a primary cause of death on death certificates. Failure to diagnose dementia and failure to report dementia as the primary cause of death obscures the real consequences of dementia on the health of EU citizens. There is a need to ensure that dementia can be recorded as the primary cause of death and that people with dementia are properly diagnosed. Until this happens, it is not possible to provide statistics on mortality for people with dementia in each member state.

6 The EUROCODE project

Alzheimer Europe and experts from the relevant fields are currently working on a 3-year EC-funded project called "EuroCoDe- European Collaboration on Dementia", which covers a number of important issues such as the socio-economic cost of dementia, the prevalence of dementia, preventing or delaying the onset of dementia, psychosocial interventions and social support to people with dementia and carers. The results of this work will be available at the end of 2008 and would fill in some of the gaps in existing knowledge raised in this chapter. Alzheimer Europe is currently developing a database which will contain the results of the EuroCoDe study and which will enable the experts involved in the study to update their findings regularly, even after the official end of the project.
Alzheimer Europe has also set up a working group on palliative care and is currently drafting recommendations for policy makers. Reports produced by the European Association for Palliative Care[*] and Alzheimer Europe's own ongoing survey into the availability of palliative

[*] For details, please see: http://www.eapcnet.org/Policy/CountriesReport.htm

care for people with dementia reveal serious shortages in the availability of palliative care, either at home or in palliative care centres.

7 Conclusion

There are over 6.1 million people with dementia in Europe and the number of cases is predicted to double every 20 years. Whilst dementia accounts for a large proportion of deaths in Europe, reliable information is lacking on survival, mortality and even incidence due to the insufficient diagnoses and failure to record dementia as the cause of death. Alzheimer Europe therefore emphasises the importance for Member States to implement the EFNS guidelines on the diagnosis and management of Alzheimer's disease and other disorders associated with dementia. Finally, the very specific nature of dementia is not always recognised by policy makers with the result that in some countries people with dementia and their carers are denied access to adequate services and support, and that even when provided, services and support are not always suited to their specific needs.

Reference list

Alzheimer Europe (2007), *Dementia in Europe Yearbook 2007*, Alzheimer Europe

Alzheimer Scotland (2006), *Good for you - good for your brain: the evidence on risk reduction and dementia*, Alzheimer Scotland

Burns, A., Jacoby, R., Luthert, P. and Levy, R. (1990), Causes of death in Alzheimer's disease, Age and Ageing, 19, 341-4. In De Vries, K. (2003), *Palliative care for people with dementia*.

Constantine, G. et al. (2000), Dementia in Elderly Persons in a General Hospital, *Am J Psychiatry*, 157:704-707

Cox, S. and Cook, A. (2007), Caring for people with dementia at the end of life. In *Palliative care for older people in care homes*, Hockley, J. and Clark, D., McGraw-Hill Higher Education Table II – Heterosexual intercourse, age and use of method to avoid pregnancy

Department of Health (2003), Discharge from hospital – getting it right for people with dementia, http://www.changeagentteam.org.uk/_library/docs/MentalHealthInOlderPeople/checklist_dementia.pdf

Freter, H.-J. (2007), Response questionnaire on social support in Germany, Alzheimer Europe

Ferri, CL, Prince, M et al. (2005), Global prevalence of dementia: a Delphi consensus study, The Lancet, Vol. 366, December 17/24/31, 2005

Hofman, A. et al. (1991), The prevalence of dementia in Europe: a collaborative study of 1980-1990 findings, *International Journal of Epidemiology*, Volume 20, No.3, pages 736-748.

Hofman A, et al. (1991), Determinants of disease and disability in the elderly: The Rotterdam Study, *European Journal of Epidemiology*, 7, 403-22

Keene, J., Hope, T., Fairburn, C.G. and Jacoby, R. (2001), Death and dementia**,** *International Journal of Geriatric Psychiatry*, Volume 16, Issue 10, 969-974

Manthorpe, J. and Price, E. (2003), Out of the shadows, *Community Care*, Apr. 3, 2003

Kivipelto, M, Ngandu, T, Laatikainen, T, Winblad, B, Soininen, H and Tuomilehto, J (2006), Risk score for the prediction of dementia risk in 20 years among middle aged people: a longitudinal, population based study, *Lancet Neurol* 2006, 5:735-41 (online)

Kurz, A. (2002), Dementia: definition and concept, Alzheimer Europe website (http://www.alzheimer-europe.org/?content=showarticle&lm3=55F3C34B39CB)

Lindsay, J, Laurin, D, Verreault, R, Hébert, R, Helliwell,B, Hill, G and McDowell, I (2002), Risk Factors for Alzheimer's Disease: A prospective analysis from the Canadian Study of Health and Aging, *American Journal of Epidemiology*, Volume 156, No 5:445-453

Matthews, F et al. (2005), The incidence of dementia in England and Wales; Findings from the five identical sites of the MRC CFA Study. *PLoS Medicine*, Vol. 2,, Issue 8, e193, 1-11

Oude Voshaar, R.C. et.al. (2006), Alarming arbitrariness in EU prescription and reimbursement criteria for anti-dementia drugs, International Journal of Geriatric Psychiatry, 21:29-31

Ritchie et al. (2007) reported in: Fondation Ipsen (2007), Le café neuroprotecteur, Alzheimer Actualités – Septembre-Octobre 2007 – N°194

Waldemar, G , Dubois, B, Emre, J, Georges, J. et al. (2007), Recommendations for the diagnosis and management of Alzheimer's disease and other disorders associated with dementia: EFNS guideline, *European Journal of Neurology*, 14:e1-e26

Waldemar, G. , Phung, KTT, Burns, A., Georges, J. et al. (2007), Access to diagnostic evaluation and treatment for dementia in Europe, Volume 22, Issue 1, 47-54

Weih, M, Wiltfang, J and Kornhuber, J (2007), Non-pharmacologic prevention of Alzheimer's disease: nutritional and life-style risk factors, *Journal of Neural Transmission*, 114: 1187-1197

Wilkinson, D. et al. (2005), Inequalities in dementia care across Europe: An Agenda for Change, *International Journal of Clinical Practice*, March 2005, 59 (Suppl. 146), 17-24

7 Depression

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1 Introduction

Mood disorders were described as one of the most common diseases in the world but it's only recently that they have been considered of major public health concern. Previous European community-based epidemiologic studies showed a prevalence of mood disorders of 8,56% (Ayuso-Mateos, 2001) and a 6-month prevalence of 17% (Lepine JP, 1997). A number of observations suggest that prevalence rates of these disorders are changing with an increase in younger age groups .

Mood disorders include a group of psychiatric syndromes with a variable course and an inconsistent response to treatment. The most common of them is major depressive disorder, characterized by a distinct change of mood, with sadness or irritability, a loss of the ability to experience pleasure and accompanied by several psychophysiological changes, such as disturbances in sleep or appetite, slowing of speech and action. These changes must last at least 2 weeks and interfere considerably with the ability to develop daily life activities. Another frequent disorder is dysthymia, characterized by long–term (two years or longer) course but less severe symptoms. Other forms of depression exhibit slightly different characteristics, however not all scientists agree on how to characterize and define them.

Despite the availability of effective treatments, episodes of major depression can often become chronic or recurrent and lead to substantial and persistent impairments in a person's habitual functioning. Comorbidity with chronic physical conditions is also known to be very high, entailing an additional impact on role impairment, treatment costs and adherence. According to the World Health Organization, major depression is the leading cause of disability as measured by YLDs and was the 4th leading contributor to the global burden of disease (DALYs) in 2000. By the year 2020, it is forecasted to reach 2nd place in the ranking of DALYs calcuated for all ages and both sexes.

On the other hand deaths as a result of suicide or self-inflicted injuries account for 1.5% of total deaths and ranked within the leading two causes of death among 15–34-year-old people in Europe (Murray and Lopez, 1996). Mental disorders are known to be related to 90% of these deaths, especially mood disorders which accounts for nearly 45% of suicides (Arsenault-Lapierre G, 2004). In the last 45 years suicide rates have increased by 60% worldwide and the highest risk group has changed from elderly males to young people in one third of the countries. The problem may even be more serious, as suicide is sometimes concealed in many societies and may be underreported (Phillips and Ruth, 1993). Nevertheless, completed suicide is only the top of the iceberg of the broader phenomenon of suicidality: individuals may, under certain circumstances, have suicidal ideations; some of them may commit suicidal acts but eventually only some of them complete the suicide.

Mood disorders and suicidality can be properly diagnosed in primary care, but up to 30-50% of depressed patients are not properly diagnosed in this setting (Pignone MP, 2002). There are still many barriers to effective care including the lack of training of health professionals, barriers in the access to health care or the social stigma associated with these disorders.

The ESEMeD project was one of the first community-based epidemiologic studies of mental disorders developed in 6 European countries. In this chapter we will present the main epidemiologic results related to the two mood disorders included in the project: major depressive disorder and dysthymia.

2 The ESEMeD Project

2.1 Scope

The European study of the Epidemiology of Mental Disorders (ESEMeD) was among the first general population surveys to collect relevant information on the epidemiology of mental

disorders in several European countries. Data on the prevalence, risk factors, disability, health-related quality of life, use of treatment and health care services asociated with mood disorders (major depression, dysthymia), anxiety disorders (generalized anxiety disorder, social and specific phobias, post-traumatic stress disorder, agoraphobia and panic disorder) and substance abuse disorders (alcohol abuse and dependence) were gathered and analyzed in a joint collaboration between European investigators and the World Health Organization (WHO). The project received funding from both public and private bodies, although the scientific independence was guaranteed. Data collection was completed in August 2003.

2.2 Methods

The study was a cross-sectional, general population, household survey in which a representative sample of adults from 6 European countries (Belgium, France, Germany, Italy, the Netherlands, and Spain) underwent a face to face computer-assisted personal interview conducted by a trained lay interviewer. The overall response rate of the study was 61.2%. (Table 2.1) Detailed information about the methodology of the study is available elsewhere (Alonso et al., 2004)

Table 2.1 The ESEMED Project study sample*

Country	Participating Sample (N)	Response Rate (%)
Belgium	2,419	50,6
France	2,894	45,9
Germany	3,555	57,8
Italy	4,712	71,3
The Netherlands	2,372	56,4
Spain	5,473	78,6
Overall	**21,425**	**61,2**

* Reprinted from Acta Psychiatrica Scandinavica, vol. 109 (Suppl. 420), the ESEMeD/MHEDEA 2000 investigators, Sampling and methods of the European Study of the Epidemiology of Mental Disorders (ESEMeD) Project, page 8-20, copyright 2004, with permission from Wiley-Blackwell Publishing Ltd.

Sampling methods

A stratified multi-stage random sample without replacement was drawn in each country. The sampling frame and the number of sampling stages used to obtain the final sample differed across countries. Target population was represented by noninstitutionalized adults (aged 18 years or older) identified from a national household list or a list of residents in each country. This list was obtained from either the census, local postal registries or, in the case of France, telephone lists (Alonso et al, 2004)..

The survey interview

The survey instrument used in the ESEMeD project was the World Mental Health Survey version of the WHO Composite International Diagnostic Interview (WMH-CIDI, now CIDI 3.0) (Kessler RC, 2004), a fully structured diagnostic interview to assess disorders and treatment. The WMH-CIDI included questions on presence, persistence and intensity of clusters of psychiatric symptoms followed by probes for age of onset and lifetime course, toghether with validated assessment tools to measure disease severity, disability and health-related quality of life, and additional batteries of questions regarding health care utilization, use of medication and risk factors.

Internal subsampling was used to reduce respondent burden by dividing the interview into 2 parts: part 1 included core diagnostic assessment while part 2 consisted of information about

correlates and disorders of secondary interest. All respondents completed part 1. The individuals who presented a number if symptoms of specific mood and anxiety disorders and a random 25% of those who did not were administered in part 2. Lifetime and 12-month mental disorders diagnoses according to the International Classification of Diseases (ICD-10) (World Health Organization, 1993) and the Diagnostic and Statistical Manual for Mental Disorders (DSM-IV) (American Psychiatric Association, 1994) were obtained by means of computerized algorithms. For this report, disorders were assessed using the definitions and criteria of the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV). CIDI organic exclusion rules were imposed in establishing the diagnosis.
The questionnaire was first produced in English and underwent a rigorous process of adaptation in order to obtain conceptually and cross-culturally comparable versions in each of the target countries and languages.

Survey procedures and data control
The project incorporated several methodological features designed to maximize data quality. Questions were administered by trained lay interviewers using a computer-assisted personal interview (CAPI) that was programmed centrally. All interviewers had received the same training and were expected to adhere to the same protocol regarding contacts and interview administration. In addition, a pretest phase was carried out in each country participating in the project. Quality control protocols, described in more detail elsewhere (Alonso et al, 2004) were standardized across countries to check interviewer accuracy and to specify data cleaning and coding procedures. Once completed, the interviews were sent to the central project data center in Barcelona, (Spain) for checking and storage. Eligible individuals were asked for their informed consent to participate in a face-to-face interview.

Data weighting and analysis
Data were weighted to account for the different probabilities of selection as well as to restore age and gender distribution of the population within each country and the relative dimension of the population across countries.

All the analyses were performed using SASTM software, version 8 of the SAS System for Windows and SUDAAN software version 9.01, a statistical package used to estimate standard errors of data obtained from complex design surveys. Three data analysis centres were involved in the project: IMIM-Hospital del Mar (Barcelona, Spain), GlaxoSmithKline (GSK- Philadelphia, USA; London, UK) and Harvard University (Boston, USA).

3 Frequency of Mood Disorders

3.1 Prevalence

Between 9.9 and 21.0% (with a weighted mean of 14,7%) (Kessler, 2007) of the general adult (18+) population of Belgium, the Netherlands, Germany, France, Spain, and Italy reported a lifetime history of any mood disorder (Alonso et al., 2004; Demyttenaere et al., 2004; Alonso et al., 2007). This implies that approximately 9 million adults in these countries have met criteria for a mood disorder. Within the 12 months preceding the interview, 4.5% ofrespondents met the criteria for any mood disorder. Among the mood disorders, major depressive episode (MDE) was more common than dysthymia, in both a lifetime (13.4 and 4.4 %, respectively) and a 12-month perspective (4.1 and 1.2%, respectively) (Alonso et al., 2004) (Table 3.1). Projected lifetime risks (i.e. the estimated prevalence of mood disorders at age 75) were between 6 and 11% higher than estimated lifetime prevalence rates. This implies that the lifetime risks of mood disorders in six European countries ranges between 16.2 and 30.5% (Kessler et al., 2007). The median age of onset of Major Depressive

Disorder is late 30s, in most countries it ranged between 35 and 43 years of age (inter-quartile range= 36-38).

Table 3.1 Prevalence estimates of mental disorders in Spain. ESEMeD project (weighted proportions and CI)

	Lifetime total (% , 95% ci)	Lifetime Male (% , 95% ci)	LifetimeFemale (% , 95% ci)	Lifetime 12 month total (% , 95% ci)	Lifetime 12 month male (% , 95% ci)	Lifetime 12 month female (% , 95% ci)
Any Mood Disorder	14.7 (13.9- 15.5)	10.1 (9.2- 11.0)	19.0 (17.8- 20.2)	4.5 (4.1- 4.9)	3.1 (2.6- 3.6)	5.9 (5.3- 6.5)
Major Depression	13.4 (12.7- 14.1)	9.4 (8.5- 10.3)	17.1 (16.0- 18.2)	4.1 (3.7- 4.5)	2.8 (2.3- 3.3)	5.3 (4.7- 5.9)
Dysthymia	4.4 (4.0- 4.8)	2.9 (2.4- 3.4)	5.8 (5.2- 6.4)	1.2 (1.0- 1.4)	0.9 (0.6- 1.2)	1.5 (1.2- 1.8)

Table 3.2 Associations between 12-Month Mental Disorders in the General Population of European Countries in the ESEMeD*

.	Major depression OR (95% CI)	Dysthymia OR (95% CI)
Dysthymia	53.0 (36.1, 77.8)	
GAD	37.1 (23.2, 59.1)	18.1 (10.4, 31.6)
Social Phobia	7.8 (5.0, 12.0)	3.7 (1.8, 7.5)
Specific Phobia	5.5 (4.2, 7.3)	4.7 (2.9, 7.4)
PTSD	14.5 (9.6, 21.7)	14.2 (8.0, 25.0)
Agoraphobia	15.5 (8.0, 30.0)	20.8 (9.6, 45.4)
Panic Disorder	29.8 (19.0, 46.6)	8.8 (4.6, 16.7)
Alcohol Abuse	3.4 (1.3, 8.7)	4.0 (0.7, 23.5)
Alcohol Dependence	9.8 (2.7, 35.8)	2.9 (0.6, 13.8)

* Reprinted from Acta Psychiatrica Scandinavica, vol. 109 (Suppl. 420), the ESEMeD/MHEDEA 2000 investigators, 12-month comorbidity patterns and associated factors in Europe: results from the European Study of the Epidemiology of Mental Disorders (ESEMeD) project, page 28-37, copyright 2004, with permission from Wiley-Blackwell Publishing Ltd.

3.2 Comorbidity

Both major depressive episode and dysthymia were to a large extent comorbid with other mental disorders in ESEMED. About 44% of respondents meeting criteria for a mood disorderalso met the criteria for a other mental disorder, especially anxiety disorders (approximately 40%). The comorbidity between mood disorders and alcohol disorders was much less common. Among respondents with a mood disorder (4.5%), 3% also met criteria for an alcohol disorder. People who met criteria for a 12-month major depressive episode were approximately 30 times more likely to meet the criteria for generalized anxiety or panic disorders, about 15 times more likely to have comorbid agoraphobia, or about 15 times more likely to have comorbid post traumatic stress disorders. Similar but weaker associations were found between dysthymia and the latter anxiety disorders (Alonso et al., 2004; Alonso et al, 2007) (Table 3.2).

3.3 Determinants of Risk

Women were almost twice as likely to have had mood disorders within the past 12 months. Moreover, the highest rates of mood disorders were found in the youngest age groups (18–24 years old), and showed a consistently significant decline with age. Compared to the oldest cohort (i.e. persons born before 1938), younger cohorts (roughly corresponding to persons born after 1970) also had systematic higher likelihood (i.e. between a six and eleven-times) to have mood disorders.

Affective disorders were also more common among divorced or single persons (with a respectively 90 and 54% increase). Both major depression and dysthymia were found to be systematically more common among those with chronic physical conditions, such as back or neck pain (Demyttenaere et al., 2006) or multiple pains (Gureye et al., 2007). People with chronic pain were up to 2.6 and 4.2 times more likely to also meet criteria of a major depressive episode or dysthymia, respectively. This is also the case, although to a lesser extent, for chronic physical disorders, such as asthma (Scott et al., 2007) or heart diseases (Ormel et al., 2007).

3.4 Life Expectancy Free of Mood Disorders

Life expectancy free of mood disorders measures the number of remaining years to be lived at a particular age against the background of the current mortality level of the country (Robine et al., 2003).
Life expectancy at age 25 was between 47.5 and 49.2 years for men and between 56.5 and 58.7 years for women. At the age of 25, men experienced between 1.4 and 3.1 years with major depression whereas for women this ranged between 3.1 and 7.1 years. As for dysthymia, men lived only between 0.2 and 1.1 years with this disorder whereas for women this ranged between 0.5 and 1.3 years. At age 25, for both major depression and dysthymia, the number of years individuals lived with these disorders tended to be higher in Belgium, the Netherlands, and France. At the age of 55, life expectancy for men ranged between 19.8 and 21.0 years, while it ranged from 28.4 to 30.2 years for women. If we look at the impact of mood disorders at the age of 55, men lived between 0.4 and 0.9 years and women between 1.0 and 2.8 years with major depression. For dysthymia, men experienced only between 0.1 and 0.4 years with this disorder whereas for women this ranged from 0.2 to 0.7 years. At age 55, there were no striking country differences with regard to the number of years lived with either a major depression or dysthymia. In conclusion, mood disorders (and especially major depression) have a significant impact on the life expectancy of individuals. In particular, women spend a greater proportion of their remaining life with mood disorders than men (15 to 20% versus 8 and 10%, respectively), with only little variation in age.

4 Burden of mood disorders

4.1 Dysfunction and Health-Related Quality of Life

Mood disorders were consistently associated with substantial functional impairment as assessed by means of the ‘work loss day’ questions of the WHO Disablement Assessment Scale version 2 (WHODAS-II; Rehm J, 1999). Indeed these disorders were more disabilitating than some chronic physical conditions. Resulting ‘work loss day’ scores (WLD) for mood disorders ranged from 24 for major depression to 27 for dystymia, compared to e.g 18 for heart diseases or 12 for diabetes. Only neurological problems showed a higher WLD mean index 31 when compared to mood disorders (Table 4.1) (ESEMeD/MHEDEA2000 investigators, 2004)

Table 4.1 Mean scores of work loss days (WLDs), SF-12 MCS (Mental Component Score) and PCS (Physical Component Score) according to specific 12 month mental disorders and chronic diseases.

CHRONIC DESEASE	WORK LOSS DAYS INDEX		PCS-12		MCS-12	
-	Mean	95% C.I.	Mean	95% C.I.	Mean	95% C.I.
No disorder	3.16	(2.06 , 4.26)	53.04	(52.69 , 53.38)	55.04	(54.68 , 55.39)
No 12month mental disorder	7.05	(6.02 , 8.08)	49.65	(49.35 , 49.96)	54.43	(54.19 , 54.67)
ANY MOOD 12 month	22.96	(19.50 , 26.42)	45.77	(44.82 , 46.72)	40.57	(39.61 , 41.52)
12 MONTH DEPRESSION	23.66	(19.90 , 27.41)	45.98	(44.99 , 46.97)	40.62	(39.62 , 41.62)
12 MONTH DYSTIMIA	26.58	(18.90 , 34.25)	42.52	(40.54 , 44.50)	37.30	(35.56 , 39.04)
ARTHRITIS/RHEUMATISM	14.93	(12.40 , 17.45)	43.61	(42.87 , 44.35)	52.71	(52.13 , 53.30)
HEART DISEASE	17.92	(12.61 , 23.23)	40.45	(38.98 , 41.93)	52.80	(51.60 , 53.99)
LUNG DISEASE	13.77	(10.73 , 16.82)	45.12	(43.96 , 46.29)	52.59	(51.51 , 53.67)
DIABETES	12.45	(7.98 , 16.91)	43.62	(42.15 , 45.10)	53.93	(52.77 , 55.09)
NEUROLOGICAL PROBLEM	30.92	(11.81 , 50.04)	35.02	(31.55 , 38.49)	51.19	(48.27 , 54.12)

Analysis of the quality of life data as measured by the SF-12 (Ware JE, 1996) showed a substantial decrease in those with depression. The mean mental component summary score of the SF-12 (MCS-12) illustrated a marked reduction of mental quality of life in participants with mood disorders (40,57) compared with individuals with no 12-months mental disorders (54,43). In fact the impact on mental quality of life exceeded that associated with physical conditions such as heart diseases (52,8) or diabetes (53,93). The opposite was observed when the mean physical component summary scores of the SF-12 (PCS-12) were examined. Although physical quality of life was also impaired in participants with mood disorders (45,77), the impact of heart diseases (40,45) and diabetes (43,62) on this measure was greater (ESEMeD/MHEDEA 2000 investigators, 2004). (Table 4.1)

When adjusted for age/gender and comorbidity, dystymia and major depressive disorder were found to be the mental disorders with the highest impact across all disability and quality of life measures together with some anxiety disorders. The highest levels of disability and impairment were seen in individuals meeting criteria for comorbidity disorders, with levels of impairment increasing in line with the number of comorbid conditions.
(ESEMeD/MHEDEA2000 investigators, 2004)
Overall, the impact of depression on disability and quality of life seemed at least similar or even stronger than the impact of common chronic physical disorders. Although the most disabling disorder was found to be of neurological nature, it's important to note that its prevalence (0.9%) was substantially lower than depression in ESEMeD countries.

4.2 Stigma

ESEMeD analysis of stigma was conducted for mood and anxiety disorders and alcohol abuse/dependence.
Health-related stigma, considered as emotional reactions and discrimination experiences due to health problems, and assessed through questions included in the WHODAS-II, showed to be common among individuals with mental disorders and significant disability experiences. It was found to be more frequent among people with less education, those married or living with a companion, and those unemployed or laid off due to disability. On the other hand,

stigma showed a significant association with physical quality of life as reflected in the SF-12 physical component summary score, but not with the mental component. It was also significantly associated with a higher proportion of limitation in work and social life, compared to individuals with bad outcomes of mental health but without stigma. Although there was some variation in the prevalence of stigma among countries, overall differences were not statistically significant.

5 Use of Services among those with Mood Disorders

5.1 Use of Services

All ESEMeD participants were asked to delineate lifetime use of any service as a result of their 'emotions or mental health problems'. Individuals reporting use of services were then asked to select whom they had seen from a list of formal healthcare providers (i.e., psychiatrists, psychologists – a category also called 'non-medical mental health providers' which included psychotherapists, social workers and counsellors -, nurses, general practitioners, and other medical doctors) and of informal providers (i.e., religious advisors and other healers). Delay in consulting a doctor and age at first consultation were also asked.

5.1.1 Lifetime consultation rates for mental health problems

A consistent pattern of literature consultation was found between countries for the different mental disorders (Table 5.1), with the highest lifetime rates for individuals with comorbid mood and anxiety disorders, followed by those with mood disorders. Considering consultation rates for mood disorders alone, striking differences were found between countries. Participants from the Netherlands were twice as likely to have sought professional help for their emotional disorder than their Italian counterparts (71.0 % versus 37.0 %; p<.001).

Multiple logistic regression analyses showed that suffering from a mood disorder was the strongest predictor for use of mental health care [OR 7.77 (6.65-9.08)] while comorbidity with anxiety disorders further increased the likelihood of its use[OR 8.5 (6.99-10.33)]. Women, divorcees, people with higher educational level, and those living in urban areas were more likely to go for a consultation. Respondents in the youngest cohorts (18-24 years) and in the oldest ones (≥ 65 years) were around 50 percent less likely to seek professional help than the rest. A lower level of consultation in Italy and Spain, compared to France, Germany and the Netherlands was also found.

The proportions of lifetime cases with mood disorders who had made treatment contact within the year of disorder onset ranged from 28.8% in Italy to 52.1% in the Netherlands (IQR 16.0- 42.7%). The proportion of individuals with mood disorders making treatment contact within 50 years ranged from 63.5 in Italy to 98.6% in France (IQR 56.8-96.4%). Among individuals with mood disorders who made treatment contact, the median duration of delay was shortest in Belgium, the Netherlands, and Spain and longer in France. These delays were generally shorter for mood than for anxiety disorders.

Table 5.1 Lifetime rate of consultation for "emotions or mental health problems" according to lifetime mental health status*

Lifetime rate of consultation for "emotions or mental health problems" according to lifetime mental health status

Mental health status	N[a]	Belgium %	Belgium 95% CI	France %	France 95% CI	Germany %	Germany 95% CI	Italy %	Italy 95% CI	Netherlands %	Netherlands 95% CI	Spain %	Spain 95% CI	p[b]
Overall sample	8,796	23.4	19.5–27.8	27.8	24.8–31.1	22.3	19.7–25.1	9.7	8.4–11.2	29.9	26.2–33.8	15.4	13.5–17.5	<.001
No disorder	6,516	13.5	9.8–18.4	16.8	13.1–21.2	14.4	11.7–17.6	4.8	3.6–6.4	17.2	13.2–22.0	8.2	6.2–10.8	<.001
Any disorder	2,280	47.8	40.8–55.0	45.5	40.7–50.3	46.3	40.6–52.0	31.4	27.4–35.7	57.9	52.0–63.7	44.1	38.5–49.8	<.001
Any mood disorder	1,292	62.4	56.4–67.9	58.3	53.6–62.9	62.3	56.6–67.7	37.0	32.6–41.7	71.0	64.6–76.5	60.4	55.4–65.1	<.001
Any anxiety disorder	1,286	50.3	41.1–59.6	46.8	39.8–53.8	48.3	40.6–56.0	33.1	27.4–39.3	63.6	55.2–71.3	44.3	36.2–52.7	.001
Any mood and anxiety disorder	544	68.3	56.3–78.3	67.5	60.5–73.8	70.8	62.3–78.1	45.0	37.6–52.6	78.9	70.7–85.3	67.5	60.2–74.1	<.001
Alcohol use disorder	432	35.1	23.0–49.5	30.8	20.4–43.6	40.3	28.6–53.3	16.5	7.7–32.1	45.9	33.7–58.7	16.1	8.6–28.1	.020

[a] Weighted
[b] Differences between countries

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5.1.2 Consulting a mental health specialist versus a general practitioner (GP)

Multiple logistic regression analyses showed that adults with mood disorders were more likely to consult a mental health specialist rather than to a general practitioner [OR 1.53 (1.16-2.01)]. This likelihood was even greater for individuals with comorbid anxiety disorders [OR 1.97 (1.46-2.65)]. Singles were also more likely to consult a mental health professional. On the other hand older individuals (≥ 65 years old) and those with a lower educational level were around 50 percent less likely to seek for mental health professional help than for GP's advice alone. Out of the six countries, adults from Belgium and France were less likely to consult a mental health specialist. This can be related to the high density of GPs in these two countries.

5.1.3 General practitioner referral to mental health professionals

When participants who consulted a GP were asked whether they had been referred to a mental health specialist, a diverse pattern was found between countries. The highest referral rates for mood disorder were found in Italy (65%), followed by the Netherlands and Spain and the lowest was found in France (30%) .Observed referral rates were fairly consistent with the availability of general practitioners in the countries. High rates were found in the Netherlands and Spain, countries with a low density of professionals, compared to the lower rates in countries with many general practitioners such as Belgium and France. This relationship did not hold for Germany and Italy, countries with a quite similar density of general practitioners, but with quite different patterns of referral.

In summary, mood disorders are the first cause of mental health consultation in the ESEMeD countries but the rates vary across these countries. Comorbidity with anxiety disorders increases the mental health contact. Half of the individuals suffering from mood disorders made a contact the first year of onset and the delay varied from 1 to 3 years. Although suffering from mood disorders increase the probability of making a contact with mental health provider, GPs are the most involved doctors. Their referral to the mental health providers varies considerably across the ESEMeD countries.

5.2 Minimally Adequate Treatment

Selected criteria for minimally adequate treatment were as follows: receiving antidepressant pharmacotherapy for at least 2 months plus at least four visits with a psychiatrist, a GP or

any other doctor; at least eight sessions with a psychologist or a psychiatrist lasting an average of 30 min (American Psychiatric Association, 1998, 2000; Guidelines Advisory Committee, 2001; Kessler et al, 2003; Royal Australian and New Zealand College of Psychiatrists, 2003; National Institute for Clinical Excellence, 2004; Wang et al, 2005).

The overall proportion of treatment adequacy for major depressive episode was 54.5% (95%CI 44.78– 64.19). Considering the setting, the rate of treatment adequacy was 57.4% (95% CI 49.7–65.1) for the specialised care and 23.3% (95% CI 16.7– 29.8) for the general medical care. These results found similar treatment adequacy rates for major depressive episodes in the ESEMeD countries compared to others found in the USA (Wang et al 2005) where rates of minimal adequate treatment were 52.0% in the specialised setting and 14.9% in the general medical setting.

Although overall rates were similar across the 6 European countries, the differences between providers varied. In northern countries (Belgium, France, Germany and The Netherlands) treatment adequacy was higher in the specialised sector, whereas no difference was found in southern countries (Italy and Spain). These variations might be due to differences in European healthcare systems.

5.3 Unmet Need for Care

It is important to note that ESEMeD analysis for unmet need includes individuals with any of the nine common mental disorders considered in the study (including MDE and dysthymia, but also anxiety and alcohol disorders). Nevertheless, findings are applicable to individuals with mood disorders.

Individuals who reported that their mental disorder (whether suffering from depression or another disorder) had interfered ‘a lot’ or ‘extremely’ with their lives or their activities and those who had used formal healthcare services for their pathology in the previous 12 months were defined as having a need for mental healthcare services. Among individuals defined as having a need for mental healthcare, 51.7% (95% CI 47.5–55.9) reported having used some type of formal healthcare and 25.1% (95% CI 21.9– 28.4) said they had seen a mental health specialist in the previous 12 months. By combining the prevalence of need for mental health care services and the proportion of respondents with a need for care who did not receive any formal healthcare, it was estimated that 3.1% (95% CI 2.7–3.6) of the overall sample had an unmet need for mental healthcare. Across participating countries, the raw level of unmet need varied from 1.6% (95% CI 1.2– 2.2) in Italy to 5.8% (95% CI 4.3–7.6) in The Netherlands.

Compared with the youngest cohorts (18–24 years), all other age groups had a statistically significant lower risk for unmet need (0.2 for adults aged 50+, 0.3 for those aged 35–49 years and 0.5 for people between 25–34 years). Homemakers and retired individuals had a substantial and statistically significant greater risk of unmet need (OR 2.4 and 3.4 respectively) when compared to employed respondents. Individuals whose mental disorder had started more than 15 years before had more than twice the likelihood of unmet need for mental care than the rest.

In this cross-sectional study in six European countries, we estimated that 3.1% of the adult population had an unmet need for mental healthcare. Even so, they are not suffering from depressive disorders only, that would represent a few millions of adults out of a total population of 213 million in those countries. This is a fairly high level of unmet need, especially given that the criterion for defining a need as being met was quite conservative. On the other hand the contacts with health system could have been underreported since it implies self recognition of the presence of mental health disorders to be declared, which may inflate the estimated rates of unmet need.

6 Suicidality

The ESEMeD 2000 study provided valuable data on the prevalence of suicidality in Europe and the factors associated to it (Bernal M, 2007). In the survey, respondents were asked about suicidality in their lifetime and during the 12 months previous to the interview. The specific question that was asked was: has any of these experiences happened to you? First the interviewer said: 'You seriously thought about committing suicide', and after 'You attempted suicide'.

Lifetime prevalence of suicidal ideas in ESEMeD was 7.8% and of suicidal attempts 1.8% (table 6.1). Lifetime prevalence of attempts ranked among the lowest rates obtained in previous population surveys and clinical studies (Paykel et al., 1974; Weissman et al., 1999 ; Kessler et al., 1995; Corcoran et al. 2004).

Lifetime suicidality (i.e., suicide ideation and suicide attempts) was more prevalent among women, younger individuals, and people living in large urban areas. Respondents that had been previously married (separated, divorced, widowed) had the highest frequency of lifetime suicidality. It was also much higher among individuals with lifetime major depression, dysthymia, Generalized Anxiety Disorder and alcohol dependence, with prevalences near 30% for suicidal ideas and 10% for suicidal attempts. Differences among the mental disorders appeared to be small, which may be a consequence of comorbidity among them.

Increased frequency of suicidal ideas in ESEMED was associated with being woman and previously married, which confirms, in a population sample, the findings of most of previously published clinical studies (Kessler et al., 1995; Moscicki, 1997; Kuo at al., 2001). Although non statistically significant, it was also found that elder individuals tended to show a lower prevalence of suicidality. Previous studies had found higher frequency of suicidal ideation and attempts among the younger individuals and women, and higher frequency of completed suicide among men and the eldest (Möller, 2003).

Some country differences were also observed, with Germany and France having the highest rate ratios of suicidal ideation and Belgium and France of attempts, while the lowest risk of ideas was found in Italy and Spain, societies that are generally more traditional and conservative (Hawton et al., 1998; Levi et al, 2003; Hjelmeland et al., 2002). Although completed suicide is qualitatively different from suicide ideation and attempts, comparison of frequencies of suicidality in our study with suicide rates in those countries (http://www.who.int/mental health/prevention/suicide/suiciderates/en/) provided highly consistent results. The two countries with highest suicide rates are Belgium and France, which were also the countries with largest frequency of suicidal attempts. On the other hand, Italy and Spain, the countries with the lowest rates of suicide, also ranked last in suicidality in our survey. The exception was the Netherlands with a relatively low rate of completed suicide and intermediate rates in suicidal ideation and attempts. Living in a large population was also associated to a higher frequency of suicidality, which may be related to higher frequency of social isolation in cities (Middleton et al., 2004).

Table 6.1 Socio-demographic data and psychiatric diagnosis of the individuals included in the analysis (absolute numbers and weighted proportions), lifetime prevalence of suicide attempts, rate ratios and 95% confidence intervals for factors associated to lifetime suicide ideation and suicide attempts (Cox proportional hazard model with time varying covariates)*

			Lifetime Suicide attempts			
Group	**N**	**%**	Lifetime	*95% CI*	*RR*	*95% CI*
Number of individuals	879	100.	1.81%	(1.58, 2.05)		
AGE						
18-24	664	11.4	1.80%	(1.08, 2.53)	1	(0.36,1.03)
25-34	159	18.4	2.10%	(1.49, 2.72)	0.61	(0.24,0.69)
35-49	266	27.8	2.05%	(1.61, 2.48)	0.40	(0.14,0.53)
50-64	219	21.8	2.06%	(1.56, 2.57)	0.27	(0.06,0.29)
>64	166	20.7	0.98%	(0.53, 1.43)	0.13	(0.36,1.03)
GENDER						
Male	368	48.2	1.06%	(0.83, 1.3)	1	
Female	510	51.8	2.51%	(2.12, 2.9)	2.10	(1.55,2.85)
MARITAL STATUS						
Married or living with someone	578	66.7	1.46%	(1.22, 1.71)	1	
Previosly married	132	11.1	3.64%	(2.54, 4.74)	2.00	(1.36,2.92)
Never married	168	22.1	1.97%	(1.46, 2.48)	1.28	(0.88,1.87)
GEOGRAPHICAL AREA OF						
Rural (<10.000)	252	33.2	1.58%	(1.17, 1.99)	1	
Mid-size urban (10.000-100.000)	384	38.7	1.64%	(1.32, 1.97)	0.99	(0.71,1.38)
Large urban (>100.000)	243	28.1	2.33%	(1.82, 2.84)	1.50	(1.10,2.07)
EMPLOYMENT STATUS	.	.				
Working	486	56.5	1.67%	(1.39, 1.96)	1	
Student	172	2.8	1.27%	(0, 2.58)	0.66	(0.22,2.03)
Homemaker	986	9.1	1.96%	(1.25, 2.67)	1.06	(0.63,1.79)
Retired	188	23.5	1.24%	(0.8, 1.68)	0.93	(0.55,1.57)
Other	894	8.1	4.54%	(3.17, 5.92)	1.94	(1.33,2.83)
COUNTRY	.	.				
Spain	212	15.6	1.48%	(1.1, 1.86)	1	
Belgium	104	3.8	2.49%	(1.71, 3.27)	1.72	(1.20,2.47)
France	143	20.5	3.37%	(2.6, 4.14)	1.85	(1.25,2.74)
Germany	132	31.5	1.70%	(1.24, 2.16)	1.21	(0.80,1.81)
Italy	177	22.4	0.54%	(0.32, 0.76)	0.45	(0.30,0.68)
The Netherlands	109	6.1	2.27%	(1.56, 2.98)	1.19	(0.73,1.90)
MENTAL DISORDERS						
Major Depressive Episode	298	13.4	8.36%	(7.03, 9.69)	3.91	(2.74,5.60)
Dysthymia	958	4.4	10.12%	(7.47, 12.76)	1.88	(1.24,2.83)
GAD	556	2.8	12.01%	(8.56, 15.46)	1.98	(1.33,2.94)
Social Phobia	386	2.8	7.60%	(4.56, 10.63)	1.19	(0.70,2.01)
Specific Phobia	945	8.3	5.11%	(3.63, 6.6)	1.26	(0.89,1.78)
PTSD	411	2.5	10.73%	(7.02, 14.44)	1.86	(1.18,2.92)
Agoraphobia	176	1.2	10.10%	(5.11, 15.09)	1.00	(0.49,2.04)
Panic Disorder	350	1.6	10.00%	(5.74, 14.27)	1.39	(0.80,2.39)
Alcohol Abuse	496	4.7	5.43%	(3.79, 7.06)	1.84	(0.17,2.90)
Alcohol Dependence	143	1.1	11.62%	(6.44, 16.8)	1.77	(0.95,3.32)

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Suffering from a mental disorder was the most important determinant of suicidality. A survival analysis showed that the highest relative risk was found for major depressive episode (2.9 for lifetime ideas, 3.9 for lifetime attempts), dysthymia (2.0 for lifetime ideas, 1.9 for lifetime attempts), GAD (1.8 and for lifetime ideas, 2.0 for lifetime attempts), PTSD (1.8 for lifetime ideas, 1.9 for lifetime attempts) and alcohol dependence (1.7 for lifetime ideas, 1.8 for lifetime attempts). The major depressive episode appeared to be the most important risk factor for lifetime suicide attempts among examined respondents, with a population attributable risk proportion (PAR) of roughly 28%, which implies that the lifetime prevalence of suicide attempts could be cut by almost one-third by preventing major depression.

Factors associated to lifetime suicide attempts among individuals with a lifetime suicidal idea were also analyzed. Males (OR 1.89, 95% CI 1.32-2.72 suffering from a major depressive episode (OR 1.632; 95% CI 1.14-2.33), a panic disorder (OR 1.89; 95% CI 1.03-3.46) or alcohol abuse (OR 2.11; 95% CI 1.28-3.50) and those on permanent sick leave were more likely to commit a suicide attempt.

The analysis of age of onset of suicidal ideas and attempts, showed that suicidal ideas and attempts may appear for the first time at any age, with suicidal ideas having the highest rate of first presentation during teenage years and young adulthood. The number of years from the first suicidal idea to first suicide attempt also had a high variability, but for most individuals it happened within one or few years.

7 Conclusions

The ESEMeD Project is among the first European epidemiologic studies to use published diagnostic criteria (DSM-IV) to assess the prevalence of mood disorders, their severity, associated risk factors, disability and use of services. When considering both, the sample size and the comprehensiveness of evaluation, ESEMeD is the largest European survey to date, including more than 21400 participants from 6 countries, representative of an overall population of about 213 million individuals.

Analyses presented here reveal the magnitude of mood disorders in the six European countries. These disorders were frequent, mainly major depression (with or without comorbid dysthymia), affecting more than 28 million people throughout Europe at some time in their lives and more than 9 million every year.

A special pattern of risk was found for mood disorders: female, unmarried individuals and individuals having chronic physical conditions were at grater risk. Younger individuals were also more likely to have mood disorders, indicating an early age of onset of the disorder.

Comorbidity is highly prevalent, especially with anxiety disorders, highlighting the need for integrated therapies and early intervention in patients with a primary disorder in order to reduce future comorbidity and general psychiatric burden.

Substantial levels of disability and loss of quality of life were found among individuals with Major Depression Episode and other mood disorders, with an overall impact similar or stronger than common chronic physical disorders. The consistent relationship found across six European countries underscores the public health significance of these findings. On the other hand the impact of mood vs. physical disorders on quality of life was rather specific, with mood disorders affecting more cognitive, motivational and emotional functions, the highest order capacities of the human being. The consequences of the impairment of these capacities make effective prevention and treatment of emotional disorders especially important for the restorement of role function and quality of life.

Despite the impact of mood disorders, data show that consultation rates and treatment adequacy in general medical care remains too low. The size of this treatment gap implies that several actions should be taken at service provision level to control mood disorders. An increase in service provision, access, use, effectiveness and efficiency of existing services has been proposed. Further efforts in continuing medical education at general practice level seems necessary, especially considering the important role of the GPs in the clinical management of these patients. On the other hand educating individuals in need for mental healthcare may be as important as expanding the services. According to our data, the youngest patients, homemakers and retired people, as well as those with a longer evolution of their disorder, need to be more specifically targeted in these efforts. There is also a need for more qualitative research to improve the knowledge about stigma and other possible reasons for the underuse of mental healthcare services.

The data presented here provide an epidemiological basis for promoting a change in mental health policy within Europe. While people's health is no longer judged in terms of mortality statistics exclusively, disability now plays a central role in determining the health status of a population. A proposed improvement of mental health care policy would aim to treat existing cases of mental illness and reduce future cases by means of early detection and early treatment. Given this, our findings highlight some important areas of concern for public mental health policy. A better identification of mood disorders and its risk factors could help mental health professionals in primary and secondary care to recognize and treat these disorders before diagnostic criteria are met. Moreover, by reducing the risk factors by means of more general measures, the proportion of individuals who would ever develop a specific disorder can be altered.

Reference list

Alonso J, Codony M, Kovess V, Angermeyer MC, Katz SJ, Haro JM, de Girolamo G, de Graaf R, Demyttenaere K, Vilagut G, Almansa J, Lepine JP, Brugha TS, on behalf of the ESEMeD-MHEDEA 2000 investigators. Population level of unmet need for mental healthcare in Europe. Br J Psychiatry 2007;190:299-306

Alonso J, Lepine JP:ESEMeD/MHEDEA 2000 Scientific Committee. Overview and key data from the European Study of the Epidemiology of Mental Disorders (ESEMeD). J Clin Psychiatry. 2007; 68 (suppl 2):3-9.

American Psychiatric Association. DSM-IV: Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition. Washington, DC: American Psychiatric Association, 1994.

Arsenault-Lapierre G, Kim C, Turecki G. Psychiatric diagnoses in 3275 suicides: a meta-analysis. BMC Psychiatry. 2004 Nov 4;4:37.

Ayuso-Mateos JL et al. Depressive disorders in Europe: prevalence figures from the ODIN study. Br J Psychiatry. 2001 Oct;179:308-16

Reprinted from Journal of Affective Disorders, Vol. 101, Issue 1-3, Bernal M., Haro J.M., Bernert S., Brugha T., de Graaf R., Bruffaerts R., Lépine J.P., de Girolamo G., Vilagut G., Gasquet I., Torres J.V., Kovess V., Heider D., Neeleman J., Kessler R. and Alonso J., Risk factors for suicidality in Europe: Results from the ESEMED study, Page 8., Copyright 2007, with permission from Elsevier.

J Affect Disord. 2007 Aug;101(1-3):27-34. Epub 2006 Oct 30.

Demyttenaere K, Bruffaerts R, Posada-Villa J et al. Prevalence, Severity and Unmet Need for Treatment of Mental Disorders in the World Health Organization World Mental Health (WMH) Surveys. JAMA 2004;291:2581-2590.

Demyttenaere K, Bonnewyn A, Bruffaerts R, Brugha T, De Graaf R, Alonso J. Comorbid painful physical symptoms and depression: prevalence, work loss, and help seeking. J Affect Disord 2006; 92: 185-193.

ESEMeD/MHEDEA2000 investigators. Disability and quality of life impact of mental disorders in Europe: results from the European Study of the Epidemiology of Mental Disorders (ESEMeD) Project. Acta Psychiatr Scand 2004a: 109 (Suppl. 420): 38–46

Reprinted from Acta Psychiatrica Scandinavica, vol. 109 (Suppl. 420), the ESEMeD/MHEDEA 2000 investigators, 12-month comorbidity patterns and associated factors in Europe: results from the European Study of the Epidemiology of Mental Disorders (ESEMeD) project, page 28-37, copyright 2004, with permission from Wiley-Blackwell Publishing Ltd.

Reprinted from Acta Psychiatrica Scandinavica, vol. 109 (Suppl. 420), the ESEMeD/MHEDEA 2000 investigators, Sampling and methods of the European Study of the Epidemiology of Mental Disorders (ESEMeD) Project, page 8-20, copyright 2004, with permission from Wiley-Blackwell Publishing Ltd.

Fernández, A., Haro, J.M., Martinez Alonso, M., Demyttenaere, K., Brugha, T.S., Autonell, J., de Girolamo, G., Bernert, S., Lepine, J.P., Alonso, J. (2007). Treatment adequacy for anxiety and depressive disorders in Europe. British Journal of Psychiatry, 190, 172-173.

Gureje, O., Von Korff, M., Kola, L. The relation between multiple pains and mental disorders: Results from the World Mental Health Surveys. Pain 2007 Jun 12; [doi:10.1016/j.pain.2007.05.005]

Kessler RC, Ustun TB. The World Mental Health (WMH) Survey Initiative Version of the World Health Organization (WHO) Composite International Diagnostic Interview (CIDI). Int J Methods Psychiatr Res 2004; 13:93-121.

Kessler, R.C., Angermeyer, M., Anthony, J.C. et al. Lifetime prevalence and age-of-onset distributions of mental disorders in the WHO World Mental Health (WMH) Surveys. World Psychiatry 2007; 6; 168-176

Kovess-Masféty V, Alonso J, Brugha TS, Angermeyer MC, Haro JM, Sevilla-Dedieu C, the ESEMeD/MHEDEA 2000 Investigators (2007). Differences in lifetime use of services for mental health problems in six European countries. Psychiatric Services ; 58: 213-220. Reprinted with permission from Psychiatric Services, Copyright 2007. American Psychiatric Association.

Lépine JP, Gastpar M, Mendlewicz J, Tylee A. Depression in the community: the first pan-European study DEPRES (Depression Research in European Society). Int Clin Psychopharmacol. 1997 Jan;12(1):19-29

Ormel, J., Von Korff, M. Burger, H. Et al. Mental disorders among persons with heart disease - results from World Mental Health surveys. Gen Hosp Psychiatry 2007; 29: 325-334.

Pignone MP, Gaynes BN, Rushton JL, et al. Screening for Depression in Adults: A Summary of the Evidence. Ann Intern Med. 2002;136(10):765-776.

Robine, J.M., Jagger, C., Mathers, C.D., Crimmins, E.M., Suzman, R.M. (Eds.). Determining health expectancies. Chichester: Wiley, 2003.

Scott K, Von Korff M, Ormel J, Bruffaerts R et al. Mental disorders among persons with asthma: results from the World Mental Health Surveys. General Hospital Psychiatry 2007; 29: 123-133

Wang PS, Angermeyer M, Borges G, Bruffaerts R, Chiu WT, de Girolamo G, (... Haro JM, ..., Kessler RC, ..., Alonso J).. Delay and failure in treatment seeking after first onset of mental disorders in the World Health Organization's World Mental Health Survey Initiative. World Psychiatry 2007; 6(3): 177-185.

Ware JE, Kosinski M, Keller SD. A 12-item short-form health survey:construction of scales and preliminary tests of reliability and validity. Medical Care 1996; 34(3): 220-233

World Health Organization. The ICD-10 classification of mental and behavioural disorders: diagnostic criteria for research. Geneva: WHO, 1993

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8 Diabetes

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Introduction

Both the BIRO and the EUCID projects are funded by the health information strand of DG-SANCO to provide information about various aspects of the state of diabetes and the achieved level of quality of care in Europe.

Diabetes

Diabetes Mellitus (Diabetes) is characterised by an elevated blood glucose level. The diagnosis is divided into two main categories: type 1 and type 2. Type 1 is an autoimmune disease in which the insulin producing cells in the pancreas are destroyed by the immune system. It affects about 10% of the diabetic population. Type 2 diabetes is characterised by insulin resistance in combination with insulin producing cell dysfunction. It affects about 90% of the diabetic population.
Diabetes mellitus is a growing burden for all the countries in the world. The International Diabetes Federation (IDF) estimates that the number of people with diabetes will grow from 194 in 2003 to 333 millions in 2025 (1). The increase will be in the industrialized countries but especially in the developing countries. Estimates were predicted from projections of known growing prevalence numbers. (fig.1)
Not only the diagnosis of diabetes and the treatment of the elevated blood glucose as a consequence are important in the burden of diabetes in the society, but especially also the complications that are the consequence of diabetes. Microvascular disease (neuropathy, retinopathy and nephropathy) and macrovascular disease (heart, cerebral an peripheral vessels) are the most important long term complications of diabetes. The national numbers for these complications are not very well known on a comparative international basis.
A growing number of all populations in the world is also at risk for developing diabetes and are in a state of impaired glucose tolerance or impaired fasting glucose. About 10% of this group will develop diabetes annually. The IDF estimates this number about 50% higher than the population with diabetes. (table 1)
Inside Europe the growth will be relatively small compared to the other global regions as estimated by the IDF (Figure 1), but the burden will increase from an estimated 7.8% in 2003 to 9.1% in 2025 of the population between 20 and 79 years.

Figure 1 Estimates of the number of patients with diabetes and impaired glucose tolerance according to the IDF diabetes atlas (Diabetes Atlas 2005)

Table 1.1
Regional estimates for diabetes and impaired glucose tolerance (20-79 age group), 2003 and 2025

	2003					2025				
Region	Population (20-79) (millions)	No. of people with diabetes (millions)	Diabetes prevalence (%)	No. of people with IGT (millions)	IGT prevalence (%)	Population (20-79) (millions)	No. of people with diabetes (millions)	Diabetes prevalence (%)	No. of people with IGT (millions)	IGT prevalence (%)
AFR	295	7.1	2.4	21.4	7.3	541	15.0	2.8	39.4	7.3
EMME	276	19.2	7.0	18.7	6.8	494	39.4	8.0	36.5	7.4
EUR	621	48.4	7.8	63.2	10.2	646	58.6	9.1	70.6	10.9
NA	290	23.0	7.9	20.3	7.0	374	36.2	9.7	29.6	7.9
SACA	252	14.2	5.6	18.5	7.3	364	26.2	7.2	29.5	8.1
SEA	705	39.3	5.6	93.4	13.2	1,081	81.6	7.5	146.3	13.5
WP	1,384	43.0	3.1	78.5	5.7	1,751	75.8	4.3	120.2	6.9
Total	3,823	194	5.1	314	8.2	5,251	333	6.3	472	9.0

For this reason it is important that health systems are provided with targeted indicators results, on a routine basis, to help them optimise the organisation of health care for people with diabetes. As a matter of fact, official figures are lacking in most Member States. The result is that policy makers still have limited ground to make evidence-based decisions as the local needs of diabetic patients are largely unknown, except for regions where dedicated networks operate to support the local communities.
As a matter of fact, European networks of excellence in this field collect extensive data as a by-product of clinical activity and systematic linkage of administrative data. We should learn from such success stories, spread the word to other regions, and send timely information to the EU web portal.
However, the goal is far from trivial in diabetes for following reasons:

- diabetes has a very high prevalence (a considerable part of the population is at risk of developing the disease).
- when a new diabetic case is diagnosed, one can predict that this subject will become extensively and increasingly involved in a range of expensive health services whose pathway can be hard to track.
- being a multifactorial disease, diabetes is managed through complicated guidelines requiring multidimensional measurements. Each parameter has to be taken carefully into account for the disease to be monitored in a satisfactory manner.

The above synthetically explain why we need innovative solutions and a proactive action to provide the strategic information that is needed to halt the diabetes epidemic.
Although diabetes represents almost an ideal model to investigate chronic diseases – as demonstrated by an overwhelming number of epidemiological studies – to report on its state at the population level still represents a major challenge with no obvious solution European-wide.

DG SANCO Diabetes projects

"Best Information through Regional Outcomes" (BIRO) is a three-year project run by seven partners since late 2005 to build "*a common European infrastructure for standardized information exchange in diabetes care, for the purpose of monitoring, updating and disseminating evidence on the application and clinical effectiveness of best practice guidelines on a regular basis"* [*]. Such strategic goal will be pursued through the use of technological solutions that will allow connecting regional registers that are already storing detailed data on diabetic patients. As soon as the system will be up and running, the EU web portal will directly tap into the BIRO server and capture the most updated parameters, safely and according to fully documented, standardized criteria.
Sustainability of systems of indicators is a crucial aspect of the future implementation of European information systems. Identifying solutions to make all key indicators available at all levels can be highly effective to reduce the burden of diabetes both in economical and clinical terms. The BIRO project aims to respond to the need of providing timely, detailed diabetes information, through the creation of an infrastructure for rapid data exchange between basic units defined as "regions".
According to the BIRO approach, a "region" is not purely an administrative entity, but a network collecting health information according to a homogeneous and well defined set of standardized rules. This definition may can eventually identify a geographical region, or even a country (typically a smaller State e.g. Malta, Cyprus etc). In a broad sense, a "BIRO region" can be even a cluster of clinicians joining a disease management program or an epidemiological study,
Such an approach allows involving a very large number of parties in the collection of diabetes information: across the EU there are several established diabetes registers

[*] The BIRO website: www.biro-project.eu , last accessed 15 December 2007.

(Scotland, Umbria), clinical networks (Austria), diabetologists and patients associations, national unions (Germany, IDF), large epidemiological studies etc., that can all contribute to the EU web portal offering relevant information for diabetes surveillance.
There are many logical reasons to involve all the above parties in the establishment of any kind of common information system.
Care for diabetic patients is increasingly demanding for both affected people and providers, due to an ever increasing prevalence, particularly for type 2 [*] [†]. Intrinsically complex needs can only be tracked by different organizations.
Tracking quality of care is paramount to prevent diabetes complications: suboptimal practices may be identified by looking at processes of care and intermediate outcomes in the clinical setting. Investigations can be based on administrative data that are increasingly available through disease registers and management programs that are currently run in many regions [‡].
Specific epidemiological problems must be taken into account to avoid misleading conclusions that can be driven by the availability of incomplete information:

- in many situations population-based denominators are not known. Disease management programs and/or diabetes registers do not cover the general population, other sources are needed to complete the picture;
- diabetes status can be misclassified, or at least heterogeneously classified. Earlier diagnosis due to increasing awareness of diabetes and to the diffusion of opportunistic screening among high risk individuals[§] can increase prevalence and change the profile of diabetic patients. Different portion of cases with less severe disease and uncomplicated diabetes are more likely to be recorded in some regions:
- epidemiological conclusions can be drawn on the basis of average national indicators (e.g. blood pressure increase by classes of age), but results would be different if using individual records or sub-national averages (effect of different sources of variation, or ecological fallacy[**]).

To overcome the above limitations in the use of quality indicators, advanced standardization approaches have been made available, based on risk adjustment techniques and multivariate regression[††].
The B.I.R.O. project has been specifically designed to pave the ground for such operations. Seven high profile partners with an extensive experience in diabetes registers are developing a platform for automatic information exchange that does not require individual data transfer (i.e. without the construction of a central humongous database).
The project will deploy open source, specialised software that will link local data systems to build up a European diabetes information infrastructure not requiring any change in the usual practice of data collection. The system includes a common dataset and related data dictionary, database/statistical engines, communication software, and a web portal. Privacy Impact Assessment is being conducted at any stage of the project to ensure maximum

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[*] Honeycutt AA, Boyle JP, Broglio KR, Thompson TJ, Hoerger TJ, Geiss LS, et al. A dynamic Markov model for forecasting diabetes prevalence in the United States through 2050. Health Care Manag Sci. 2003;6:155-64.

[†] Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. Diabetes Care. 2004;27:1047- 53.

[‡] Saaddine JB, Cadwell B, Gregg EW, Engelgau MM, Vinicor F, Imperatore G, Narayan KM. Improvements in diabetes processes of care and intermediate outcomes: United States, 1988-2002. Ann Intern Med. 2006;144:465-74.

[§] U.S. Preventive Services Task Force. Screening for type 2 diabetes mellitus in adults: recommendations and rationale. Ann Intern Med. 2003;138:212-4

[**] Schwartz S., The fallacy of the ecological fallacy: the potential misuse of a concept and the consequences, Am J Public Health. 1994 May;84(5):819-24.

[††] Elixhauser A, Pancholi M, Clancy CM., Using the AHRQ quality indicators to improve health care quality, Jt Comm J Qual Patient Saf. 2005 Sep;31(9):533-8.

compliance with national and international privacy protection laws at any architectural stage. Technological transfer and evaluation of the system are duly taken into account.
The flexibility of the B.I.R.O. system allows to accommodate different data sources, so that inconsistent methodologies for the construction of national indicators can be systematically avoided, providing routines to monitor data quality and clear directions for the construction of regional/national indicators.
The system will be available in the public domain and can be productively used also at the national level to integrate information collected at the regional level.
The major output of the project will be the European Diabetes Report, whose structure has been defined by a common Template that can be automatically produced through the use of the BIRO software.
In the last part of this chapter we present the general features of the BIRO report.

"European Core Indicators in Diabetes" (EUCID) is a two-year project funded by the same health information DG-SANCO strand, whose goal is "*to make available the national facts of Diabetes Mellitus and it's risk factors from countries in the European Union".* The project involves 19 Countries with the aim of delivering diabetes indicators for 2005 by the end of 2007.
From 2000 until 2002 a project was sponsored by DG-SANCO called European Diabetes Indicator Project (EUDIP). The aim of the project was the "establishment of indicators monitoring diabetes and its morbidity" on a national level. A set of indicators was constructed and tested for feasibility. The result was a set of core and secondary indicators that are feasible to collect on a national basis. The end report was published in December 2002.
The availability of the data was dependent of the monitoring systems in the collaborating countries. Some indicators were widely available and some only in a few countries. Also the types of databases, where the data derived from, were different as were the ways of data collection. As a consequence the comparability of the national indicators was often not straight forward, but very complicated. The discussion in the EUDIP project resulted in a number of core and non-core indicators.
During the EUCID project these indicators were collected by partners in 20 European countries. Data had to be from the one of the years between 2004 and 2006. For all the indicators availability differed. The reasons for these differences will be described in the final report of EUCID (www.eucid.eu).

1 Health determinants/risk factors

Many risk factors for diabetes are known, like family history, genetic background, diabetes in pregnancy and rare diseases like Cushing's disease. No nationwide indicators are available for these risk factors. On the other hand two risk factors are known and measured on a national scale: impaired glucose tolerance/impaired fasting glucose and obesity.

1.1 Obesity

The body mass index is measured by weight and height and calculated by weight in kilogram divided by the square of the height in meters. The outcome categories are: below 20 underweight, 20-25 ideal weight, 25-30 overweight and equal and above 30 obesity.
Overweight and obesity are indicators for the EUCID project. The figures are available by age and gender. (figure 2-4)

Figure 2a Crude Overweight (BMI 25 to 30) and Obesity (BMI equal or above 30) from Health Interviews Surveys in Europe, 2004, 2005 and 2006.

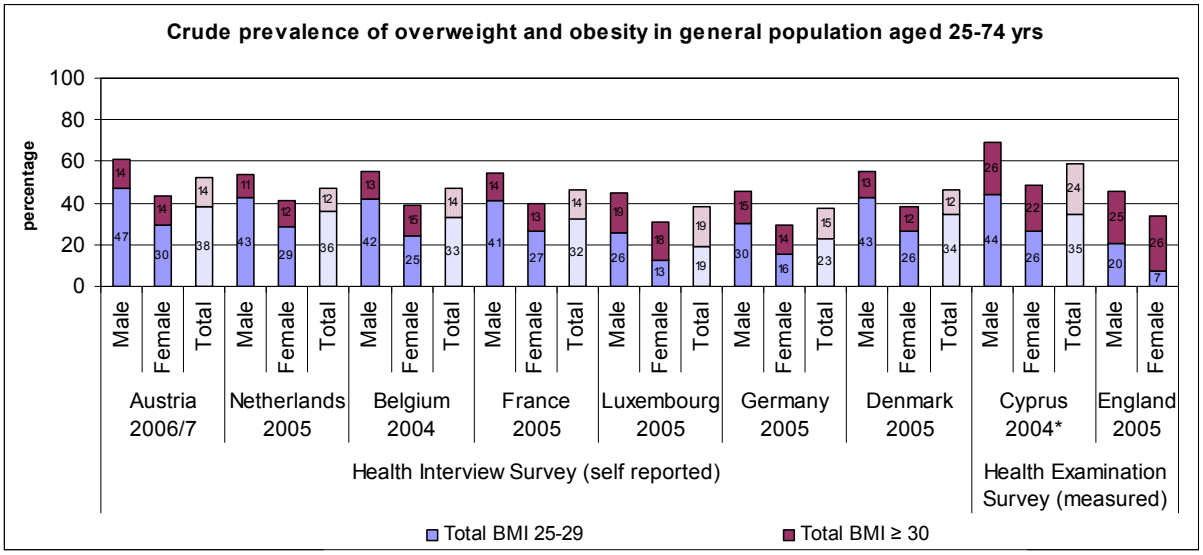


Figure 2b Standardised Overweight (BMI 25 to 30) and Obesity (BMI equal or above 30) from Health Interviews Surveys in Europe, 2004, 2005 and 2006. Standardisation by the age structure of the European population (IARC-1976)

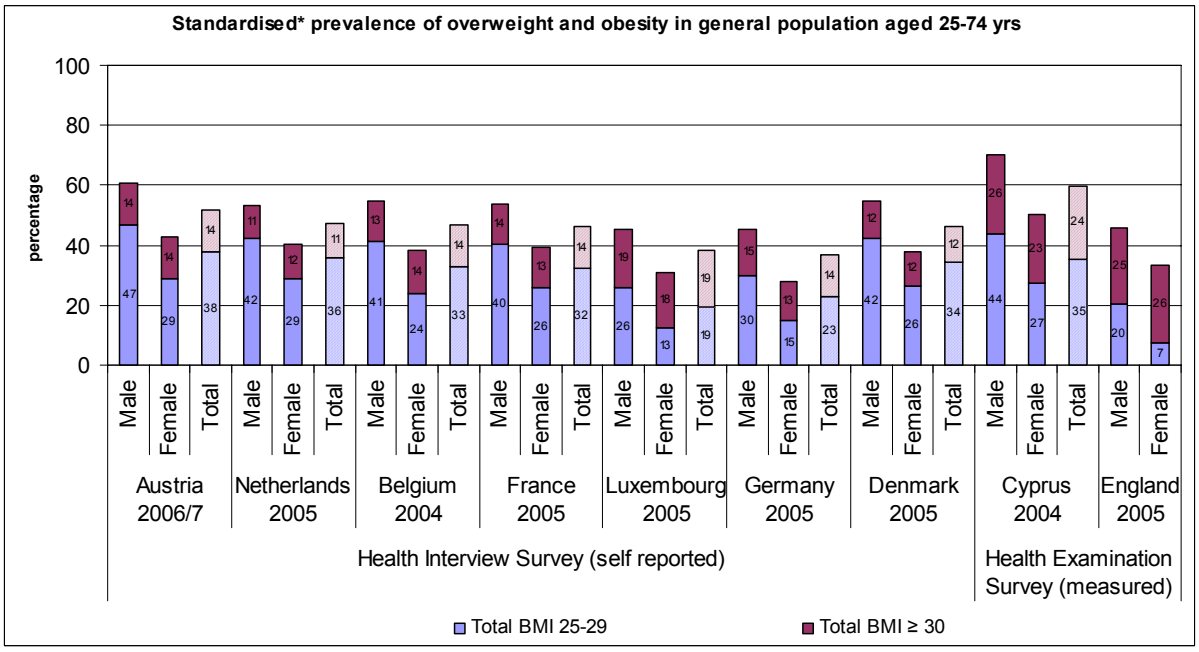


Figure 3 BMI equal or above 25 in Europe, 2004 and 2005 by HIS and HES

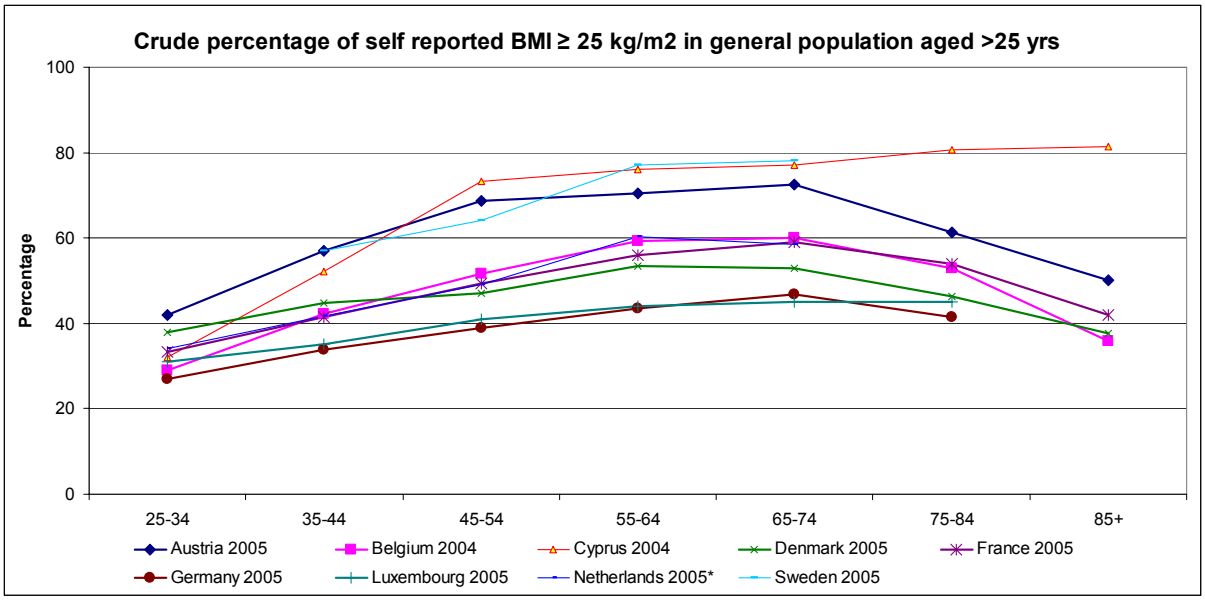
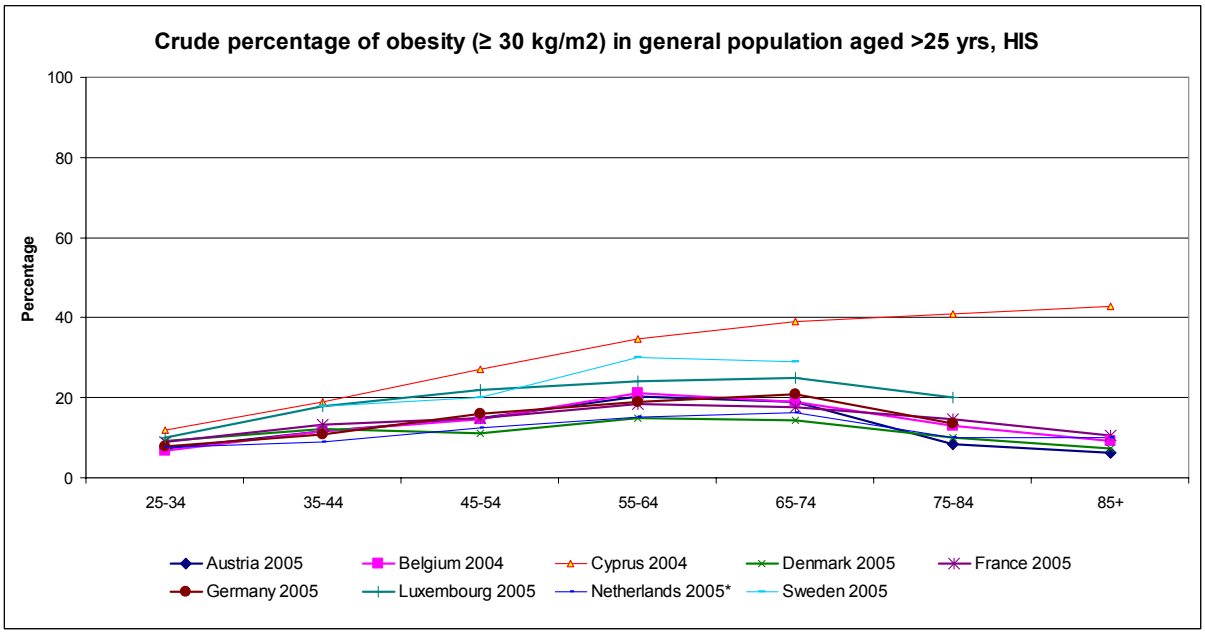


Figure 4 BMI equal and above 30 in the EU by age bands by HIS and HES



These figures show that the health problem of overweight and obesity approaches 50% in the countries that have figures available. This problem has a growing attention inside the EU countries that are implementing or planning strategies to decrease obesity.
A different approach to obesity is waist circumference measurement. This might have advantages to BMI. It is however not measured yet in routine practice in a sufficient way to provide meaningful data.

1.2 Impaired glucose tolerance/impaired fasting glucose

The EUCID project tried to collect data on impaired fasting glucose as a risk factor for the development of diabetes. There were very little data available and this should be one of the items to be discussed for the future. Since the comparability of these data is not sufficient these data are not provided in this report. Impaired glucose tolerance is most of the time not known to the individual, so in a Health Interview Survey this will not be available. Only Health Examination Surveys will pick up these individuals if the fasting or postprandial, after a standardised meal, is measured.

1.3 Family history and genetic background

These data were not collected in the EUCID project and were not available from other sources.

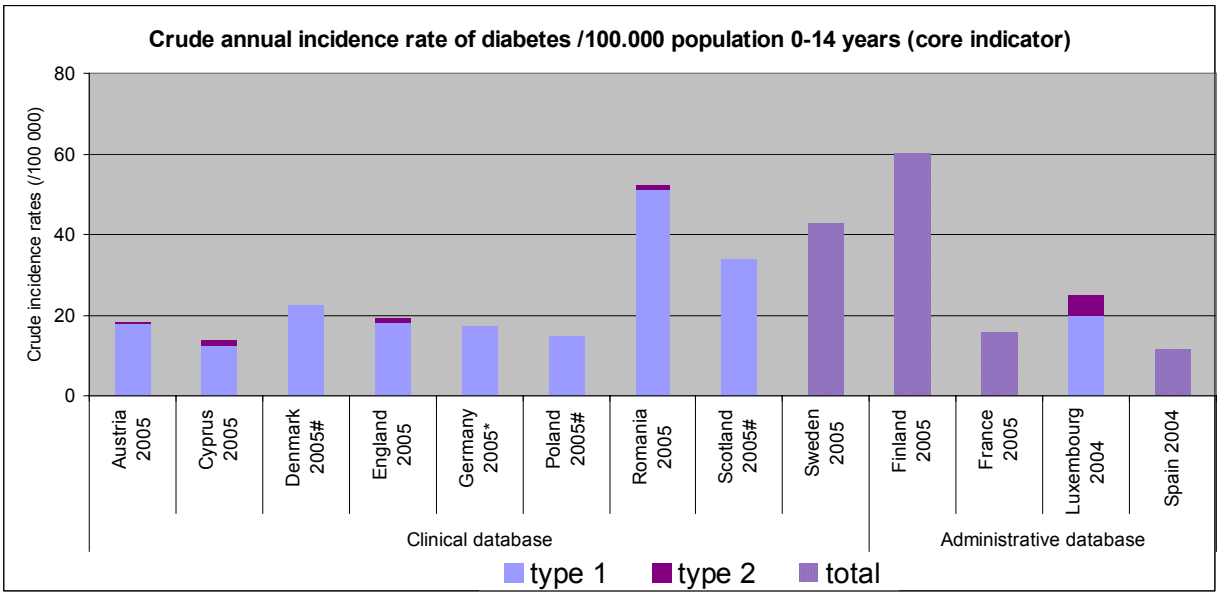
2 Incidence/prevalence

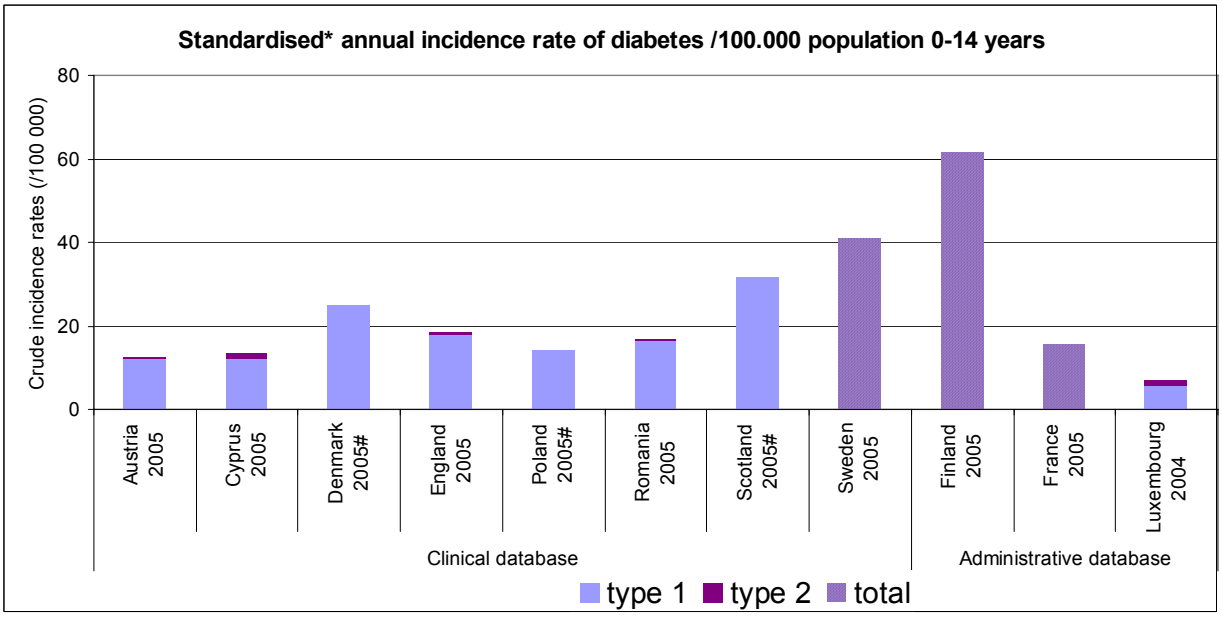
2.1 Incidence in children

The incidence of childhood diabetes is one of the indicators of EUCID. Not all EUCID countries have data available. Within the EU there are considerable differences (figure 5).

Some countries had only data on type 1 diabetes and some only of the total of type 1 and type 2. The incidence of type 2 diabetes in these children is growing, but proves not to be a considerable percentage in 2005 for the countries where data were available.

Figure 5a and 5b Crude and standardised Incidence by the age structure of the European population (IARC-1976) of diabetes amongst children 0-14 years old in the EU

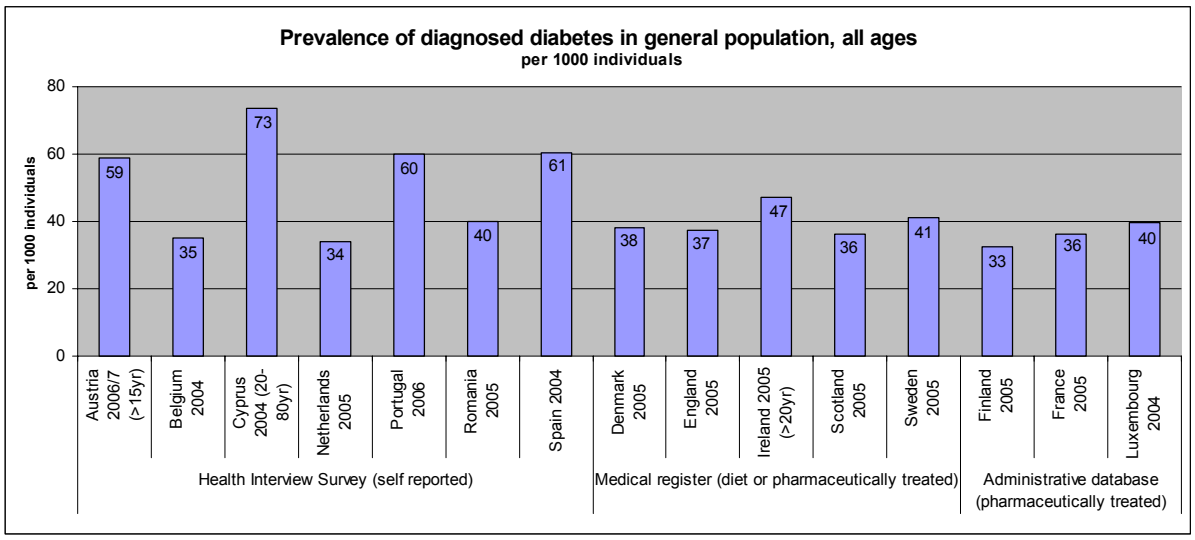




2.2 Prevalence above 25 years of age

The prevalence in the population was an indicator in the EUCID project. Figures 6 and 7 show the incidence in total and by age that were collected for this project.

Figure 6a and 6b Crude and standardised prevalence of diabetes per 1000 population.
(standardised by the age structure of the European population (IARC-1976))



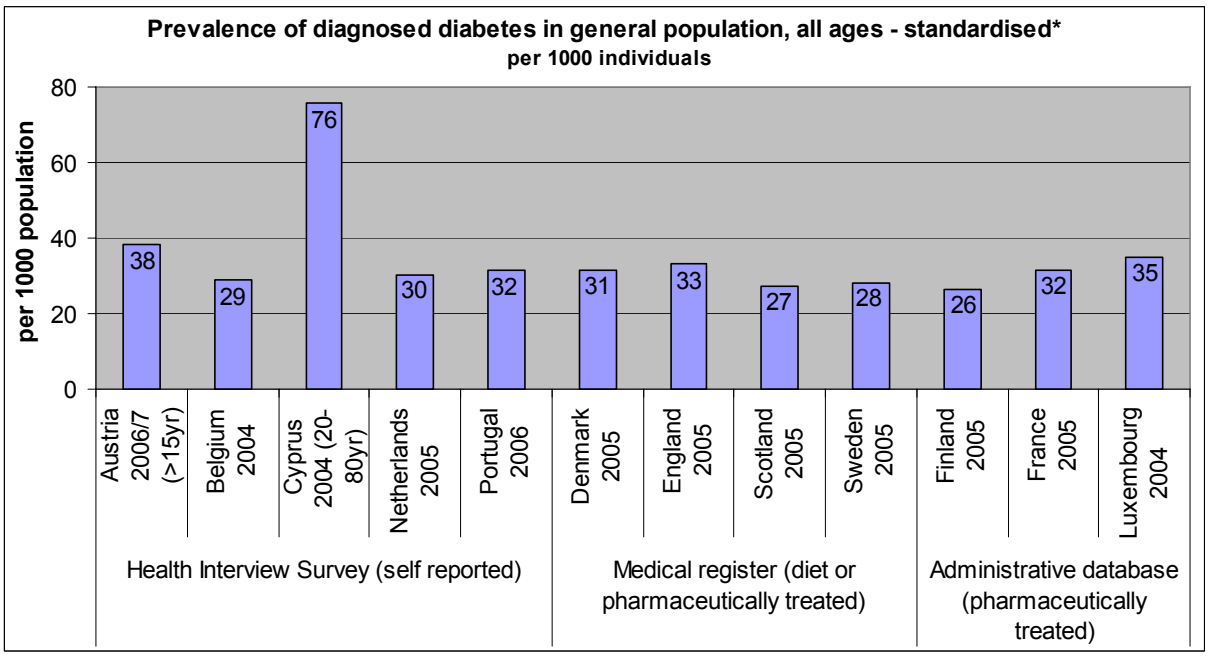
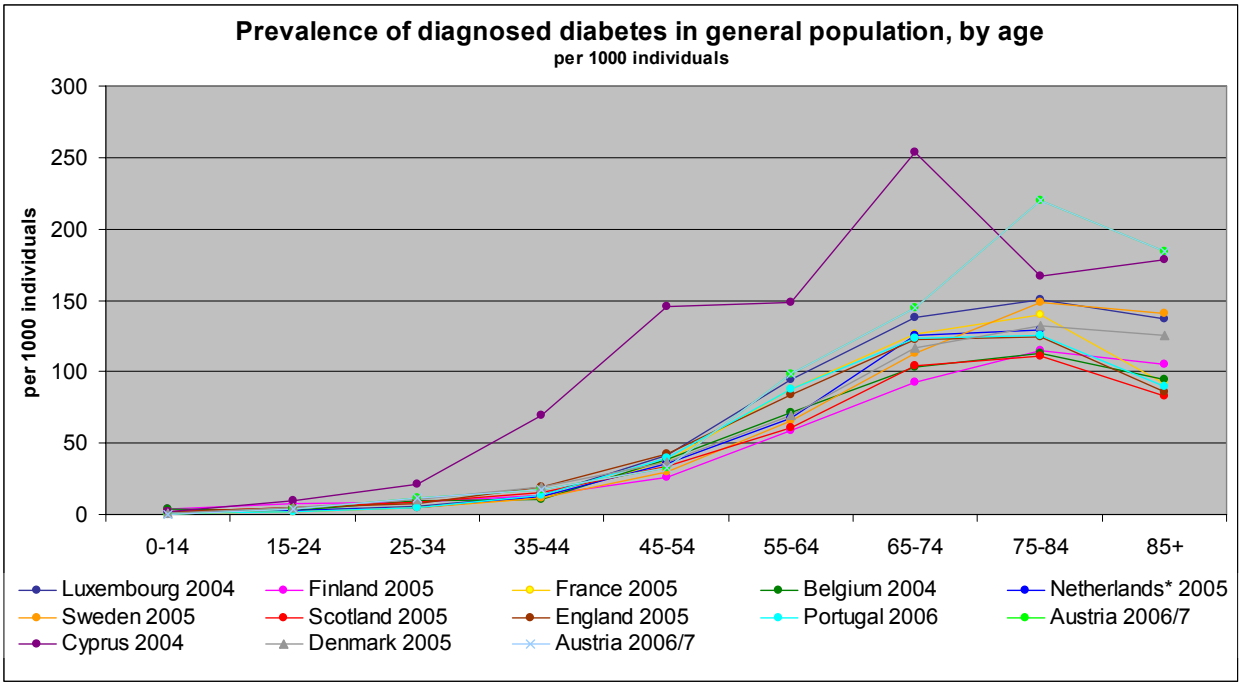


Figure 7 Prevalence of diabetes by age group in 13 European countries



No data on diagnosis per gender are available.

3 Morbidity

3.1 Clinical management

Clinical management in diabetes uses a well defined set of data to intervene above certain cut off points. These vary from blood glucose management with HbA1c as indicator, blood pressure, blood lipids, kidney functions and microalbuminurea and many more. For the complete set of these data the BIRO project will provide valuable data. Since all quality of care is local, these regional data are the key indicators to improve the care for individuals with diabetes. The EUCID project collected many of these data also. Most of them originated from regional database that were more or less representative for the national situation. A small selection will be provided on process and outcome from the EUCID project: HbA1c, blood pressure and total cholesterol. For more indicators the end report of EUCID will be available on the DG-SANCO and EUCID (www.eucid.eu) websites.

3.1.1 HbA1c

There is a clinical consensus that to minimise the risk of late microvascular diabetes complications the measure of average blood glucose, HbA1c, should be below 7% (American Diabetes Association and European Association for the Study of Diabetes). Some organisations put this risk factor even below 6.5%.
Some of the data collected originated from national samples, however most of the data were extracted from regional clinical databases. Two indicators were collected: HbA1c measured, as a process indicator, and if measured <= 7.0%, as an outcome indicator. Figures 8 and 9.

Figure 8a Crude percentage of HbA1c measured in different European countries

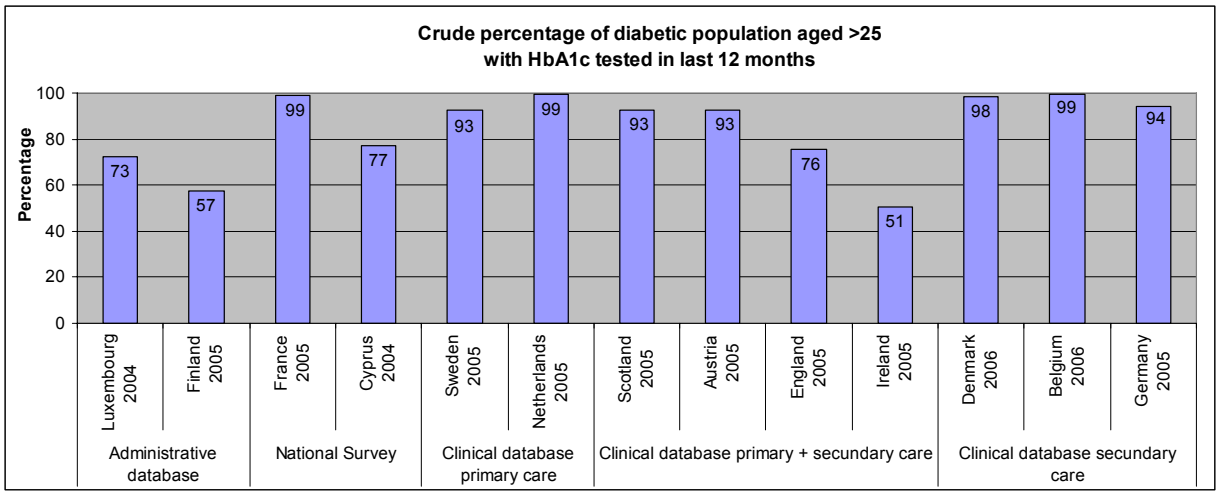
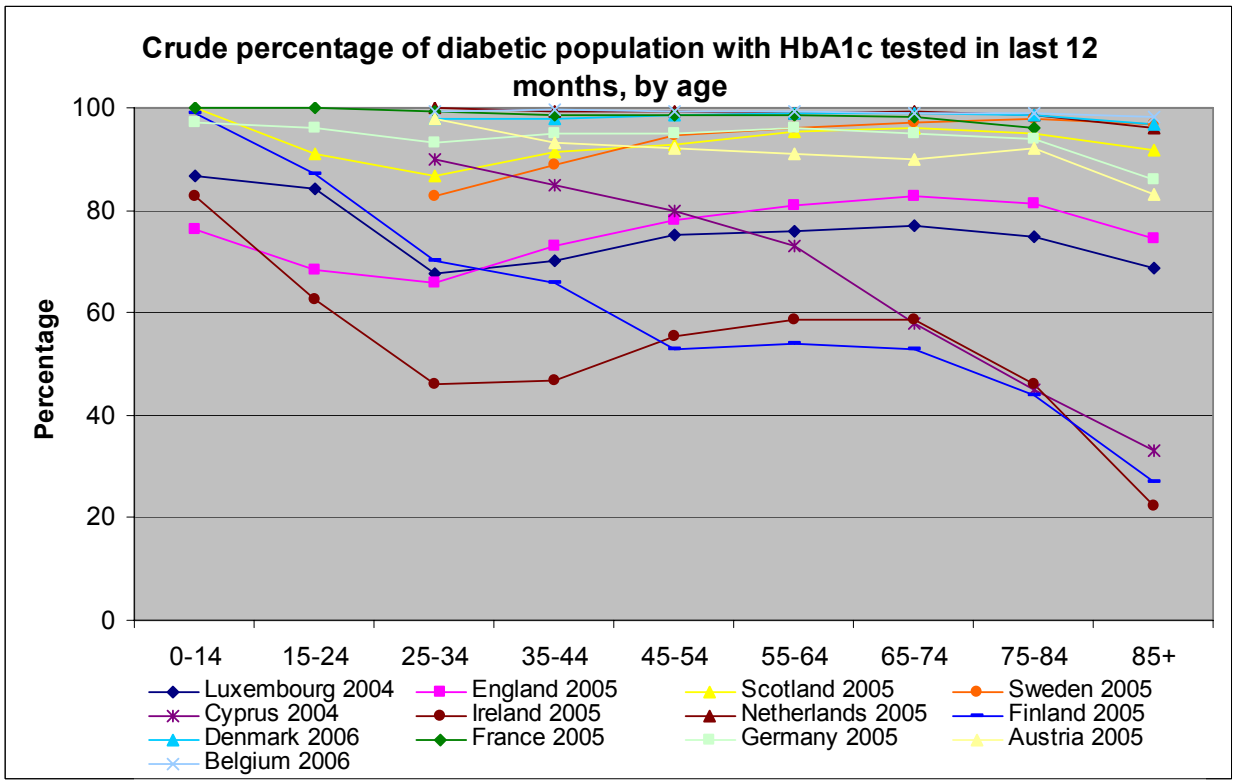


Figure 8b Crude percentage of HbA1c by age measured in different European countries



It is clear that reaching the optimal average blood glucose is not attainable for all the patients. The differences by age group are striking, as is the difference between the countries. The outcomes are also influenced by the lower percentage measured in the older age groups.

3.1.2 Blood pressure

More than 70% of people with type 2 diabetes die of a macrovascular disease like stroke or myocardial infarction. One of the risk factors that has even a higher weight in diabetes compared to non diabetes is the level of blood pressure.

Figures 9 and 10 show the process indicator measured and the percentage of people with a blood pressure in the risk zone as outcome indicator.

Figure 9a Percentage of blood pressure measured in a diabetic population above 25 years of age in different European countries.

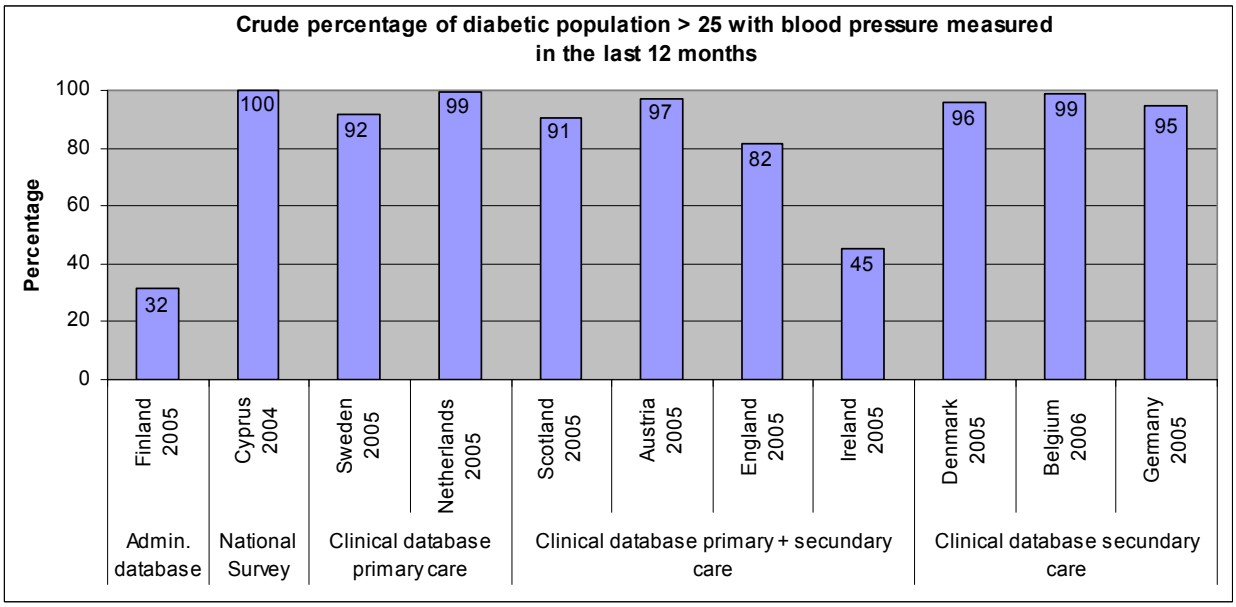


Figure 9b Percentage of blood pressure measured in a diabetic population above 25 years of age by age bands in different European countries

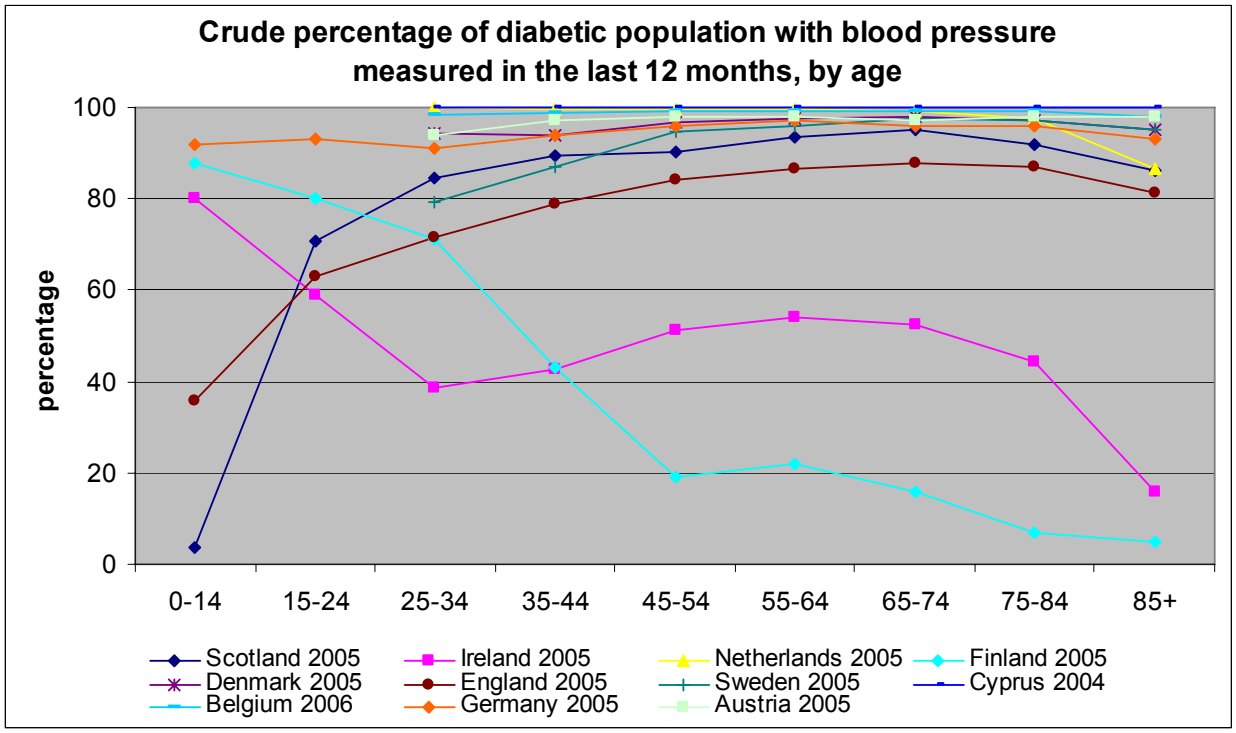


Figure 10a Percentage of blood pressure above 140/90 mm Hg in a diabetic population above 25 years of age in different European countries

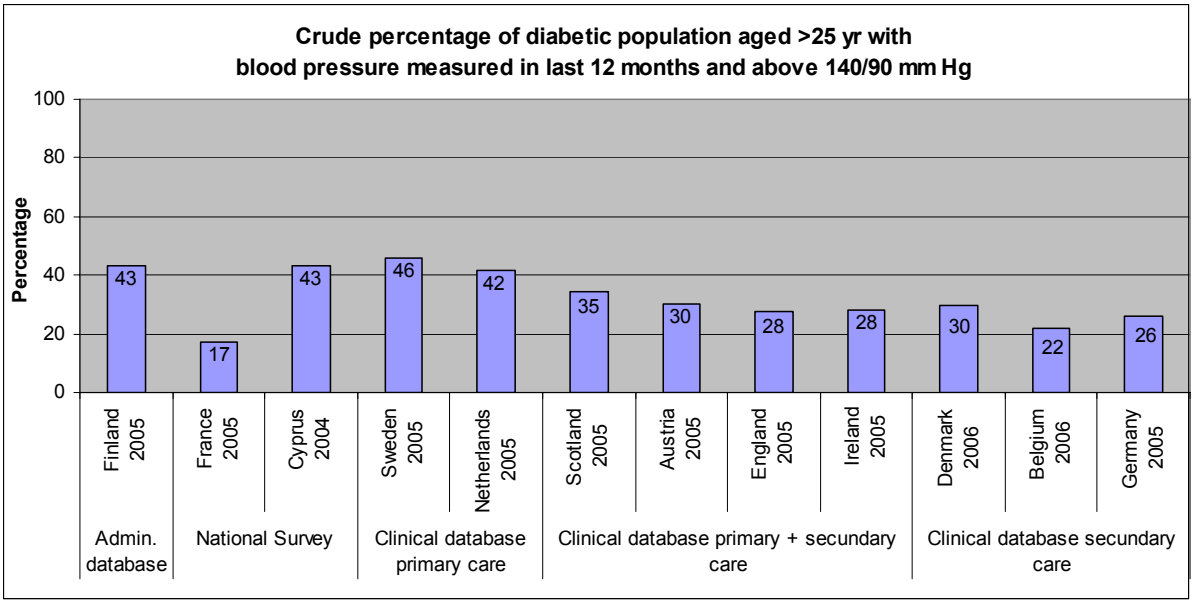
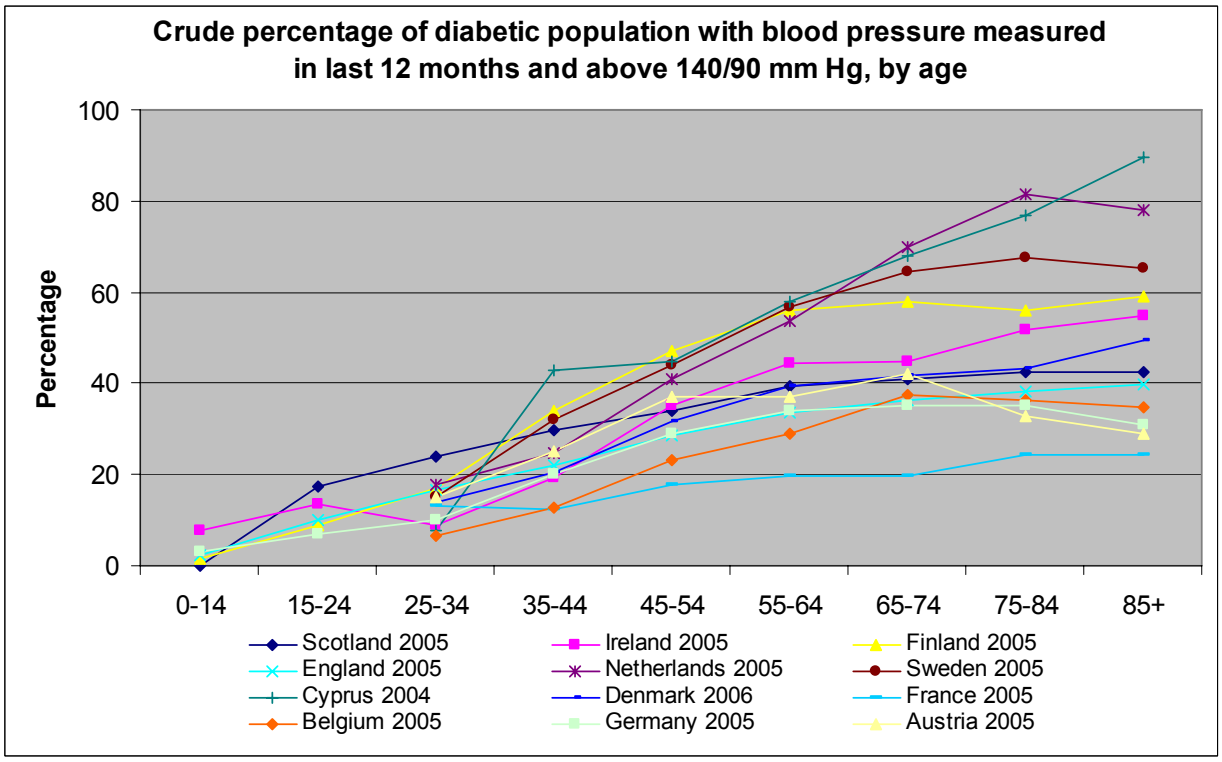


Figure 10b Percentage of blood pressure above 140/90 mm Hg in a diabetic population above 25 years of age by age bands in different European countries



It is obvious that many blood pressure measurements are missed and that when measured a result in the low risk range is not reached in many.

3.1.3 Total Cholesterol

Like blood pressure, level of blood lipids is a risk factors, that has even a higher weight in diabetes compared to non diabetes. The most important blood lipid for this risk factor are total Cholesterol and LDL Cholesterol. Triglycerides have also a negative effect, while HDL-Cholesterol has a positive effect. All these indicators are included in the EUCID list. Since this list is too long to show in this report we show the Total Cholesterol as an example.

Figures 11 and 12 show the indicator Total Cholesterol measured as a process outcome and Total Cholesterol < 5.0 mmol/l as an outcome indicator.

Figure 11a Crude percentage of Total Cholesterol measured in the last 12 months per European country.

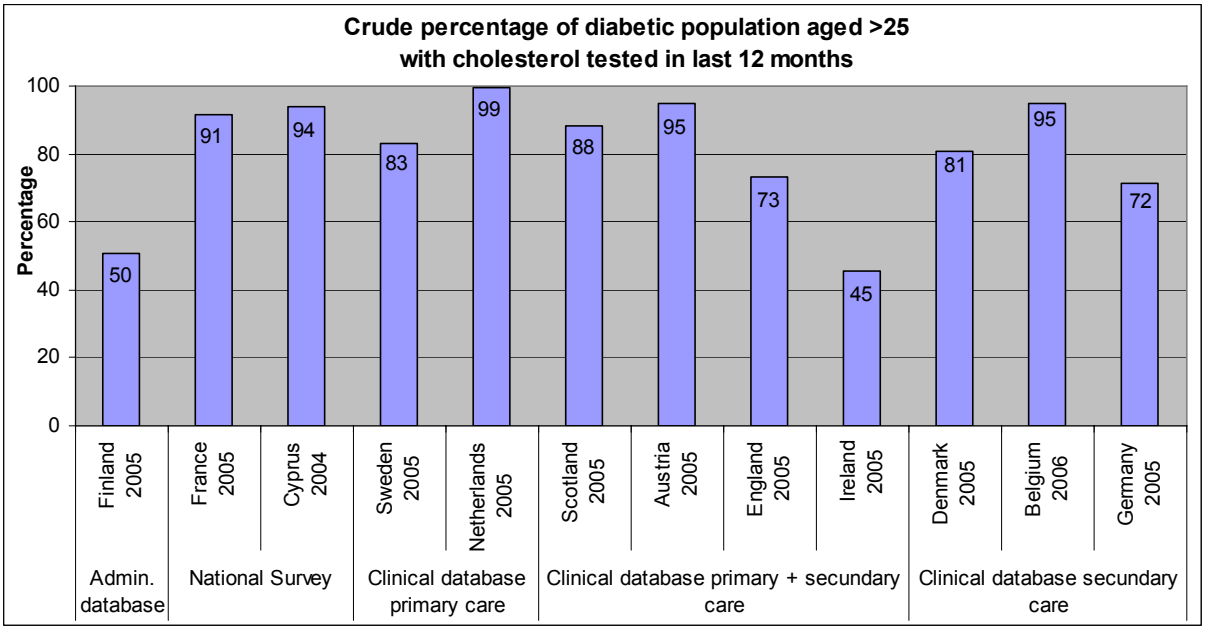


Figure 11b Crude percentage of Total Cholesterol measured by age in the last 12 months per European country

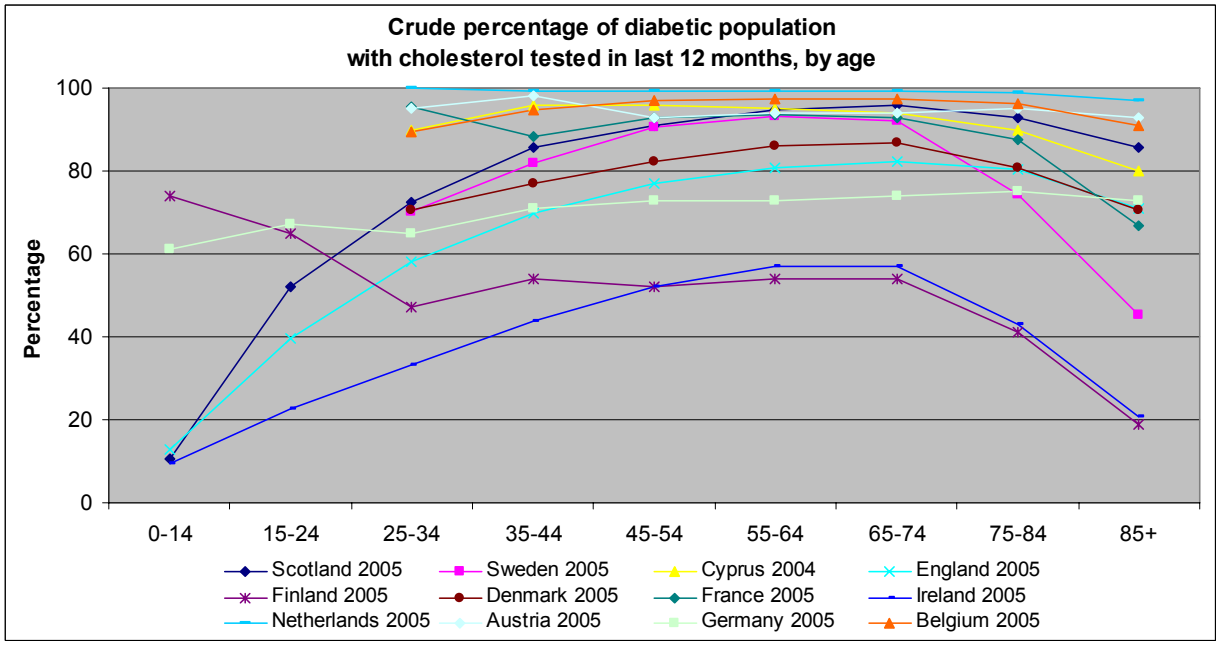


Figure 12a Crude percentage of Total Cholesterol > 5.0 mmol/l in the last 12 months per European country

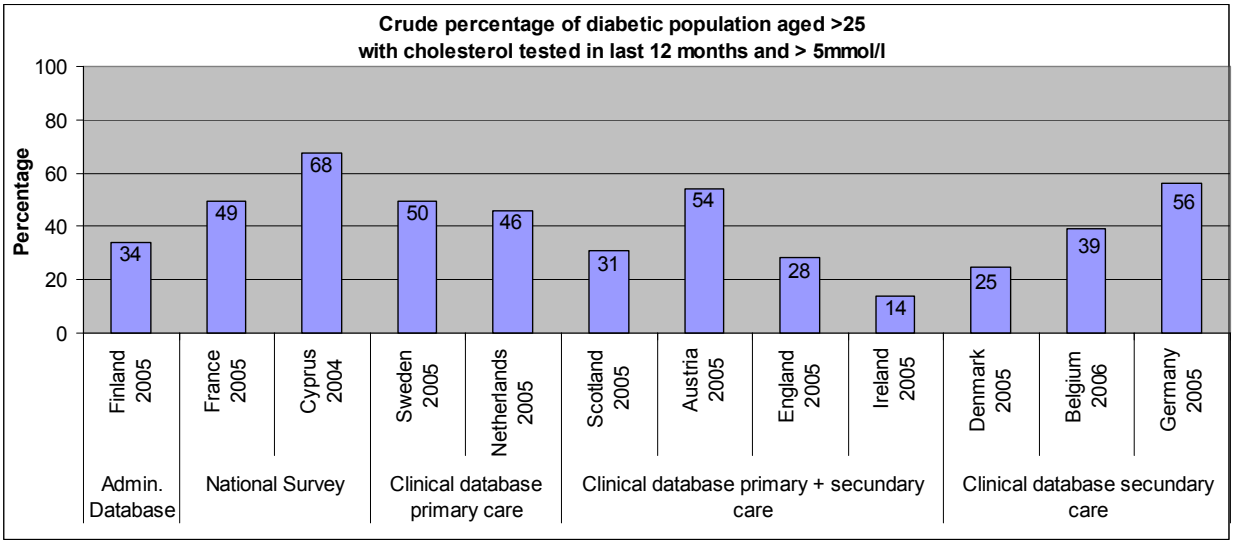
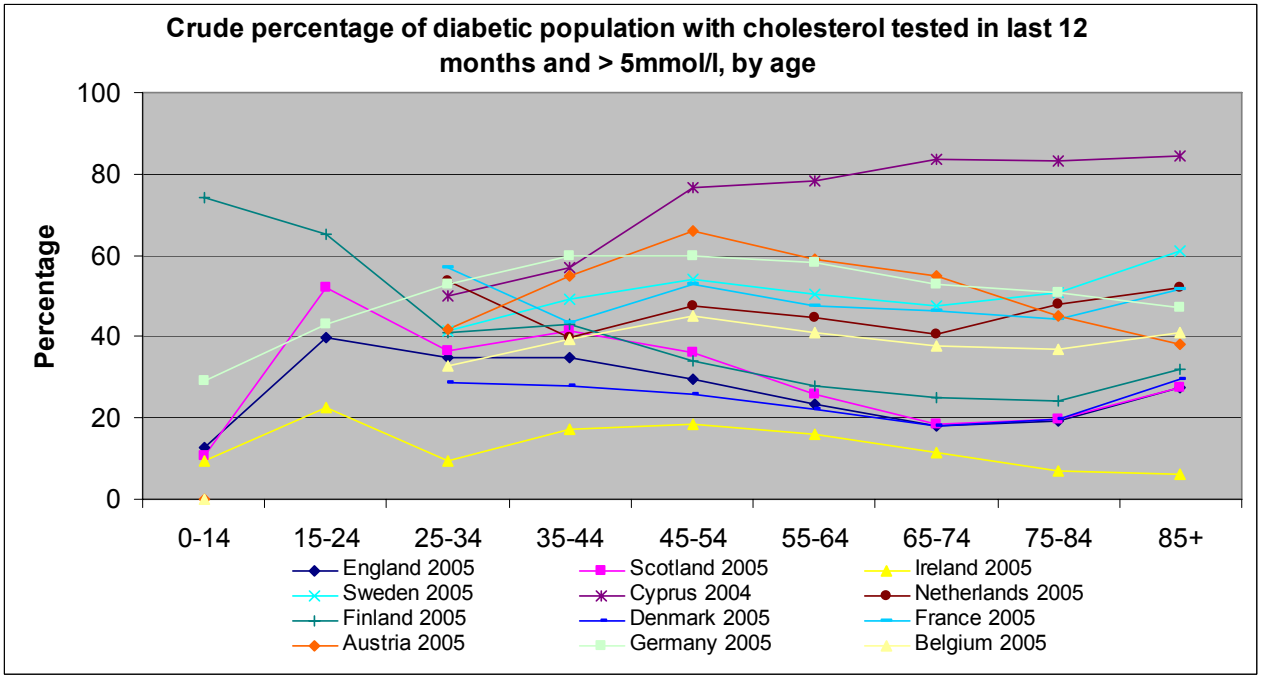


Figure 12b Crude percentage of Total Cholesterol > 5.0 mmol/l in the last 12 months by age per European country



It is clear that 100 % is never reached for measurement of Total Cholesterol in any European country, and if it is measured considerable percentages do not reach the goal of 5 mmol/l.

3.2 Disability

Diabetes has many long term complications. These can be divided in microvascular, end stage renal failure, blindness and diabetic foot, and macrovascular, Stroke, Myocardial Infarction and also diabetic foot. Diabetic foot is a combination of vascular and neural (microvascular) damage.

EUCID has several end points available in the indicator list (Figure 13). We will show the indicator of incidence and prevalence of dialysis/kidney transplantation as an example. For more indicators see the results at the DG-SANCO website or EUCID website (www.eucid.eu) .

Figure 13 Indicators of Disability / Long Term Complications available in the EUCID project. (ESRF: End Stage Renal Failure)

Retinopathy
Retinopathy and timely lasertreatment
Incidence of blindness
Creatinine tested
ESRF
Incidence of dialysis and transplantation
Prevalence of dialysis and transpalntation
Incidence of stroke
Incidence of myocardial infarction
Incidence of major amputation

Several countries in Europe have a national database for kidney function replacement therapy. All of these databases can split the total population by cause of renal failure and provide data for diabetes patients. The incidence and prevalence of dialysis/kidney transplantation in the year 2005 is shown for different European countries in figures 14 and 15.

Figure 14a Incidence of dialysis/transplantation in the diabetic population in different European countries

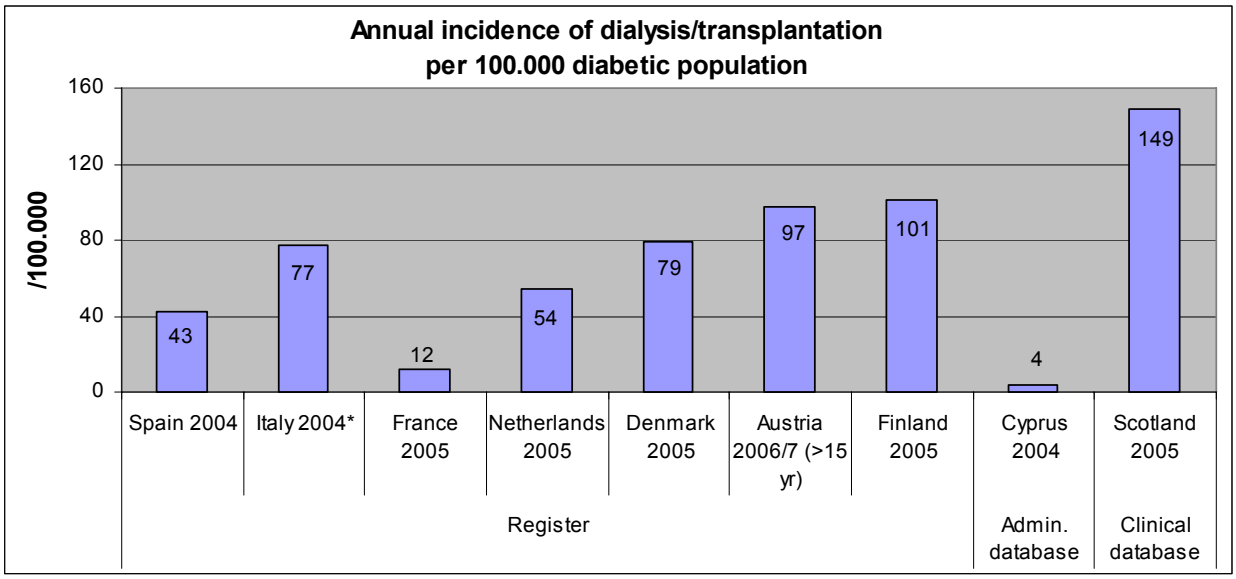


Figure 14b Incidence of dialysis/transplantation in the diabetic population by age in different European countries

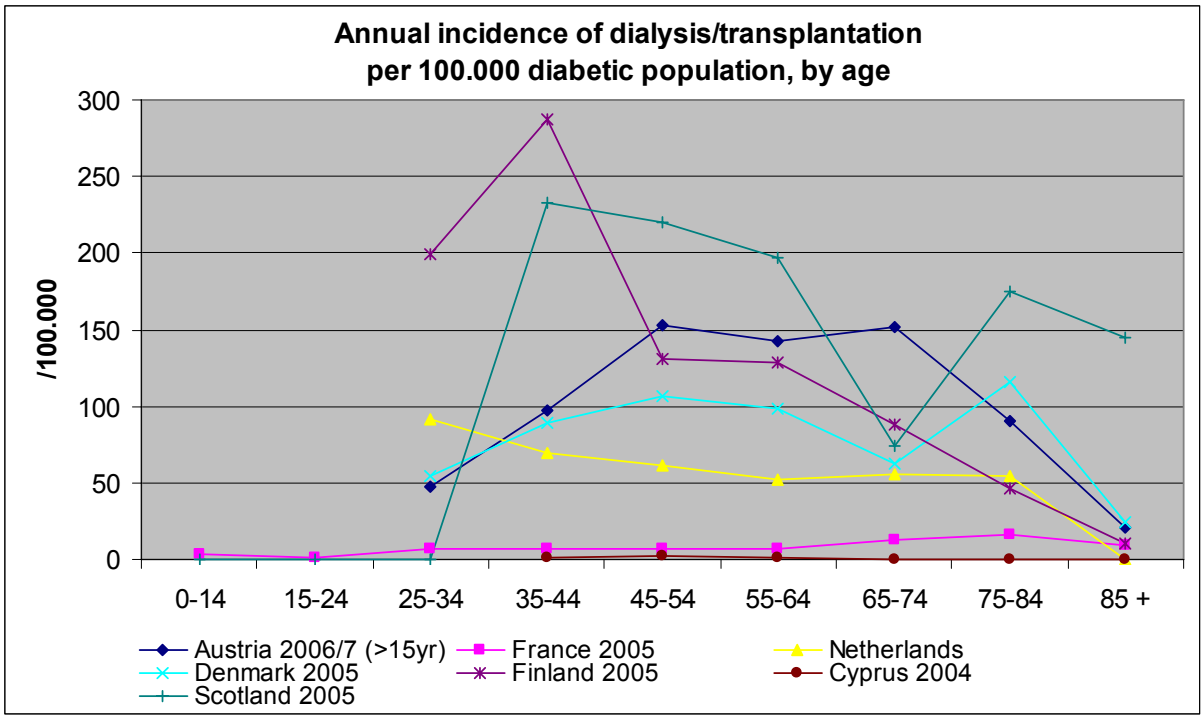


Figure 15a Prevalence of dialysis/transplantation in the diabetic population in different European countries

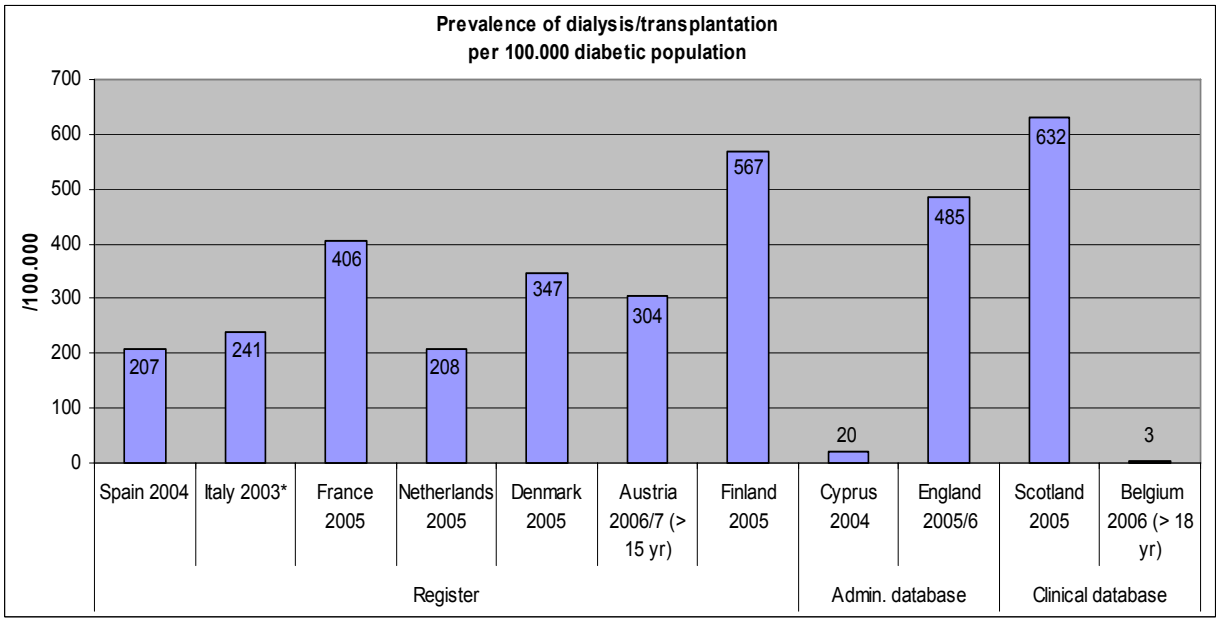
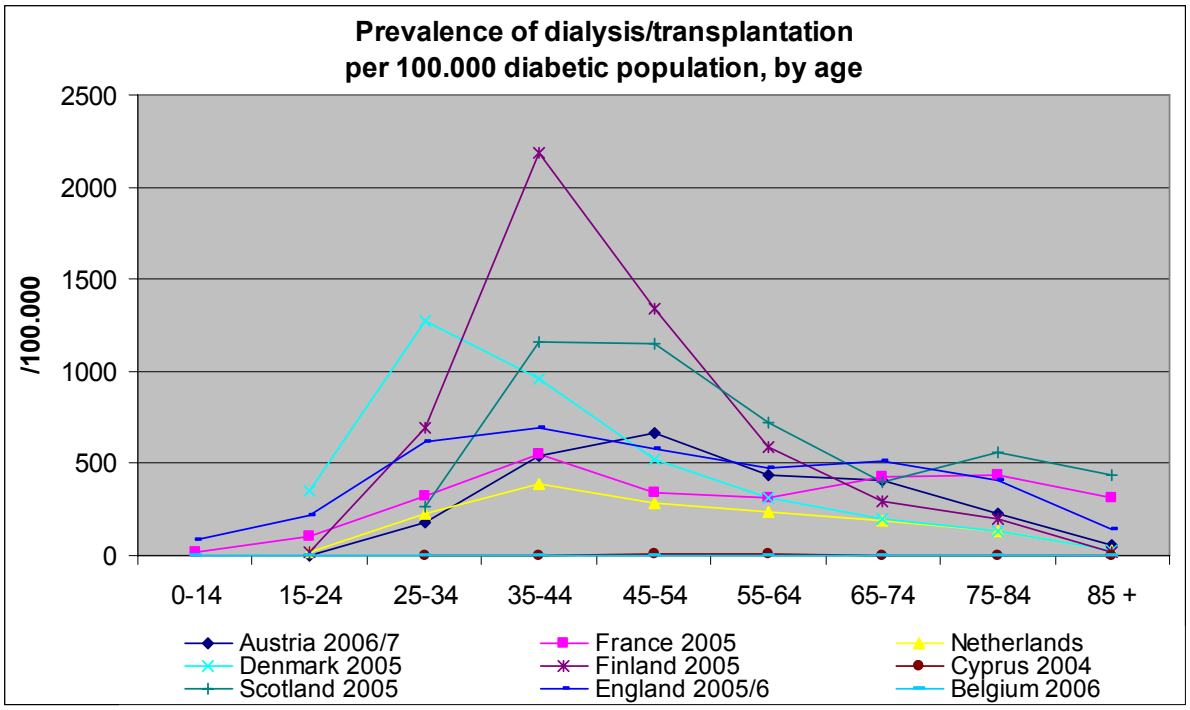


Figure 15b Prevalence of dialysis/transplantation in the diabetic population by age in different European countries



The different European countries have levels of incidence and prevalence of dialysis/kidney transplants that cannot only be explained by the difference in prevalence of diabetes. There seems to be a policy and/or availability of care that differs per country.

4 Mortality

Mortality data for diabetes are not very reliable. Death through acute complications of diabetes like hyperosmolar coma and ketoacidotic coma are reliable and can be retrieved from national death registers. The incidence however is low as treatment is in most instances not a big problem. Since most diabetic patients die however from a macrovascular complications, diabetes will normally not be the primary cause of death but a secondary cause. In only a few countries are regional (Scotland) or national (Denmark) databases of people with diabetes available that can look for the combination of death and diabetes while being alive. Doctors who fill in the death certificate will be very reliable on the primary cause of death, but unreliable for second causes and even less for concomitant diseases.

Death with primary or secondary cause of diabetes is one of the indicators in EUCID. Figure 16a and 16b show the incidence of death with primary or secondary cause of death of diabetes in different European countries.

Figure 16a Standardised rates of mortality per 100.000 individuals in general population with primary or secondary cause of death of diabetes

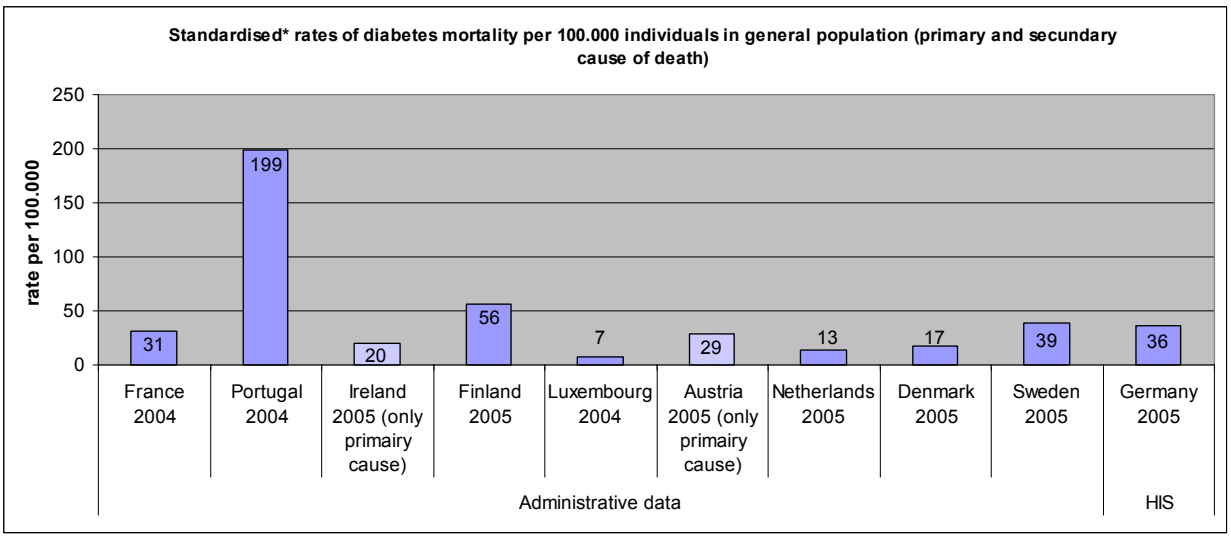
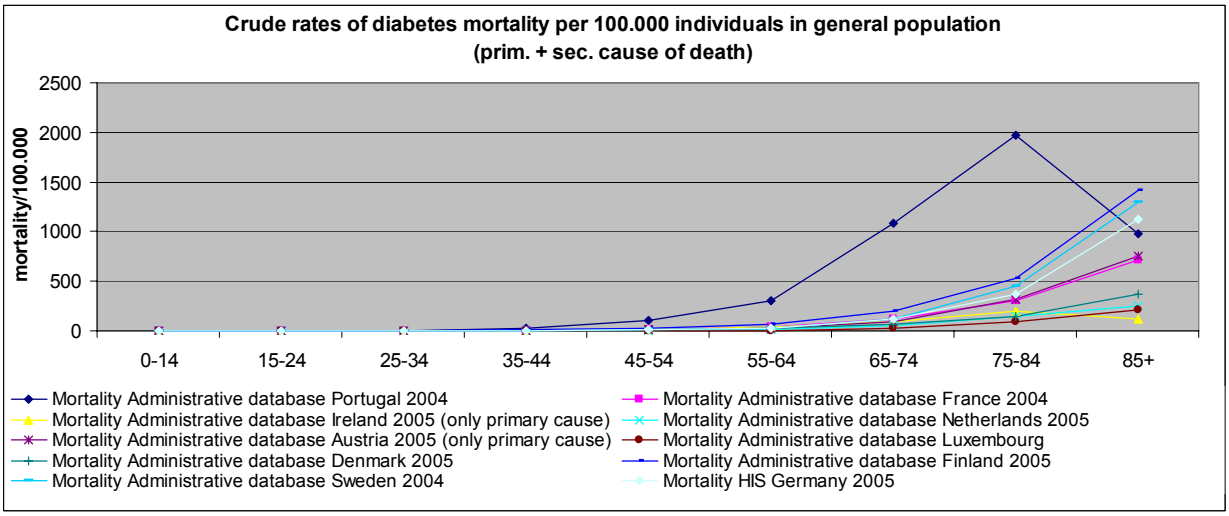


Figure 16b Crude rates of mortality by age group per 100.000 individuals in general population with primary or secondary cause of death of diabetes



We need a more standardised approach of mortality as cause for death to analyse the impact of diabetes on death in the European population. It is obvious that a national database with the individuals with diabetes can solve this problem.

5 Towards the construction of a European Diabetes Register

The BIRO Report Template includes the following measures for governance:

- demographic characteristics (age, gender)
- clinical characteristics (diabetes status, risk factors e.g. obesity, lifestyle, clinical measurements, diabetes complications)
- health system (structures, structural quality, processes, measurement done, treatment, management)

- population (area level)
- risk-adjusted indicators (epidemiology, process quality, intermediate and terminal outcomes)

All measures are stratified to take into account all major confounders and stratification factors.

To ensure that the BIRO Report Template can be practically and reliably applied to all prospective partners, there will need a proactive action of technological transfer as well as a flexible adaptation to the many possible different situations.

By acknowledging the importance of an increased cooperation for the construction of a European Diabetes Registers, both BIRO and EUCID Consortia have decided to merge into a common initiative called “EUBIROD”.

The plan is to spread the use of a unique system of online indicators in as many regions as possible all over Europe, allowing a regular update of EUCID indicators and the periodic release of a EU Report based on the BIRO template.

Targeted training will be performed through the establishment of a “BIRO Academy” that will work both online and through residential courses held at a high-level scientific facility.

The project, following submission to the SANCO call 2007, has been favourably evaluated and is currently undergoing the negotiation process, with a proposed start in the first months of 2008.

6 Conclusion

Diabetes care indicators differ considerably amongst the European countries. Some differences can be explained by medical causes, but many have no obvious reason. The organisation of care can be one of the explanations. For this reason it is important that politicians involved in health policy increasingly have access and regularly use targeted indicators to optimise the organisation of health care for people with diabetes.

Paradoxically, key indicators that are crucially needed to plan diabetes care, like prevalence of impaired fasting glucose and death with diabetes as primary or secondary cause are still inconsistently available at the moment.

Identifying solutions to make all key indicators available at all levels can be highly effective to reduce the burden of diabetes both in economical and clinical terms.

Appendix

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9 Haematological Malignancies

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The HAEMACARE Project

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9.1 Introduction

Haematological malignancies (**lymphomas, leukaemias and multiple myeloma**) constitute a large fraction of blood diseases in adults. Leukaemias and non-Hodgkin's lymphomas (NHL) are the commonest haematological malignancies (HMs), accounting for 6% of all cancer deaths in the EU. [1] In 1995 the Age-standardised incidence in the EU was 8/100,000 for NHL; 2 for Hodgkin lymphoma (HL), 2 for multiple myeloma (MM), and 6 for leukaemias. [2] Incidence of NHL is increasing in most countries [3].

In recent years, important developments have occurred in diagnosis and treatment of HMs. Effective treatments for HL are available since the end of 1970s, based on conventional chemo- and radio- therapy. In recent years, the discover of innovative molecular targeted treaments - such as imatinib for subtypes of myeloid chronic leukaemia – likely will modify the natural history of these diseases, and improve prognosis in the near future.

Population based survival and prevalence are important indicators of outcome and are crucial to plan the resources necessary for public health provision. There are considerable differences in survival for HMs across European countries, with eastern European countries showing low survival also for potentially curable tumours like Hodgkin's lymphoma. Despite the importance of population Cancer Registry data for monitoring the effectiveness of health systems, the comparison of incidence, prevalence and survival for HMs across countries and over time is difficult, due to changes in the classification of HMs, which now makes use of morphologic, immunologic and genetic criteria. Furthermore, most studies on HMs are carried out on selected series of patients, so that results may not be generalisable to the entire population.

9.2 The Relevance of Haematological Malignancies for Public Health

The existence of differences in survival for HMs across the European member states (and between Europe and US) suggests differences in the access to and availability of appropriate diagnosis and treatment facilities. In recent years, important developments have occurred in diagnosis and treatment of HMs.The diffusion of innovative molecular targeted therapies are likely to improve the prognosis in the near future. However, the high cost of these new treatments may generate inequalities in availability and access to treatments, which should be carefully monitored.

9.2.1 Classification of haematological malignancies, comparability of indicators

The classifications of HMs used by Cancer Registries are not always up-to-date or compatible with clinical classifications. Various classifications for HMs have been used in recent years, based on morphological and clinical features and genetic and immunohistochemical criteria. The evolving classification for NHL complicates comparisons of disease incidence and survival over time and across regions. Better standardization and uniform classification will help explaining the reasons of differences in survival across the European countries.

In order to increase the comparability of incidence, survival and prevalence produced by Cancer Registries, the European Union funded in 2005 the HAEMACARE project.

The main aims of HAEMACARE are:

1. Revision of HM coding procedures used by Cancer Registries, ensuring strict adherence to ICD-0 morphology codes, and making them consistent with nosologic categories currently used by clinicians.
2 Improve public health use of clinical data. Indicators of clinical activity for HMs by country, will be provided, through integration of data from population Cancer Registries and clinical networks on HMs.

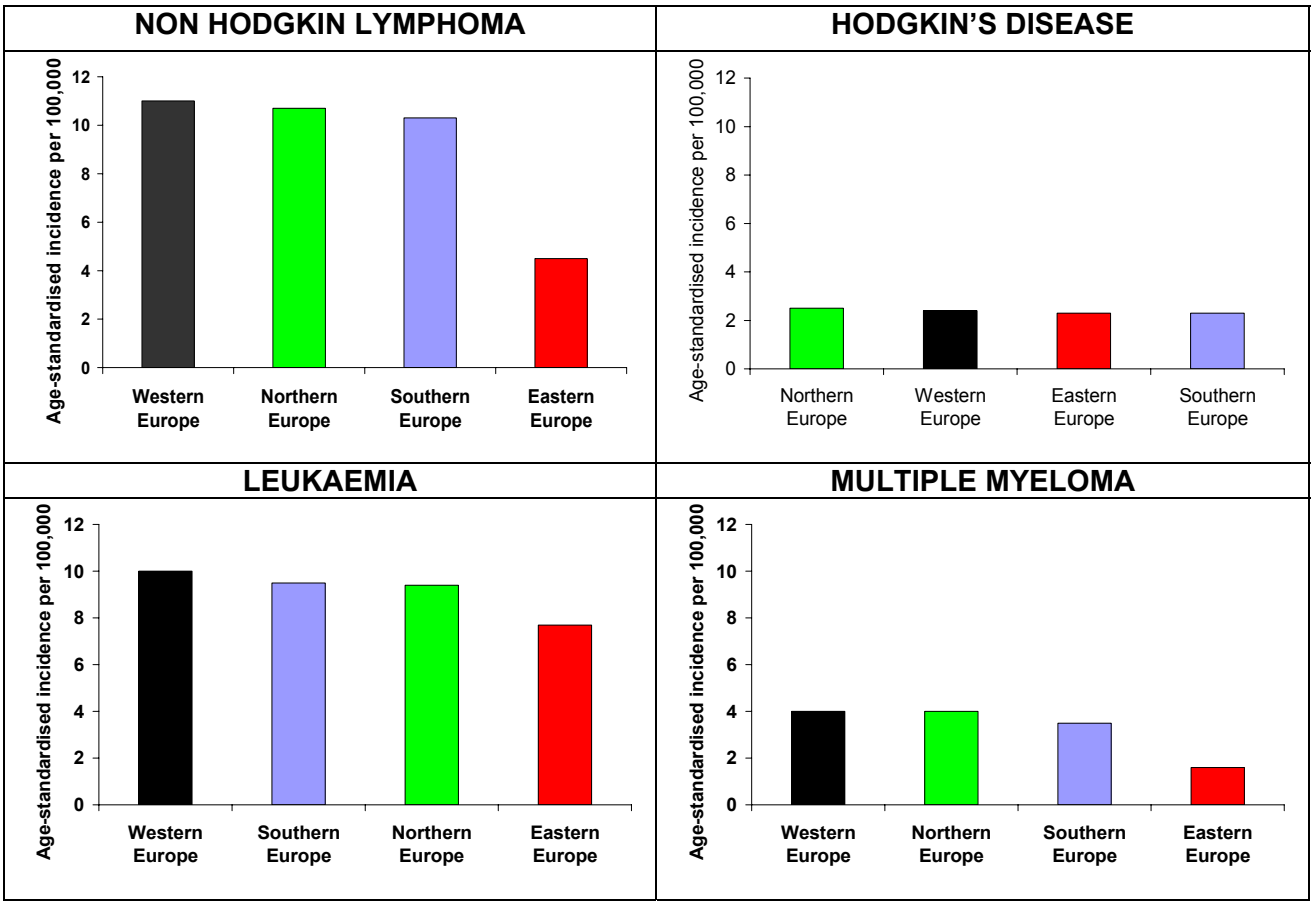
9.3 Incidence and mortality

The GLOBOCAN project is a unique source of the most up-to-date information on cancer incidence, mortality and prevalence using data provided by Cancer Registries worldwide, provided by the International Agency for Research on Cancer [4]. The European countries included in the GLOBOCAN project are divided in 4 geographic areas or regions: **Eastern Europe** (Belarus, Bulgaria, Czech Republic, Hungary, Moldova, Poland, Romania, Russian Federation, Slovakia, Ukraine), **Northern Europe** (Denmark, Estonia, Finland, Iceland, Ireland, Latvia, Lithuania, Norway, Sweden, UK), **Southern Europe** (Albania, Bosnia Herzegovina, Croatia, Greece, Italy Macedonia, Malta, Portugal, Slovenia, Spain, Yugoslavia), **Western Europe** (Austria, Belgium, France, Germany, Luxemburg, The Netherlands, Switzerland).

9.3.1 Incidence

There is a considerable variation in the Incidence of HMs across Europe.
As shown in Figures 9.3.1a, Non-Hodgkin lymphomas constituted the most frequent HM. In 2002, its age standardised incidence rate in men was double in the Western European countries (11/100,000) compared to the East European countries (4,5/10000). The age standardized incidence of MM was approximately 2/100000 in the Eastern European countries and 4/100000 in the Northern and Western European countries.
The regional variation in incidence of all Leukaemias considered together was lower (ranging from 10/100,000 in Western Europe to 8/100,000 in Eastern Europe).
The incidence of HL was similar across the European regions.
Men had higher HMs incidence than women for all HMs.

Figures 9.3.1a Age-standardised incidence rate for main HMs in men, by European region



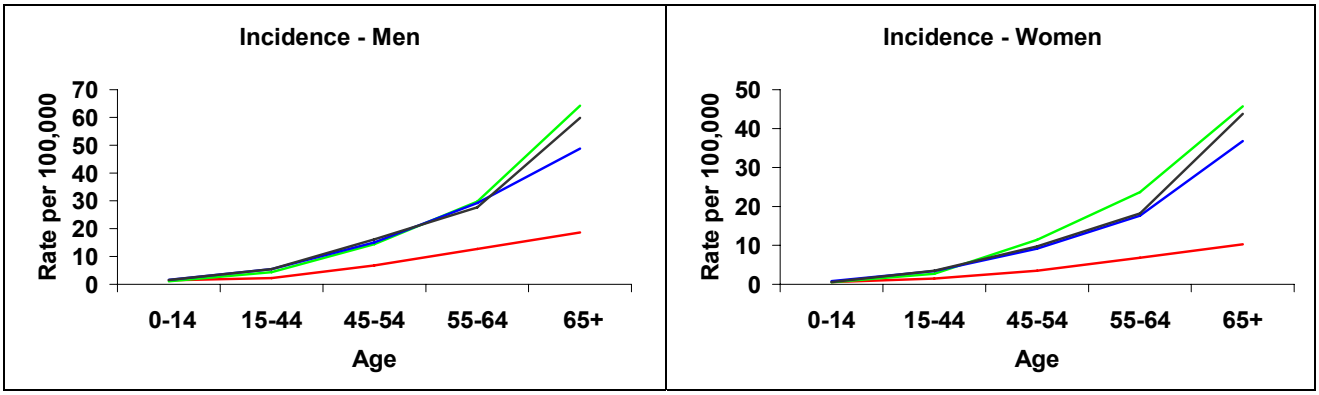
(Source: GLOBOCAN 2002)

Figures 9.3.1b show the incidence rates per 100,000 for the main HMs in the European regions, by age and sex.

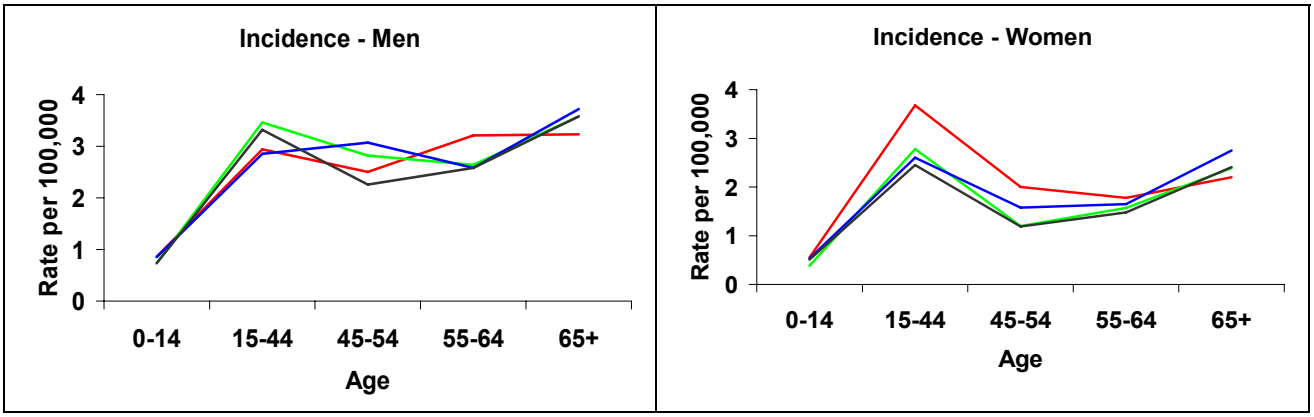
Some HMs are rare (NHL and Leukaemia) or absent (MM) in children under 14 years old. Their incidence increases steeply after age 55, reaching a maximum after age 65 (approximately 60/100,000 for NHL and 30/100,000 for MM). The incidence of HL showed two peaks: one in young adults and the other in the elderly. In the Eastern European countries women aged up to 55 had the highest incidence pattern compared to the other regions.

Figures 9.3.1b Incidence rate for main HMs by age, sex and European region (Source: GLOBOCAN 2002)

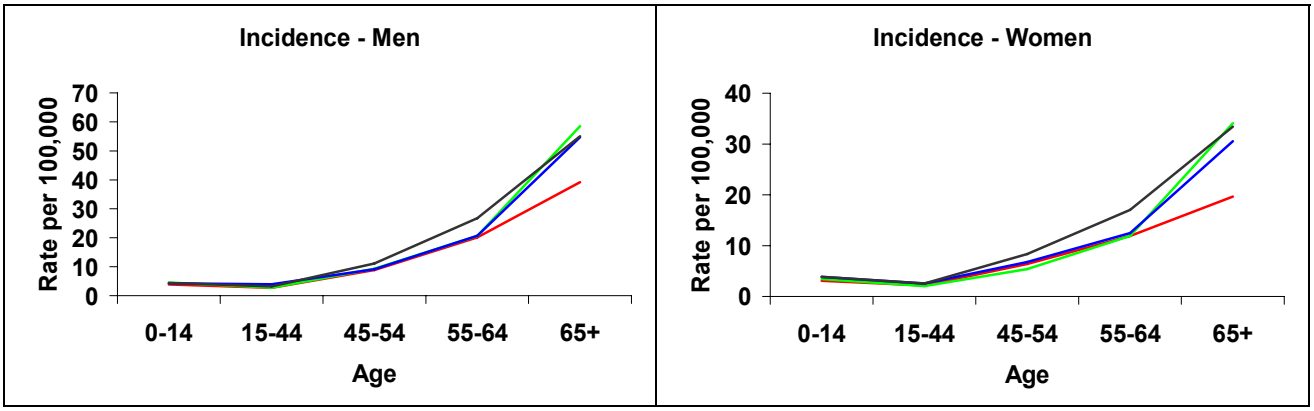
NON HODGKIN LYMPHOMA



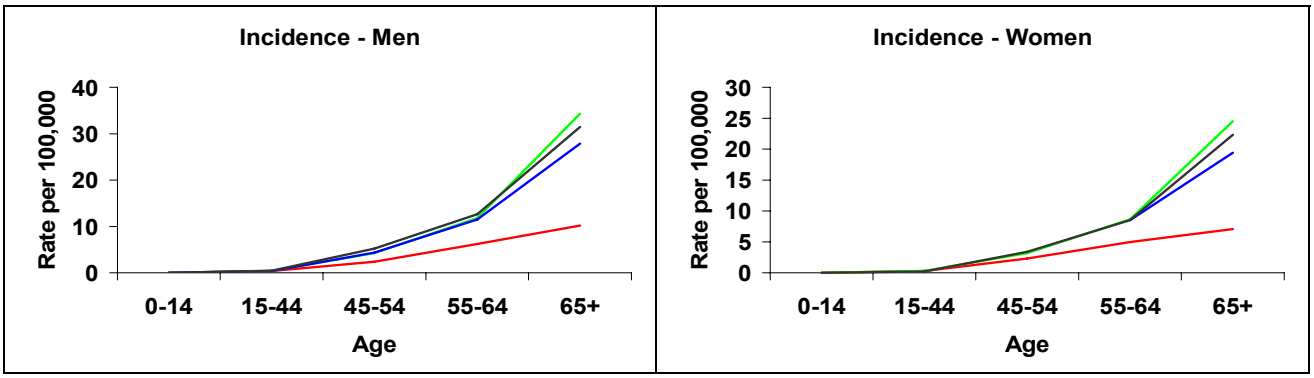
HODGKIN'S DISEASE



LEUKAEMIA



MULTIPLE MYELOMA



Northern Europe Western Europe Eastern Europe Southern Europe

9.3.2 Brief review of risk factors for Haematological malignancies

Incidence reflects the prevalence of risk factors in the population under study. Compared to other tumours, there is less evidence of causal relationship between risk factors and HMs. Many of the etiological studies carried out to date suggest etiological hypotheses, however a large part of these studies are not conclusive. The strongest causal relationships were found for ionising radiations and subsequent risk of leukaemia, immunodeficiency status and subsequent risk of NHL and for viral infections such as Epstein Barr Virus and Burkitt's lymphoma/leukaemia [ref 3,5,6]. The relevant knowledge can be briefly summarised as follows:

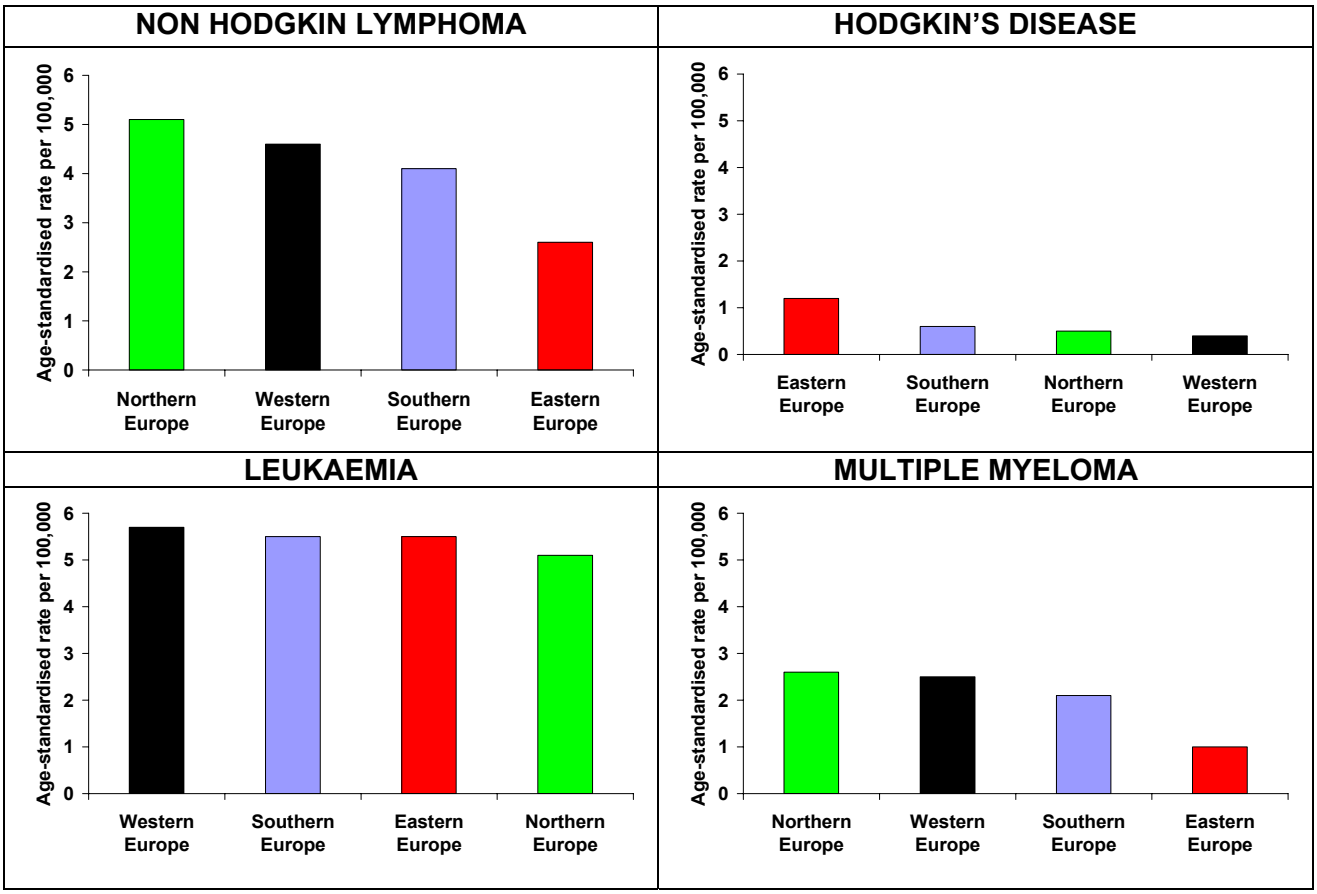
- **Congenital conditions.** About 25% of patients with congenital imunodeficiencies (Wiskott-Aldrich, ataxia teleangiectasica etc) will develop tumors during their lifetime, with NHL accounting for 50% of those observed. Some diseases caused by abnormal chromosomes (e.g. Down syndrome) may increase the risk of leukaemia.
- **Familial predisposition.** Lymphohematopoietic cancers in patients and increased risk in at least one siblings for NHL has repeteadly been observed. In the same time, first-degree relatives (parents, siblings, or children) of CLL patients have a two-to-fourfold increased risk for this cancer.
- **Immunosuppressive drugs** after organ transplantation increases six fold the risk of NHL whereas alkylating drugs administrated in cancer patients increase the risk of leukaemia.
- Infections. Except for Africa, *AIDS* patients show a 60- to 100-fold higher NHL risk than the general population. The HTLV-1, EVB, Helicobacter pylori and Campylobacter jejuni, Hepatitis C virus and Chlamydia psittaci account for an increased NHL incidence, as well. The HTLV-1 causes a rare type of chronic lymphocytic leukaemia known as human T-cell leukaemia.
- **Other health conditions.** Autoimmune diseases such as Sjogren's syndrome, rheumatoid arthritis, celiac disease account for an increased NHL incidence, whereas myelodysplastic syndrome increases risk of developing acute myeloid leukaemia.
- **Exposure to environmental agents.** Studies have demonstrated a two to eightfold increase in NHL risk following a frequent use of herbicides (in particular 2,4-dichlorophenoxyacetic acid). An occupational risk for hematologic cancers in hairdressers and cosmetologists has been reported, but there are also studies that were unable to confirm this hypothesis. Working with certain chemicals (benzene) in the chemical industry increases risk for leukaemia, too. The role of formaldehyde has recently been reviewed, but there is not conclusive evidence of its causal association to leukaemia or lymphoma.
- **Ionising and UV radiation.** Very high levels of radiation (e.g. nuclear power plant accidents) have been strongly associated to leukemia, but no evidence is provided for an association to NHL. Radiation used for diagnosis, however, exposes people to much lower levels of radiation and is not linked to leukaemia. Results from recent studies show that the association between electromagnetic fields and leukaemia is weak.
- **Lifestyle-related risk factors.** While studies on alcohol consumption or smoking provide little evidence, if any, that these are associated to NHL, the only proven lifestyle-related to leukaemia is smoking.

9.3.3 Mortality

Mortality data on HMs are provided by the GLOBOCAN database.
As shown in Figures 9.3.3a, in 2002, the standardised mortality rate of NHL in men from the Northern European countries was approximately 5/100,000 and that of MM in men from the Western European countries was 2,5/100,000. These values are more than the double of those in men from the East European countries. Conversely, the standardised mortality rate of HL in men from Eastern Europe (1,2/100,000) was three fold superior to that in men from

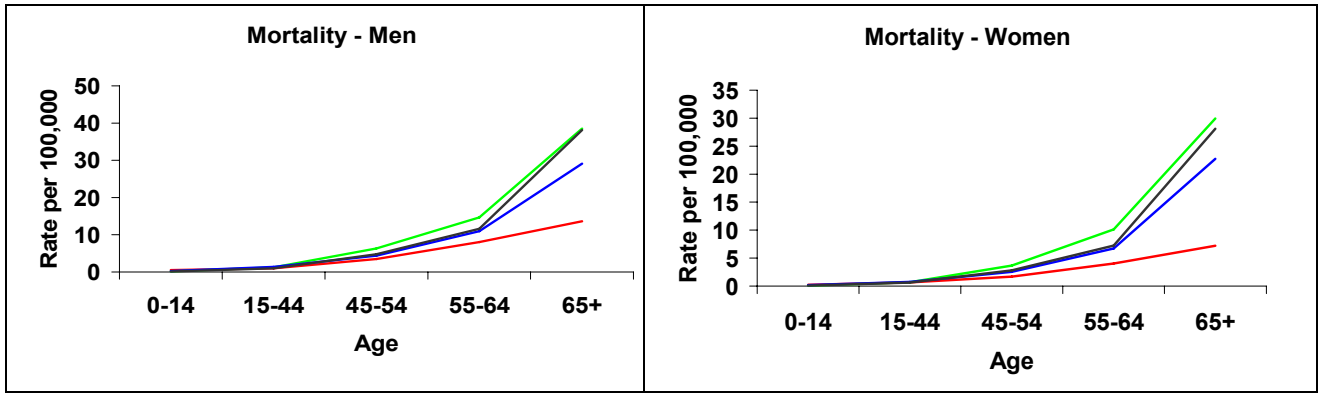
Western Europe. For Leukaemia no significant difference by geographic area were observed. As for incidence, mortality in people affected by HMs was higher in men than women.

Figures 9.3.3a Age-standardised mortality rate for main HMs in men, by European region (Source: GLOBOCAN 2002)

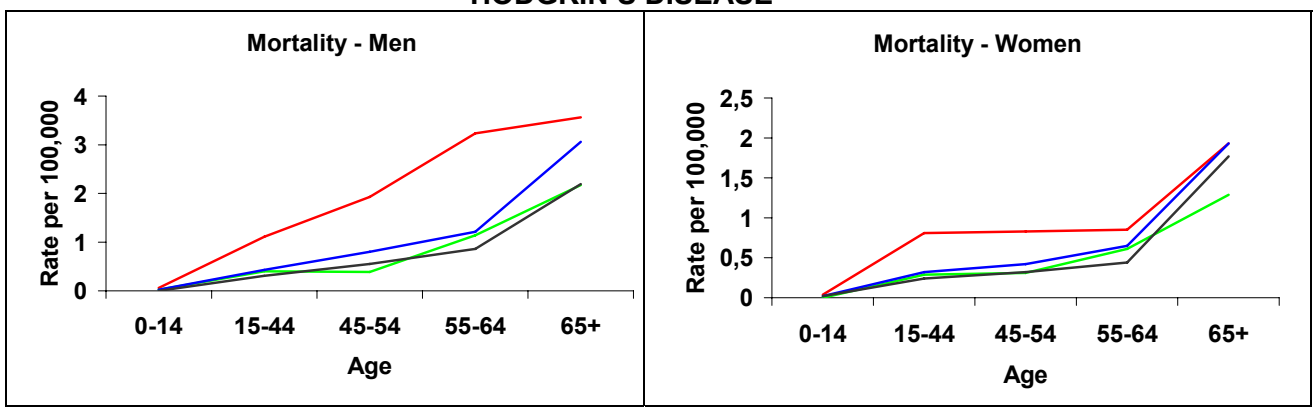


Figures 9.3.3b show the mortality rates per 100,000 persons for the main HMs in the European countries, by age and sex. Mortality increases with increasing age at diagnosis. In all geographical areas, mortality rate in men over 65 years is much higher than that in men of all ages, especially for NHL and Leukaemia. Mortality in old people is lower in the Eastern European countries than in the other European regions, except for HL.

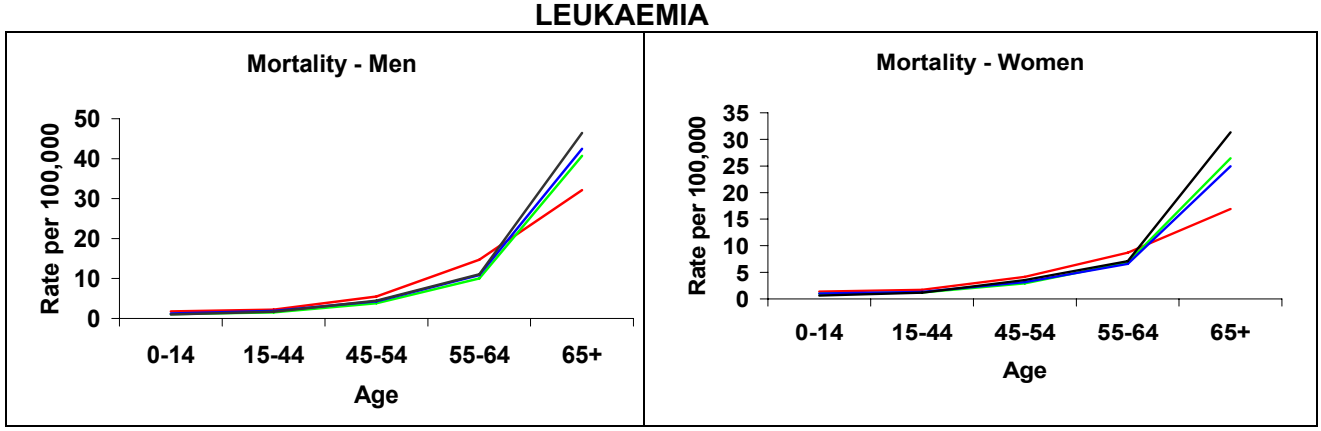
Figures 9.3.3b Mortality rate for main HMs by age, sex and European region (Source: GLOBOCAN 2002)



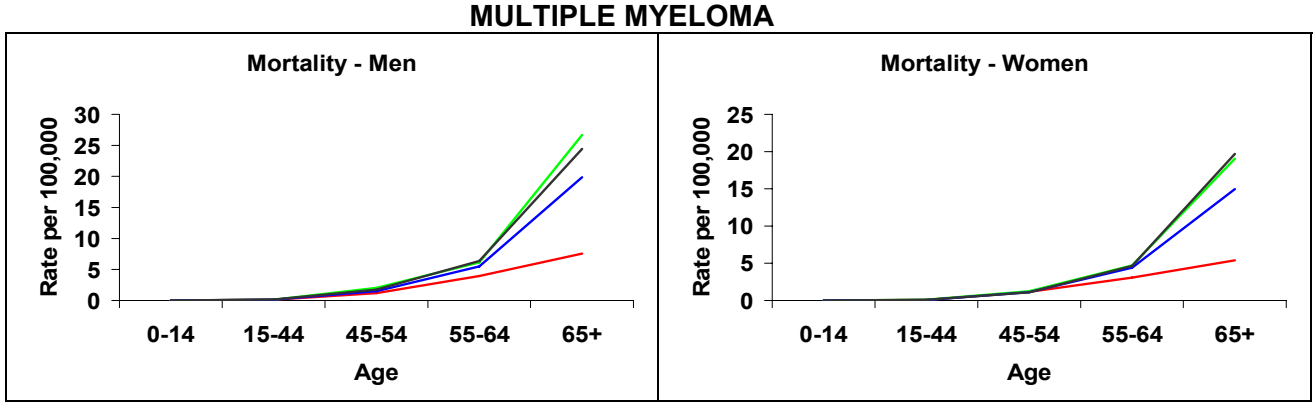
HODGKIN'S DISEASE



LEUKAEMIA



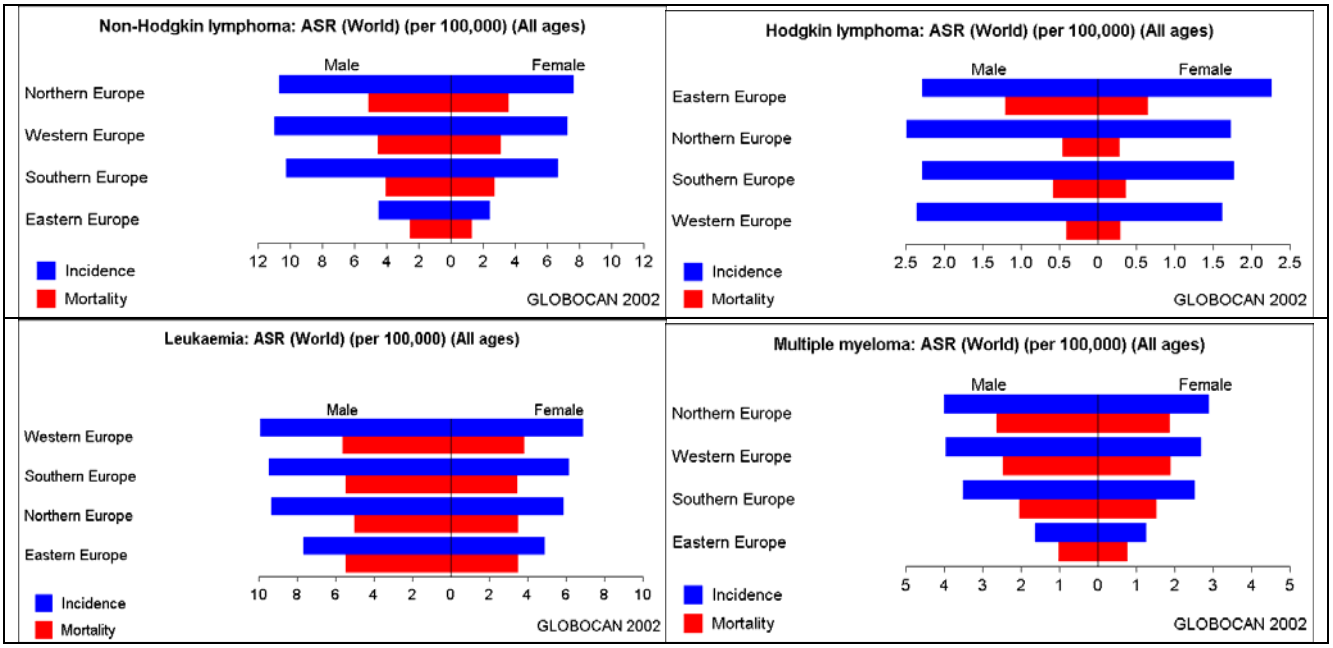
MULTIPLE MYELOMA



Northern Europe Western Europe Eastern Europe Southern Europe

Figures 9.3.3c illustrate a comparison between Incidence and Mortality Age-Standardized Rate of HMs in 2002, by sex and European region. Higher differential between incidence and mortality rates suggests better survival. Thus, in all the European regions, HL and NHL had better survival than MM and Leukaemia. Eastern European countries have poor survival comparatively to the countries in the other European Regions.

Figures 9.3.3c Differential between the Incidence and Mortality Age Standardized Rates of HMs (Source: GLOBOCAN 2002)



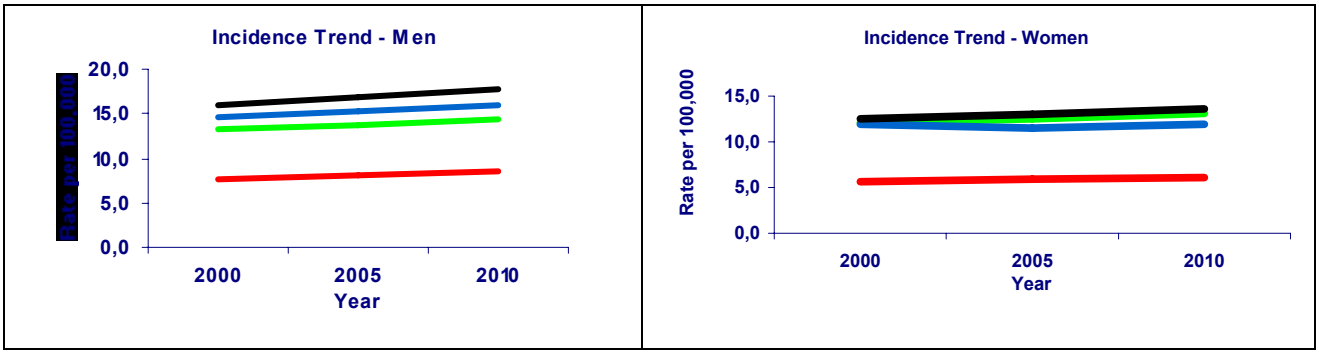
9.3.4 Incidence and mortality time trends

Figures 9.3.4a and 9.3.4b show the time trend of the incidence and mortality estimated rates per 100,000 for main HMs, by sex and by European region, in the period 2000 -2010. (GLOBOCAN 2000)

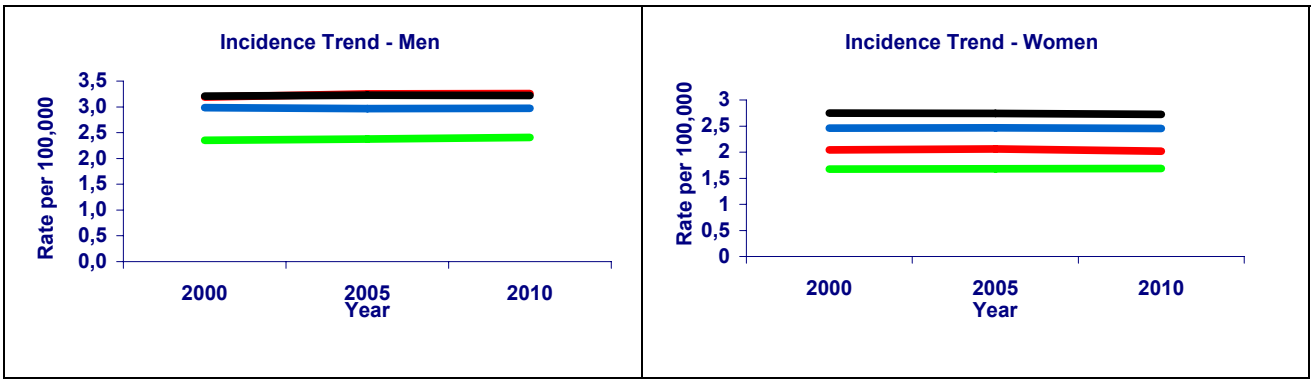
An increase of incidence and mortality is estimated in all the European regions and for all the main HMs, except HL. This increasing trend is more accentuated in the Western and Northern European countries where the predicted incidence rate in men will increase from 16 to 18/100,000 for NHL, from 12 to 14/100,000 for Leukaemia and from 5 to 6/100,000 for MM. Although the predicted evolution of the mortality rate in the Western and Northern European countries reflects the incidence trend, the differential value between is lower. It increases from 7 to 8/100,000 for NHL, from 9 to 10/100,000 for Leukaemia and from 4 to 5/100,000 for MM.

Conversely, in the Eastern European countries the predicted increase of the incidence and mortality rates is lower than in the other European regions.

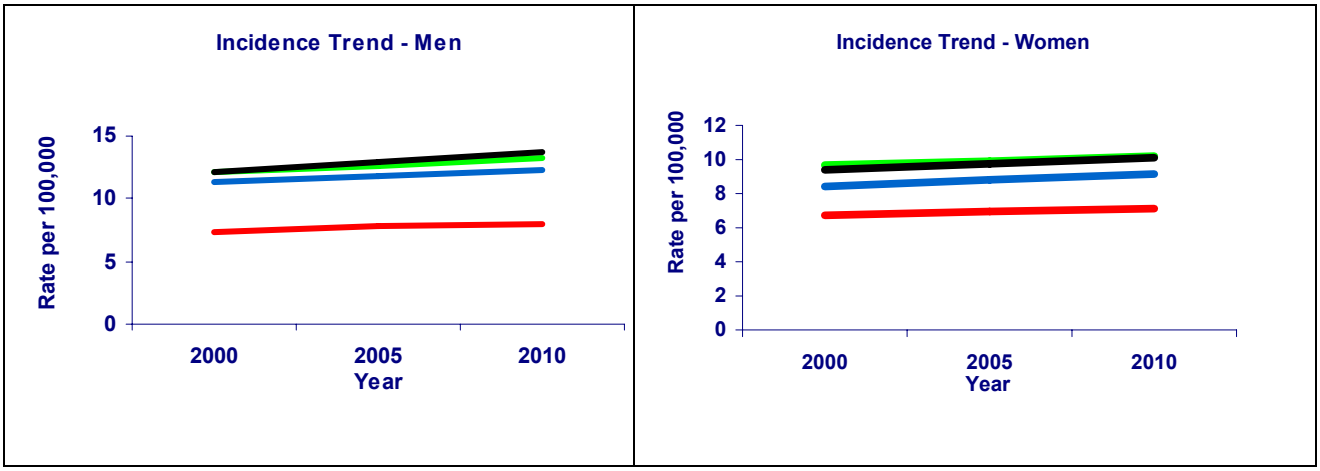
Figures 9.3.4a Incidence rate trend for main HMs, by sex and by European region (Source: GLOBOCAN)



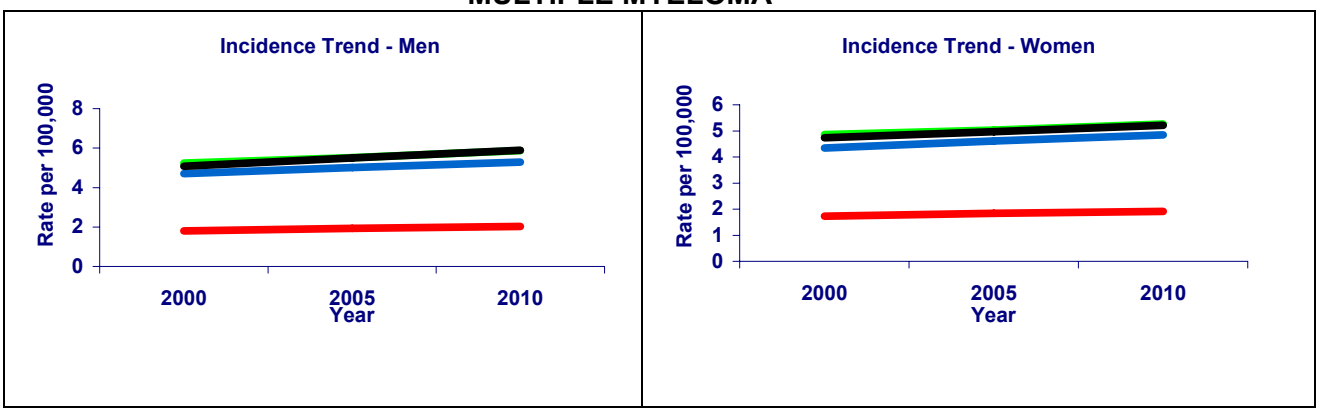
HODGKIN'S DISEASE



LEUKAEMIA



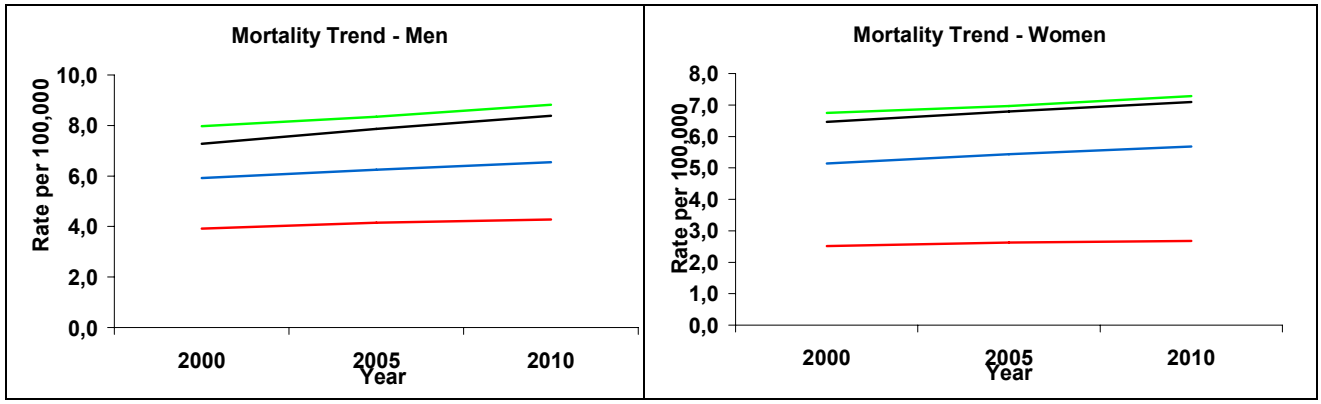
MULTIPLE MYELOMA



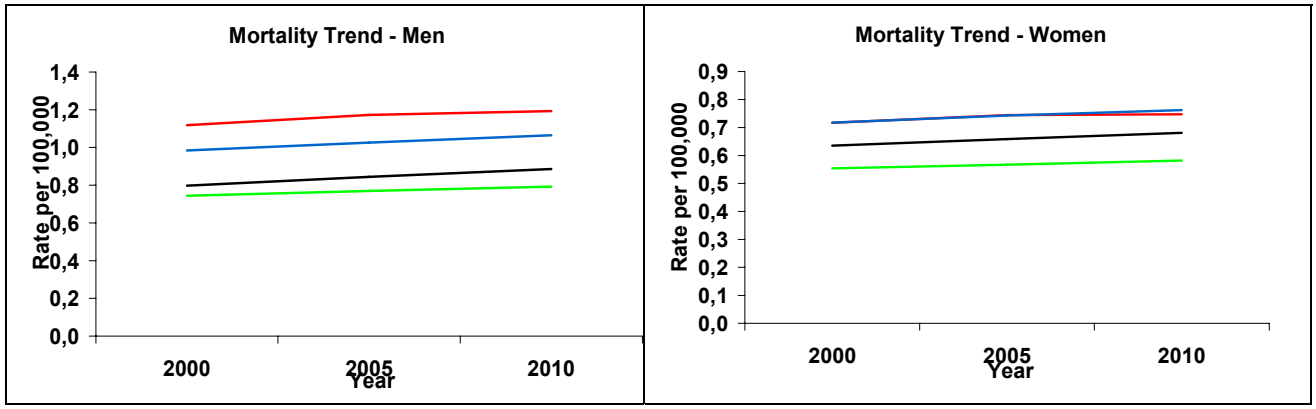
Northern Europe Western Europe Eastern Europe Southern Europe

Figures 9.3.4b Mortality rate trend for main HMs by age, sex and European region (Source: GLOBOCAN)

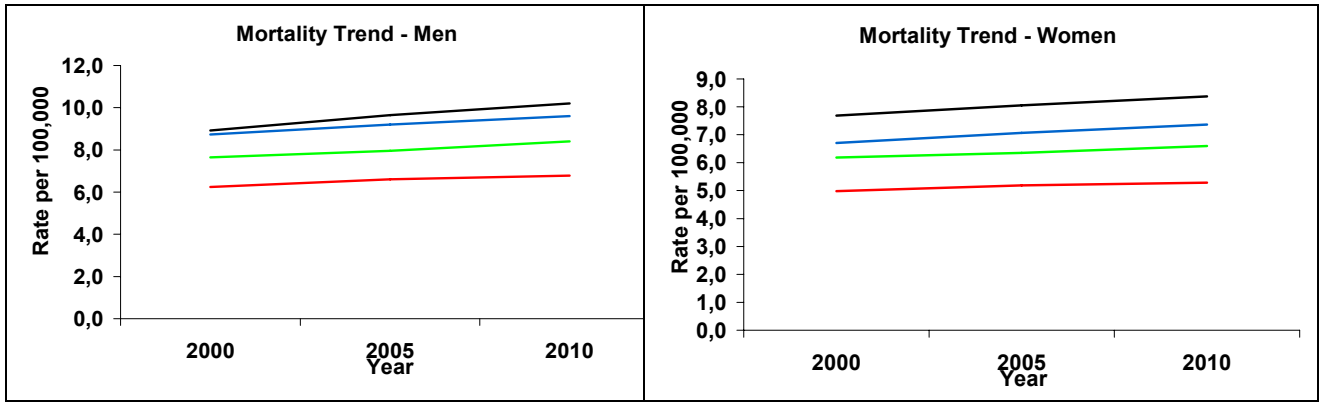
NON HODGKIN LYMPHOMA



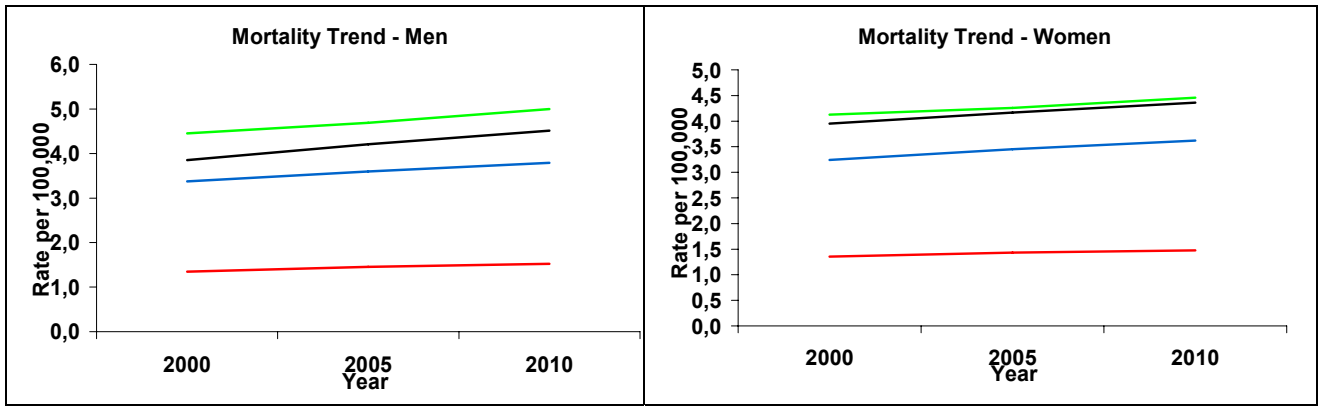
HODGKIN'S DISEASE



LEUKAEMIA



MULTIPLE MYELOMA



Northern Europe Western Europe Eastern Europe Southern Europe

9.4 Survival

Survival is provided by the EUROCARE project. The results of the EUROCARE-4 study provide us with information on the 5-year relative survival of people affected by the main HMs, diagnosed between 1995-1999 in 70 Registries from 23 European countries. [7]

Figures 9.4a illustrate the age-adjusted 5-year relative survival in Europe, by type of HMs and by country in the EUROCARE-4 study. Survival for HMs varied strikingly. Moreover there was a great difference in survival between the European countries.

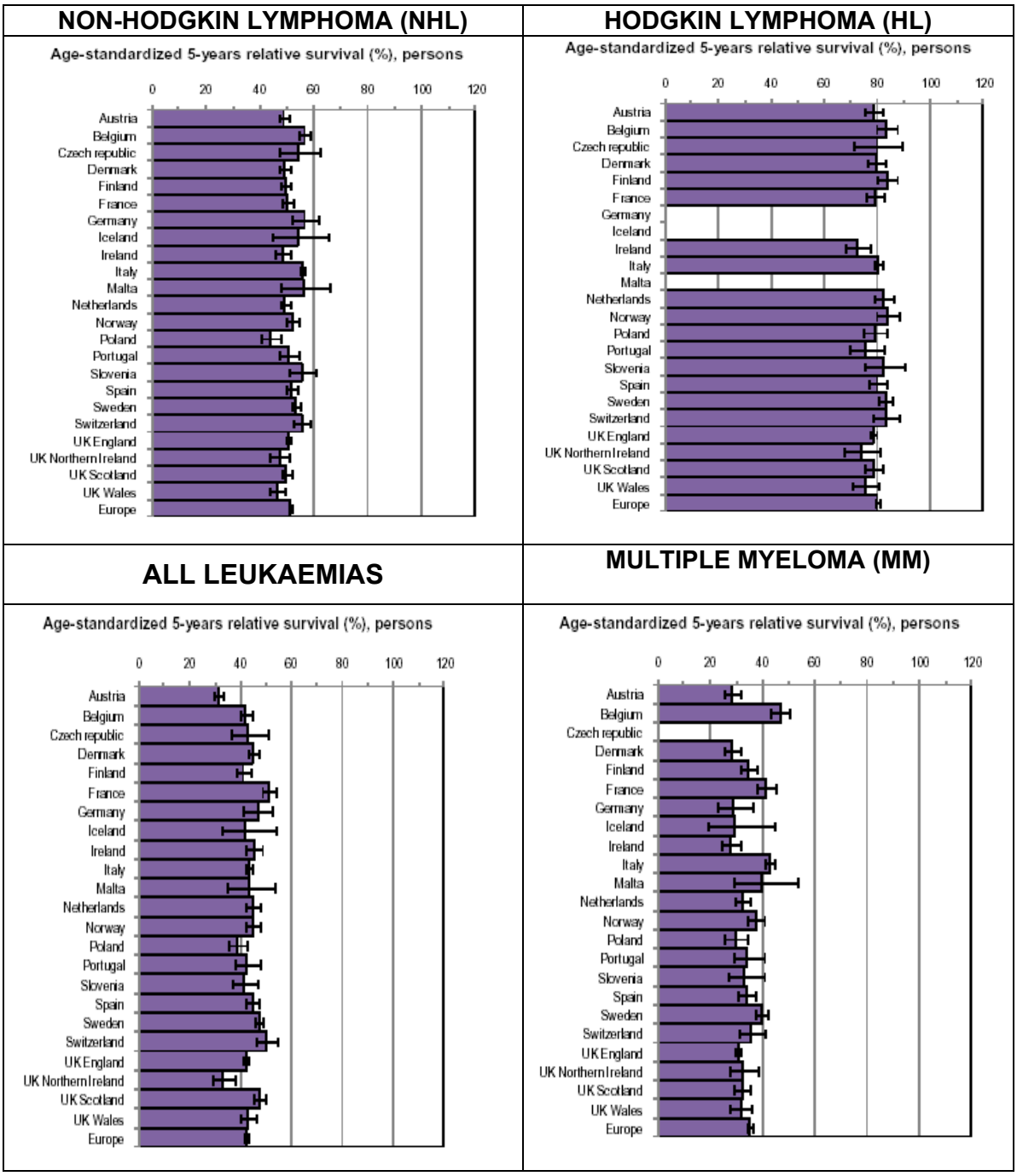
The age-adjusted 5-year relative survival in Europe was high for HL (80%), with a maximum in Northern countries (Norway, Finland) and Belgium (84%) and a minimum in Ireland (72%). For NHL the age-adjusted 5-year relative survival was 51%. The best survival for NHL was observed in Germany and Belgium (57%) and the poorest in Poland (44%).
Conversely, people affected by Leukaemias or MM had rather poor survival (42,5% and 35% respectively). The best survival for all Leukaemias was in France (51%), while the poorest was in Austria (31,5%). For MM the survival ranged from 28% in Ireland to 47% in Belgium.

Figures 9.4b show the 5-year age adjusted relative survival for different types of Leukaemia, by country in patients diagnosed in 1995-99. It was observed that Chronic Lymphatic Leukaemia (or CLL) had the highest survival from all Leukaemia. It was 68% in Europe, with a maximum of 78% in France and a minimum of 52% in Austria.

Other types of Leukaemia have not so good prognosis. For example, the age-adjusted 5-year relative survival was poor for Chronic Myeloid Leukaemia (or CML) and for Acute Lymphatic Leukaemia (or ALL). For CML, the percentage of people with 5-year survival in Europe was 36% (range: 21,5% - 54%), while for ALL it was 31% (range: 25% - 44%).

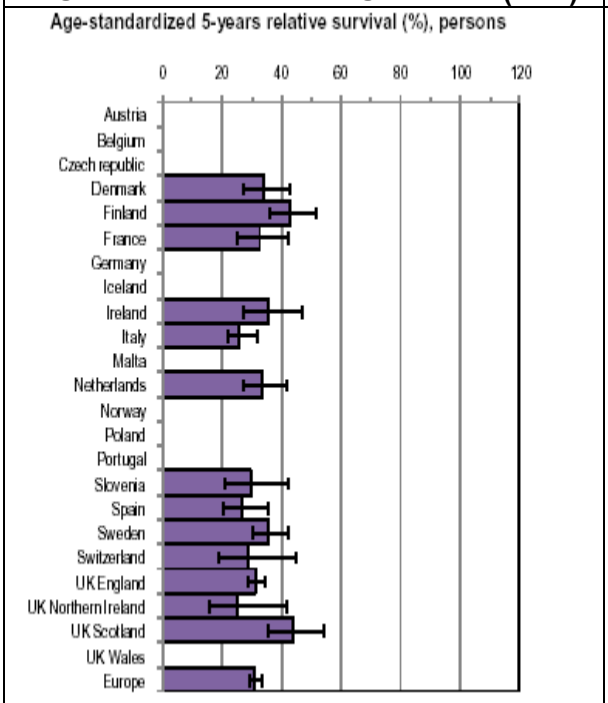
The HM with the poorest survival was Acute Myeloid Leukaemia or AML (14%), for which the best survival was observed in Belgium (20)% and the worst in Slovenia (5%).

Figures 9.4a Five-year age adjusted relative survival for HMs, by country in patients diagnosed in 1995-99. (Source: EUROCARE- 4)

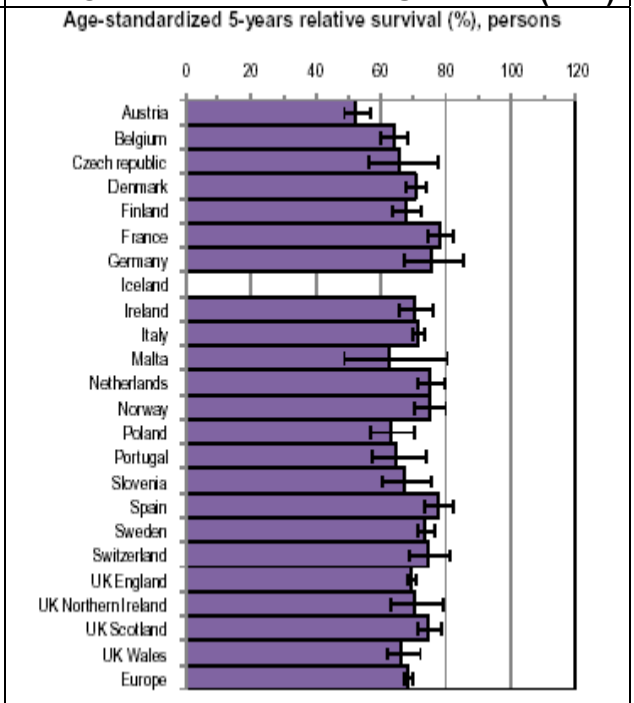


Figures 9.4b Five-year age adjusted relative survival for different types of Leukaemia, by country in patients diagnosed in 1995-99. (Source: EUROCARE- 4)

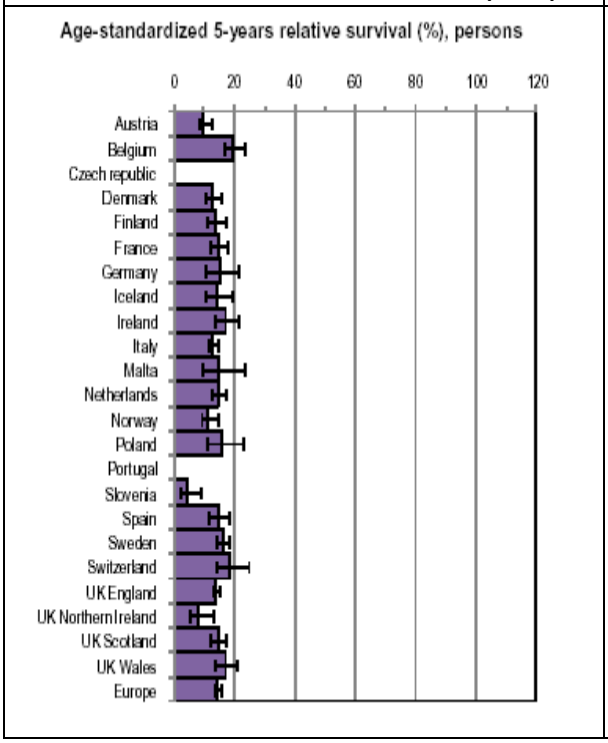
ACUTE LYMPHTATIC LEUKAEMIA (ALL)



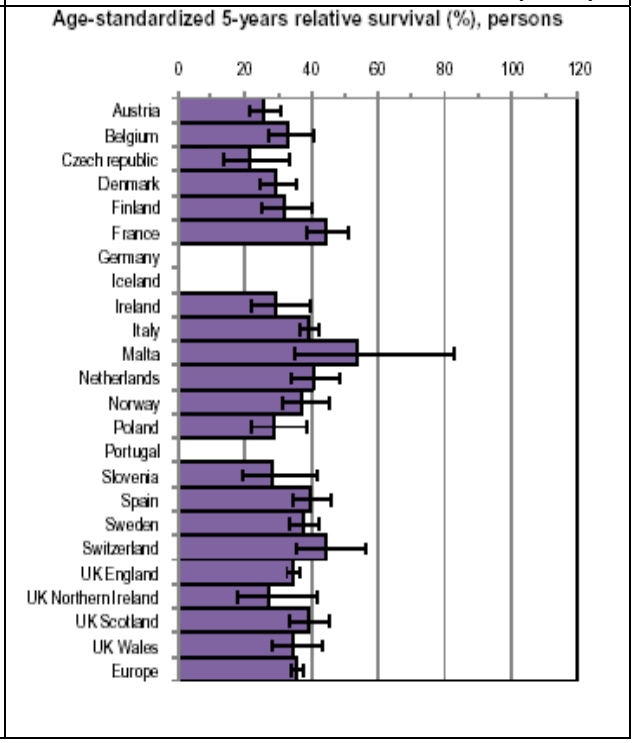
CHRONIC LYMPHTATIC LEUKAEMIA (CLL)



ACUTE MYELOID LEUKAEMIA (ALL)



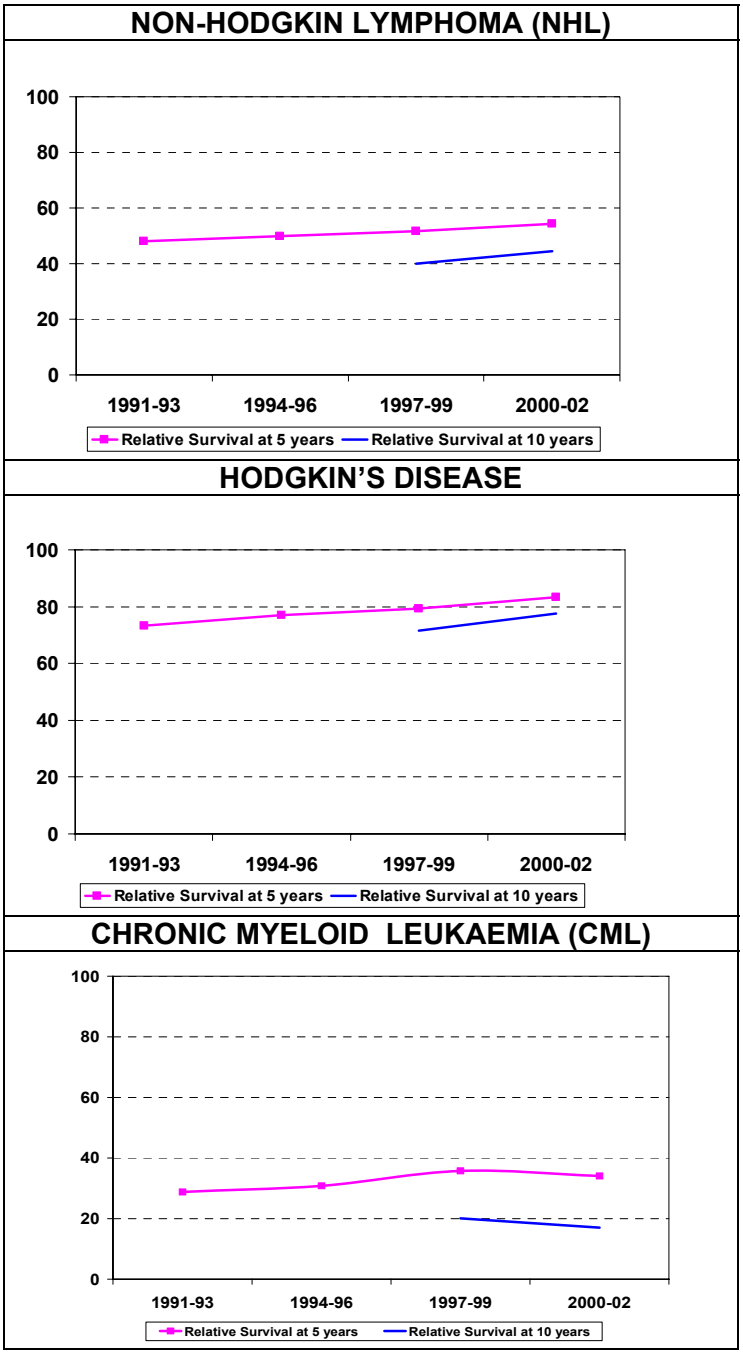
CHRONIC MYELOID LEUKAEMIA (CML)



9.4.1 Time trends of five and ten-year relative survival

Figures 9.4.1 are provided by the EUROCARE project and illustrate the time trends of five and ten-year relative survival in Europe for some of the main HMs. Age-adjusted 5-years period survival improved for patients diagnosed in 2000-2002, especially for patients with HL and NHL. The profile of 10-year survival was close to the 5-year for HL and much lower for NHL, and CML. [8] HL is one of the HMs that had a very significant improvement in the 5-year relative survival in the 1995-1999 period with respect to the 1990-94 period. For example survival increased from 66,1% to 78% in Poland and from 70,5% to 78% in Scotland.[7]

Figures 9.4.1 Time trends of five and ten-year relative survival in Europe for NHL, HL and Chronic Myeloid Leukaemia (Source: EUROCARE-4)



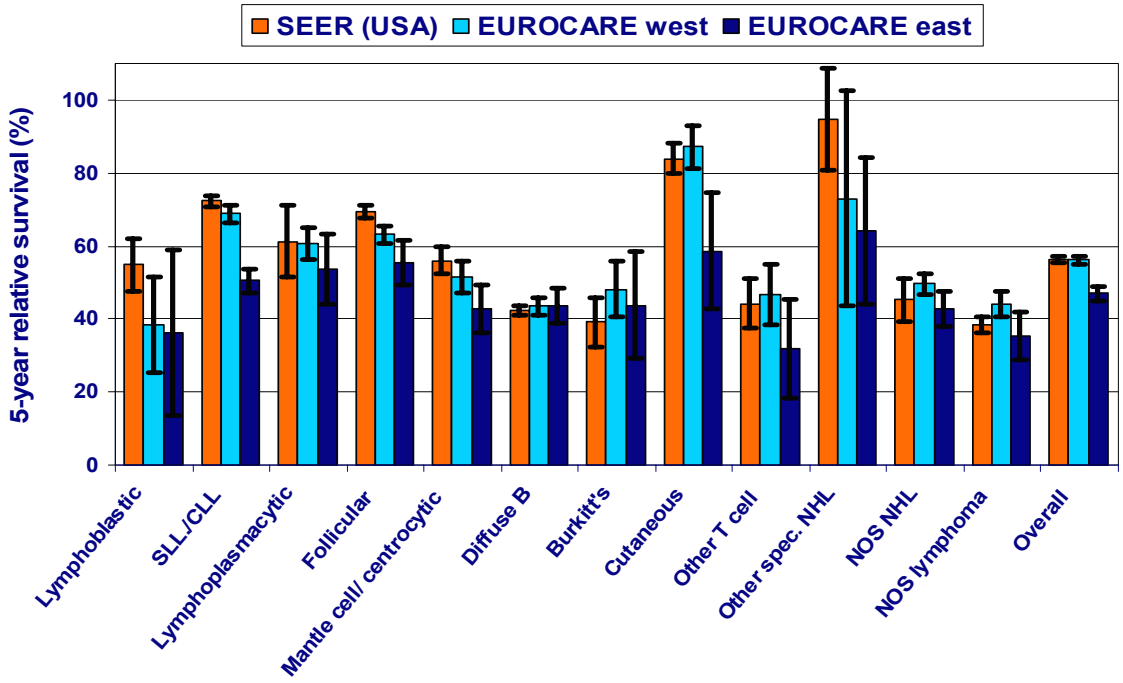
9.4.2 Focus on treatment indicators: treatment delay and compliance with guidelines

In the field of haematological malignancies some important therapeutic progresses are ongoing since few years. First was the use of humanised antibodies directed against B lymphocytes antigens such as CD20 and CD52. The efficacy of anti-CD20 in follicular lymphoma which were less sensitive to chemotherapy than high grade forms, has been very impressive and the use of this molecule has quickly been as wide as possible. We can expect an effect on epidemiological indicators from 2000 or 2001 data. More recently, molecules that inhibit tyrosine kinase proteins including BCR-ABL have been elaborated known as “targeted therapies”. The main one, Imatinib, has demonstrated a great efficacy in Chronic Myeloid Leukaemia in chronic phase but also in blast phase and in Ph1+ Acute Lymphoid Leukaemia. The use of this molecule has been extraordinary disseminated from 2001 and effects on survival are expected in subsequent dataseries. In the treatment of Multiple Myeloma; therapeutic successes are also on progress with the Bortezomid, a proteasome inhibitor responsible of induction of the apoptotic cascade in malignant cells. Phase II studies have been successful in 2003 and different clinical trials are ongoing with therapeutic schemes including this molecule.
Progresses are important and generate great expectancies but all these molecules are relatively expensive and have to be introduced through clinical trials. Two elements that are evident limitations to their largest diffusion especially in less developed countries.

9.5 Important Outcomes of the Haemacare Project

With the aim to standardise the coding practices of Cancer Registries, and to make Cancer Registry data consistent with clinical data, the HAEMACARE project proposed a grouping of NHL and HL into morphological subgroups to be used in the analyses of incidence and survival. This grouping was developed with reference to the WHO classification for the tumours of the haematological system and is compatible with that used for other etiological studies [9].
The proposal was validated on the EUROCARE and SEER (Surveillance, Epidemiology, and End Results program of the US cancer registries) data and was diffused to the European Cancer Registries through the European Network of Cancer Registries (ENCR).
Figure 8.5.1a shows five-year relative survival and 95% CI, in the EUROCARE groupings and SEER, for all NHLs combined and for each morphological group. Overall survival was 56.1% in EUROCARE west, 47.1% in EUROCARE east and 56.0% in SEER.
The morphologies with the highest survival were cutaneous lymphoma, and other specified lymphoma, followed by SLL/CLL, follicular lymphoma and lymphoplasmacytic lymphoma.
Morphologies with low survival were lymphoblastic, diffuse B, other T cell, Burkitt’s and mantle cell/centrocytic. Survival for “not otherwise specified” entities, such as NOS NHL and NOS lymphoma, was on the low side, close to that of the morphologies with poorer prognoses.
For each morphological group survival did not usually differ significantly between the three geographic groupings. Exceptions were cutaneous lymphoma, follicular lymphoma, small lymphocytic NHL together with chronic lymphocytic leukemia SLL/CLL, and mantle cell/centrocytic lymphoma, for which five-year survival in EUROCARE east was significantly lower than in SEER; for follicular lymphoma survival was also significantly lower in EUROCARE west than SEER. [10]

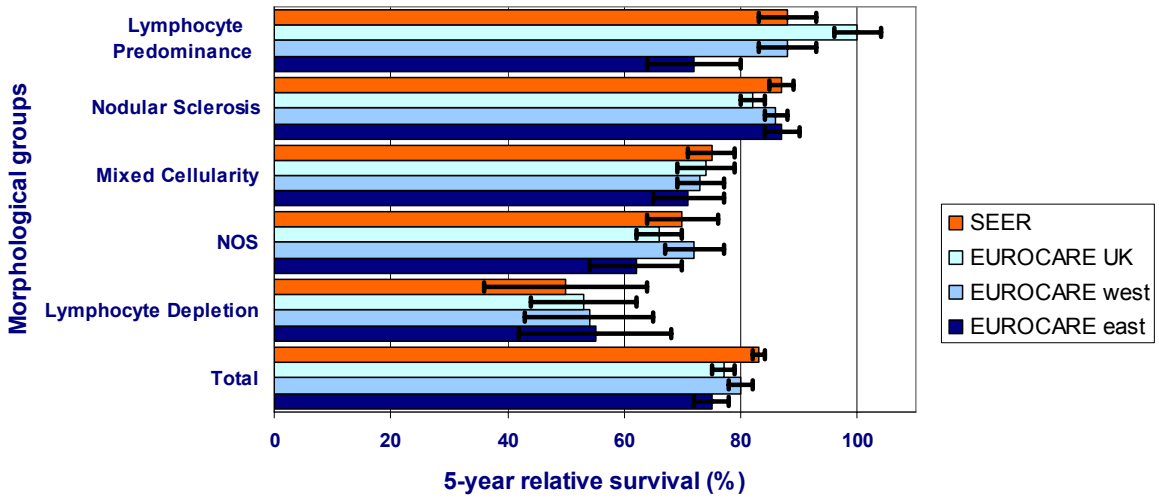
Figure 9.5.1a Five-year relative survival according to area and morphology grouping for NHL*



* The three geographical area compared were: **EUROCARE west** (Registries from France, Germany, Italy, the Netherlands, Spain, Switzerland and the National Registries of Iceland and Malta), **EUROCARE east** (National Registries of the Czech Republic, Estonia, Slovakia, and Slovenia) and **SEER** (San Francisco-Oakland Standard Metropolitan Statistical Area, Connecticut, Detroit-Metropolitan, Hawaii, Iowa, New Mexico, Seattle [Puget Sound], Utah, and Atlanta-Metropolitan).

Figure 9.5.1b shows five-year relative survival, overall and by morphological group, for HL in the EUROCARE groupings and SEER. Overall survival was 80% (95%CI 78-82) in EUROCARE west, 77% (95%CI 75-79) in EUROCARE UK, 75% (95%CI 72-78) in EUROCARE east and 83% (95%CI 82-84) in SEER. Highest survival was found for lymphocyte predominance, followed by nodular sclerosis. Lowest survival was found for lymphocyte depletion. Mixed cellularity and NOS were characterized by intermediate survival.
In general there were no significant differences between the four geographic groupings [11]

Figure 9.5.1b Five-year relative survival according to area and morphology grouping for HL**



* The three geographical area compared were: **EUROCARE west** (France, Germany, Italy, the Netherlands, Spain, Switzerland and the National Registries of Iceland and Malta); **EUROCARE UK** (English Registries of East Anglia, Mersey, Oxford, South West, Trent, Yorkshire and the National Registry of Scotland) and **EUROCARE east** (the Polish Registry of Warsaw and the National Registries of the Czech Republic, Estonia, Slovakia, and Slovenia) and **SEER** (San Francisco-Oakland Standard Metropolitan Statistical Area, Connecticut, Detroit-Metropolitan, Hawaii, Iowa, New Mexico, Seattle [Puget Sound], Utah, and Atlanta-Metropolitan)

9.6 Conclusion

Due to recent evolutions in the HMs classification and available treatments, monitoring its incidence and survival is particularly important.

Among all HMs, NHL and Leukaemia are the most common, while the HL has the best prognosis. In 2002, there was a considerable variation in the incidence, mortality and survival of HMs across Europe. Generally men had higher HMs incidence and mortality than women for all HMs. Age-adjusted 5-years period survival improved for patients diagnosed in 2000-2002, especially for patients with HL and NHL.

NHL were the most frequent HM in the Western European countries (age-standardized incidence rate in men 11/100,000; mortality 5/100,0000). For patients diagnosed in 1995-99 The mean European Age-adjusted 5-year relative survival was 55%.

The regional variation in incidence of all Leukaemias considered together ranged from 10/100,000 in Western Europe to 8/100,000 in Eastern Europe, with no important difference by geographic area in mortality. People affected by Leukaemias had rather poor survival (42,5%)

The incidence of HL was similar across the European regions, with an age-standardised rate in men of approximately 2/100,000. Conversely, the mortality age-standardised rate varied from 0.4/100,000 in Western Europe to 1.2/100,000 in Eastern Europe. The mean European age-standardised 5-year relative survival in Europe was the highest from all HMs (80%).

The age-standardized incidence (4/100000) and mortality (2,5/100,000) of MM in men was double in the Northern and Western European countries compared to the Eastern European countries. MM had extremely poor survival (35%).

In the future an increase of incidence and mortality is estimated in all the European regions and for all the main HMs, except HL. This trend is more accentuated in the West and the North of Europe compared to the East.

Lack of standardisation of diagnostic criteria and evolving classifications make difficult intercountry and over time comparisons of incidence, survival and mortality. The HAEMACARE project is expected to increase the comparability of population based indicators for HM.

The availability of innovative molecular targeted treatments will probably increase the prognosis of many HMs. However the high costs of these treatments may generate inequalities in the access to appropriate treatments.

Reference list

1 Ferlay J, Autier P, Boniol M, Heanue M, Colombet M and P Boile: "Estimates of the cancer incidence and mortality in Europe in 2006", Annals of Oncology 2007; 18: 581-592

2 J.Ferlay, F.Bray, Sankila R, D.M.Parkin "EUCAN: Cancer Incidence, Mortality and Prevalence in the European Union 1998", version 5,0 IARC CancerBase No 4. Lyon: IARC Press 1999

3 J.Ferlay, F.Bray, P.Pisani and D.M.Parkin "GLOBOCAN 2002: Cancer Incidence, Mortality and Prevalence Worldwide IARC" CancerBase No 5, version 2.0. Lyon, France: IARC Press 2004

4 Fisher SG and Fisher R "The epidemiology of non-Hodgkin's Lymphoma", Oncogene 2004; 23:6524-6534

5 Mueller AMS, Ihorst G, Mertelsmann R, Engelhardt M "Epidemiology of non-Hodgkin's lympohoma (NHL): trends, geographic distribution, and etiology" Ann Hematol 2005; 4:1-12

6 Groves D F, Linet M S, Travis L B, Devese SS "Cancer Surveillance Series: Non-Hodgkin's lymphoma Incidence by Histologic Subtype in the United States From 1978 Through 1995", Journal of the National Cancer Institute 2000, 92(15): 1240-1251

7 Berrino F, de Angelis R, Sant M, Rosso S, Lasota MB, Coebergh JW, Santaquilani M and the EUROCARE Working group "Survival for eight major cancers and all cancers combined for European adults diagnosed in 1995-99: results of the EUROCARE-4 study", Lancet Oncol 2007:8:773-783

8 Verdecchia A, Francisci S, Brenner H, Gatta G, Micheli A, Mangone L, Kunkler I and Eurocare-4 Working group "Recent cancer survival in Europe: a 2000-02 period analysis of EUROCARE-4 data", Lancet Oncol 2007; 8: 784-796

9 Morton LM, Turner JJ, Cerhan JR, Linet MS, Treseler PA, Clarke CA, et al. Proposed classification of lymphoid neoplasms for epidemiologic research from the Pathology Working Group of the International Lymphoma Epidemiology Consortium (InterLymph). Blood 2007, 110, 695-708.

10 Sant M, Allemani C, De Angelis R, Carbone A, de SanJosè S, Gianni AM, Giraldo P, Marchesi F, Marcos-Gragera R, Martos-Jiménez C, Maynadié M, Raphael M, Berrino Fand the EUROCARE-3 Working Group "Influence of morphology on survival for non-Hodgkin lymphoma in Europe and the United States", submitted to Eur J Cancer, 2007.

11 Allemani C, Sant M, De Angelis R, Marcos-Gragera R, Coebergh JWW and the EUROCARE Working Group "Hodgkin disease survival in Europe and the U.S.: Prognostic Significance of Morphologic Groups". Cancer 2006; Jul 15;107(2):352-60.

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10 Maternal and Child Health

A Maternal and perinatal health

Zeitlin J, Zimbeck M, Cans C, Gissler M and the EURO-PERISTAT Steering Committee (see appendix)
EUROPERISTAT project

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B Very low gestational age and very low birth weight infants

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A Maternal and Perinatal Health

1 Introduction

1.1 Perinatal health: an overview of historical trends

Maternal and child deaths and illnesses associated with childbirth began to decrease at the beginning of the 20th century and this trend has continued to the present day. Between 1975 and 2005, neonatal mortality (deaths in the first 28 days of life) declined from between 7 to 23 per 1000 live births to between 2 and 8 per 1000 live births in the countries that now make up the European Union. Maternal deaths from childbirth have also become increasingly rare. These declines reflect improved standards of living, the development of maternal and child health services, and technological advances in obstetrical and neonatal care.

While greatly reduced, deaths and illness associated with childbearing still remain a priority for surveillance in Europe. Of the over five million babies born yearly in the European Union, an estimated 23,000 are stillborn and an additional 22,000 die in their first year; more than 40,000 (approximately 8 per 1,000 survivors) experience severe impairments, many of perinatal origin [1]. Maternal deaths constitute an estimated 5 to 15 cases per 100,000 live births, but up to half of these deaths may be associated with substandard care. There are large inequalities in perinatal health between and within the countries of Europe. Poverty and low social status are associated with preterm birth, low birth weight and perinatal death.

Perinatal health problems affect young people - babies and adults starting families – and, as such, have long term consequences. Impairments associated with perinatal events represent a long-term burden for children, their families and health and social services. It is increasingly understood that a healthy pregnancy and infancy reduce the risk of common adult illnesses, such as hypertension and diabetes. This life-course approach to our health begins at conception – or perhaps before – and suggests that better management of the major morbidities associated with pregnancy, such as intrauterine growth restriction or preterm birth– may reap large dividends in overall population health.

Finally, the new techniques that have contributed to the improvements in health outcomes are not risk-free and raise ethical issues that require continual evaluation. In many countries, babies born alive at 25 and 26 weeks of gestation now have a 50% chance of survival [2, 3], but these extremely preterm babies have a much higher rate of disabling impairments than babies born at term [4, 5]. Developments in the management of subfertility now mean that infertile couples can conceive, but these treatments increase multiple births – which have higher mortality and morbidity – and are associated with preterm birth and congenital anomalies [6, 7]. Improved antenatal screening techniques bring up the difficult issue of when to terminate a pregnancy. Finally, a key challenge for the care of pregnant women and newborns is to use and benefit from new medical technology without the concomitant over-medicalisation of pregnancy and childbirth, resulting in additional diagnostic tests after false positive screening tests, unnecessary caesarean deliveries and their attendant maternal morbidity, and always higher levels of parental anxiety.

1.2 The EUROPERISTAT project: objectives, members and indicator set

The EURO-PERISTAT project was charged with developing an indicator set for monitoring and describing perinatal health in Europe. The challenge was to define indicators that cover common concerns and have the same meaning within the different health information systems within the member states. The project's guiding principles were to consolidate

existing work on perinatal health indicators and to redress known methodological shortcomings of these indicators.

The EURO-PERISTAT project is coordinated by a scientific team at the Unit for Epidemiological Research on Perinatal and Women's Health at INSERM (the French National Institute for Health and Medical Research) and administered by Assistance Publique-Hôpitaux de Paris (AP-HP), in collaboration with a steering committee of experts in perinatal health and a scientific committee (SAC) composed clinicians, epidemiologist and statistician from 25 European member states and Norway. The project also enlisted the assistance of specialists in the field of congenital anomalies and convened a consultative panel of midwives.

The EURO-PERISTAT project developed its indicator set after an extensive review of existing perinatal health indicators by using a DELPHI consensus process with scientific committees composed of clinicians (obstetrician, paediatricians, midwives), epidemiologists and statisticians from European member states and Norway [8]. The EURO-PERISTAT indicators are grouped into four themes: fetal, neonatal and child health, maternal health, population characteristics and risk factors, and health services. Within each group, we defined core indicators, which are those essential to monitoring perinatal health, recommended indicators, those considered desirable for a more complete picture of perinatal health across the member states and indicators for further development. The latter represent important aspects of perinatal health, but further work is required before they can be operationalised in the member states.

This chapter presents the EURO-PERISTAT indicators, the methodological questions that arise when constructing and interpreting these indicators in Europe and available data on the indicators. We use data from international health databases such as EUROSTAT, WHO and OECD to describe these indicators, as the EURO-PERISTAT indicators are not yet reported routinely. Data collected by EURO-PERISTAT to test the feasibility of its indicators in the 15 members states that participated in phase I of the project as well as data from published studies are used to illustrate how other indicators, once part of a routine reporting system in Europe, will enrich our understanding of key issues in perinatal health.

2 Population based data sources for monitoring perinatal health

2.1 Coverage

The EURO-PERISTAT project aims to monitor perinatal health outcomes and care on the national level. Its indicators are thus based on data sources that cover the entire population of births. Data sources that only include births from selected hospitals are often biased and these biases will differ depending on the hospitals that are included in the health information system. In most European health systems, maternity units are classified based on their capacity to provide services to higher risk patients – often termed 'levels of care' [9]. Thus, level I maternity units provide care for lower risk pregnant women, while level III units provide care to women and babies at highest risk. If data come from networks of tertiary level III centres, then babies and mothers included in the system will have less favourable outcomes than in the general population. However, outcomes and practices differ even within units with the same level of care [10, 11] and many other factors, such as whether the maternity is public or private or is a teaching hospital have been found to affect practices, such as caesarean section [12, 13]. In countries where home births are a delivery option, these should also be represented. When population-based data do not exist on a national level, it may be possible to use population-based data on smaller geographical areas, such as the region.

2.2 Principal sources of routinely collected data on perinatal health

Table 1 lists the main sources of population-based data on perinatal health in the countries of the EU and briefly describes their strengths and weaknesses. This table illustrates the large number of different types of routine information systems that exist for perinatal health reporting. This diversity complicated the collection of comparable information. Most of these routine data systems collect information at delivery and during the immediate postpartum hospitalization stay and indicators based on data from this period are the easiest to collect. When longer-term information is needed, other methods need to be used, such as surveys, registers on specific conditions or data linkage with other databases. Institutionalized audits or confidential inquiries have been developed by many countries to collect more detailed data on maternal and perinatal deaths and to ensure complete enumeration of these events. When these audits exist, the quality of routine data is greatly enhanced.

All countries have civil registration systems, but the usefulness of these systems for monitoring perinatal health differ. In France, for instance, medical information cannot be included in these systems and data are not available on gestational age or birthweight [14]. In other countries, however, some clinical information is available from these systems either directly or through record linkage [15]. The best data on perinatal health outcomes come from birth registers, many of which have been in existence for decades. For example, the Nordic countries have longstanding birth registers that are used for routine surveillance and epidemiological research [16]. Many of the new EU member states also have birth registers with national coverage of births.

Surveys are done on a representative sample of births and can either cover general perinatal health indicators or focus on specific topics. In France, the National Perinatal Surveys, done on a representative sample of women after delivery in hospital, cover all aspects of perinatal health and care [17]. Surveys are also used to get routine information on infant feeding, as for instance in the United Kingdom, because data are necessary on practices after discharge from the maternity unit. Hospital discharge data are not frequently used for reporting on perinatal health outcomes, but these systems could be important sources for data on morbidities related to childbearing, both for the child and the mother. Hospital systems could be particularly powerful if record linkage is used. More research and harmonization of existing practices is necessary to verify that data from these sources are reliable and comparable across countries, however. Finally, profession based registers make it possible to get good data on antenatal care. The Netherlands uses linked professional based databases, including midwives, general practitioners, obstetricians and neonatologists [18].

Table 1

Type of data source	Description	Strengths	Weaknesses
Civil registration	Civil registration covers vital events - births and deaths. It is required by law and needed for legal purposes and access to identity documents.	In most countries, civil registration systems are the most complete source of data in terms of inclusiveness. Civil registration records may include information about the parents' or deceased person's social background which does not appear on hospital or clinical records, such as occupation, country of birth, ethnic origin and level of education.	Most civil registration systems include very little clinical information about births and factors leading to deaths or about the care given. In the case of some pregnancy-related deaths, the death may be registered but the pregnancy may not be recorded. Some countries do not include births to and deaths of non-residents or non-citizens.
Birth Registers	Population-based registers at a national, regional or local level are based on notifications by midwives, doctors or other clinical informants. These can be established for specific clinical purposes. There are no clear definitions of birth registers or perinatal databases or documentation of how they differ. The majority of existing systems were established for a range of health monitoring and epidemiological purposes.	Compared with most civil registration systems, considerably more data items are recorded. Linkage with other data collection systems is often possible (as in the Nordic countries, for instance)	Although coverage is very good in many countries, some birth registries do not include all births. Stillbirths and neonatal deaths may be underreported. These registers most often include information at birth and cannot provide information on deaths after discharge from hospital (ie neonatal deaths after discharge or first year deaths).
Surveys	Surveys are done on a representative sample of births and can either cover general perinatal health indicators or focus on specific topics, such as infant feeding.	Surveys yeild relatively good quality data when compared with other sources of routine data collection. In surveys it is possible to ask questions directly to the pregnant woman/new mother and to use standardised protocols which improve data quality.	Limited sample sizes make it difficult to study rare events (such as mortality or very preterm birth)

Type of data source	Description	Strengths	Weaknesses
Hospital discharge data	Many countries have hospital discharge systems to record information about all stays in their hospital. Information about stays during which delivery takes place can then be collected through these. Such information may be limited, unless provision is made for the fact that one person, the mother, goes into hospital and two or more are discharged at the end of the stay.	Good coverage of events occuring in hospitals (ie the majority of births in most countries), since these data are usually required by law.	Does not include births out of hospital or other events (deaths) out of hospital. These databases are commonly used for budgetary purposes and little attention is given to standardising definitions of medical complications. Poor or no data on diagnosis or on socioeconomic status.
Profession based registers	Profession-based data collection systems include data from consultations with specific specialities and in particular, obstetricians, midwives, general practitionners and neonatal intensive care units. For use for evaluating population-based indicators, all professionals participating in the provision of services must participate.	Make it possible to get good quality data on the course of the pregnancy, not just at the moment of delivery.	Possibility of including a birth twice if several different types of providers are consulted during the pregnancy. Participation rates depend on motivation of professionals and the participation of all groups.
Other condition specific registries	These are population-based registers that use agreed common definitions and protocols for ensuring completeness to collect data on specific conditions, such as congenital anomalies and cerebral palsy.	Good quality data for complications and complete enumeration of cases.	Very time consuming and these registers more often exist on a regional and not national level.
Confidential enquiries	These are audits into specific adverse events which aim to describe the causes and characteristics of cases. Most common in perinatal health are confidential inquiries into maternal deaths and into perinatal deaths.	Provide detailed information of good quality including qualitative data on the management of cases and sub-optimal care.	Very time consuming, suitable for rare events only. Does not include data on denominators.

Condition specific registers are essential for data collection on complex conditions when definitions need to be standardized and completeness ensured. Two main network of registers exist for perinatal health: EUROCAT on congenital anomalies and the SCPE (Surveillance of Cerebral Palsy in Europe) register [19]. EUROCAT began in 1979 and is a European network of population-based registries for the epidemiologic surveillance of congenital anomalies. EUROCAT (acronym derived from its original name "European Concerted Action on Congenital Anomalies and Twins) now surveys more than 1.5 million births every year in Europe and includes 43 registries in 20 countries covering 29% of European births. Cases of congenital anomaly among livebirths, stillbirths, fetal deaths from 20 weeks gestation, and terminations of pregnancy after prenatal diagnosis of any gestation are registered. More information about the network's activities, its publications as well as data tables on the prevalence of congenital anomalies in Europe is available on its website www.eurocat.ulster.ac.uk. The SCPE Network which is a partner to the EUROPERISTAT project is described in section 6 below.

3 Population characeristics and risk factors

3.1 Key indicators

EURO-PERISTAT indicators: Population characteristics and risk factors
C=core, R=recommended, F=future development
C: Multiple birth rate by number of fetuses
C: Distribution of maternal age
C: Distribution of parity
R: Percentage of women who smoke during pregnancy
R: Distribution of mothers' education
F: Distribution of mothers' country of origin

To compare outcome indicators between countries and to understand their evolution, it is important to look at the characteristics of the population, since their differences and modifications of these characteristics may affect the outcome indicators substantially. The EURO-PERISTAT indicator set includes 6 indicators that describe population characteristics and risk factors: 3 core indicators, 2 recommended indicators and 1 indicator that is being developed.

Maternal demographic characteristics affect rates of perinatal mortality and morbidity [20]. The literature shows that older mothers and nulliparas both face increased risks of stillbirth [21-23] Studies report higher rates of antepartum, intrapartum and neonatal complications such as pregnancy induced hypertension, preterm labor, caesarean births and neonatal intensive care unit admissions in older women [24-26]. Parity is known to be associated with such maternal and neonatal conditions as hypertension and pre-eclampsia, fetal growth restriction, as well as with use of services and intervention during pregnancy, labour, and delivery [27-29]. Multiple pregnancies also carry a much higher fetal and neonatal mortality risk than singleton pregnancies [30-32]. This increased risk is mostly due to the higher preterm birth rate in multiple pregnancies [33, 34].

Numerous reports have demonstrated the harmful effects of smoking on maternal and neonatal condition [35-37]. These effects concern not only the perinatal period but also the infant's long-term development. Smoking cessation may be the most effective intervention to improve both short- and long-term outcome for mothers and children and is an indicator of effective antenatal preventive health services.
Finally, a large body of literature has consistently documented differences in perinatal health outcomes linked to social factors [38, 39]. Mortality and morbidity rates are higher among

socially disadvantaged population groups, defined with respect to individual indicators of social status such as education or parental occupation and neighborhood deprivation scores.

3.2 Measurement and methods

Data on demographic characteristics of the population, such as age, parity and multiple pregnancies, are relatively easy to collect as these exist in vital statistics registries. Parity may not always be defined in the same way, since the rules about counting past stillbirths or early abortions and births from previous marriages differ.

In contrast, data on smoking during pregnancy and maternal education are less frequently collected in routine statistics. However, these items are included in many birth registers and thus can be considered realistic goals for routine health reporting. These data can also be collected in surveys. Country of birth is also collected in many registers and in vital statistics, but common conventions for reporting on these data do not as yet exist.

3.3 Data on incidence, prevalence and time trends

Of the EURO-PERISTAT indicators, data are available only on maternal age and parity in existing routine databases. We also present data on smoking among women of reproductive age from EUROSTAT data, with data from 2000 on smoking among pregnant women from the EURO-PERISTAT feasibility study.

Figures 1 and 2 display data on the proportion of childbearing women aged under 20 years and 35 years and older in EU. The relationship of maternal age to perinatal health outcomes is U-shaped and it is thus pertinent to compare the extremes of the age distribution. For young mothers the increased risks of perinatal mortality are associated with social and health care factors, including lack on antenatal care, unwanted or hidden pregnancies, poor nutrition and lower social status [40]. In a large number of EU countries, births to young mothers constitute only between 2% and 4% of all births. In others, principally countries that have recently joined the EU, these represent a greater proportion of all births (between 6% and 13%). Differences between the new and old member states are also apparent with respect to childbearing at older ages. Risks of adverse outcomes increase starting at approximately 35 years of age. There is a trend towards later childbearing in the 15 old member states, while this trend is much less evident in the new member states.

Smoking among women of childbearing age varies substantially across Europe from 15 to over 40%. This information is not sufficient for monitoring the impact of smoking on perinatal outcomes, however, because many women stop smoking during pregnancy as illustrated in Figure 3. Failure to collect these data at a national level in many countries may prevent the generalisation of smoking cessation programmes for pregnant women and will certainly preclude the measurement of their effects.

Figure 1 Mothers under 20 in 2005 or most recent year (source WHO Health for all - statistical database)

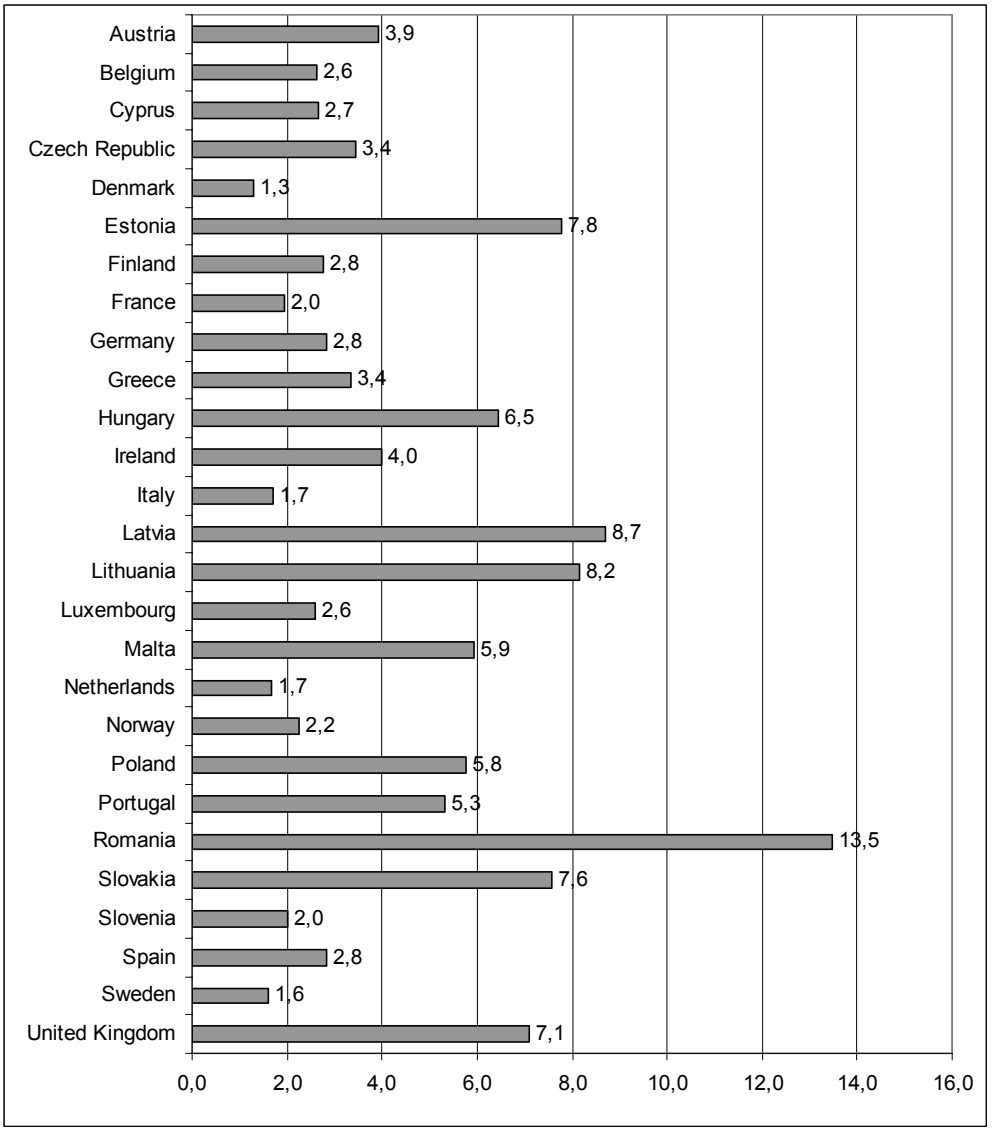
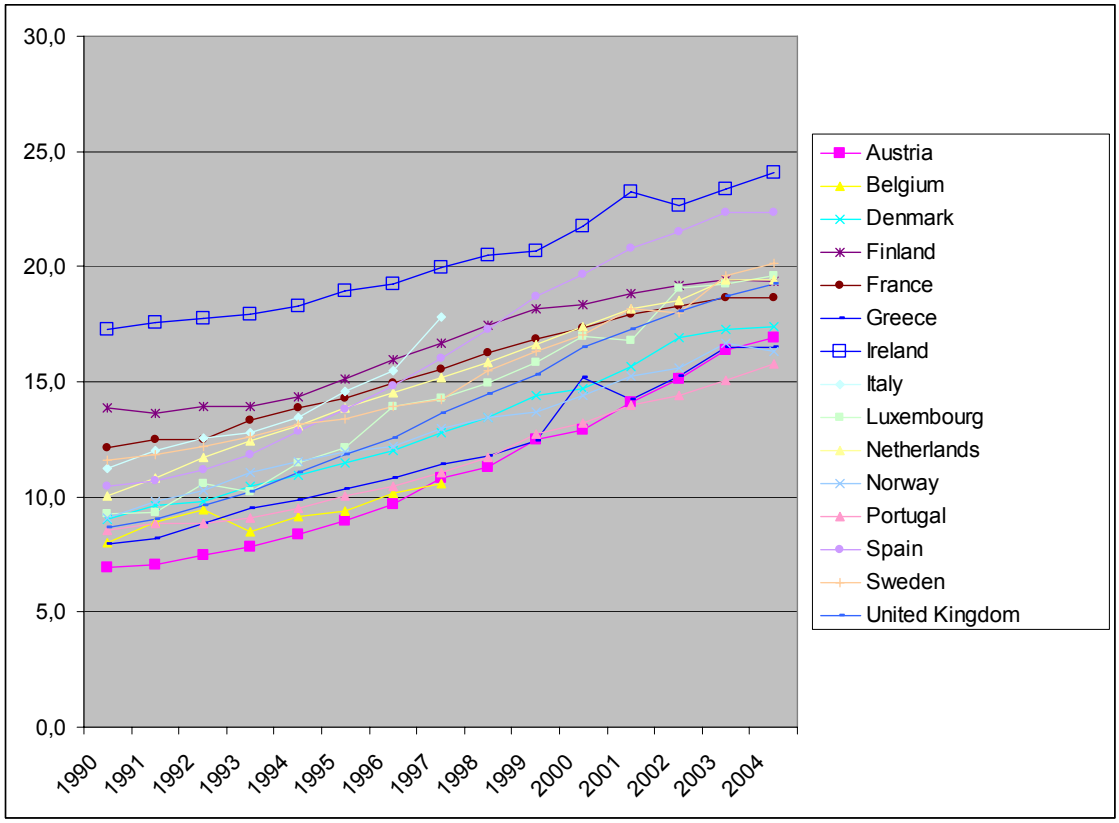


Figure 2 Percent of live births to mothers 35 years and older in the new and old member states (source WHO Health for all - statistical database)



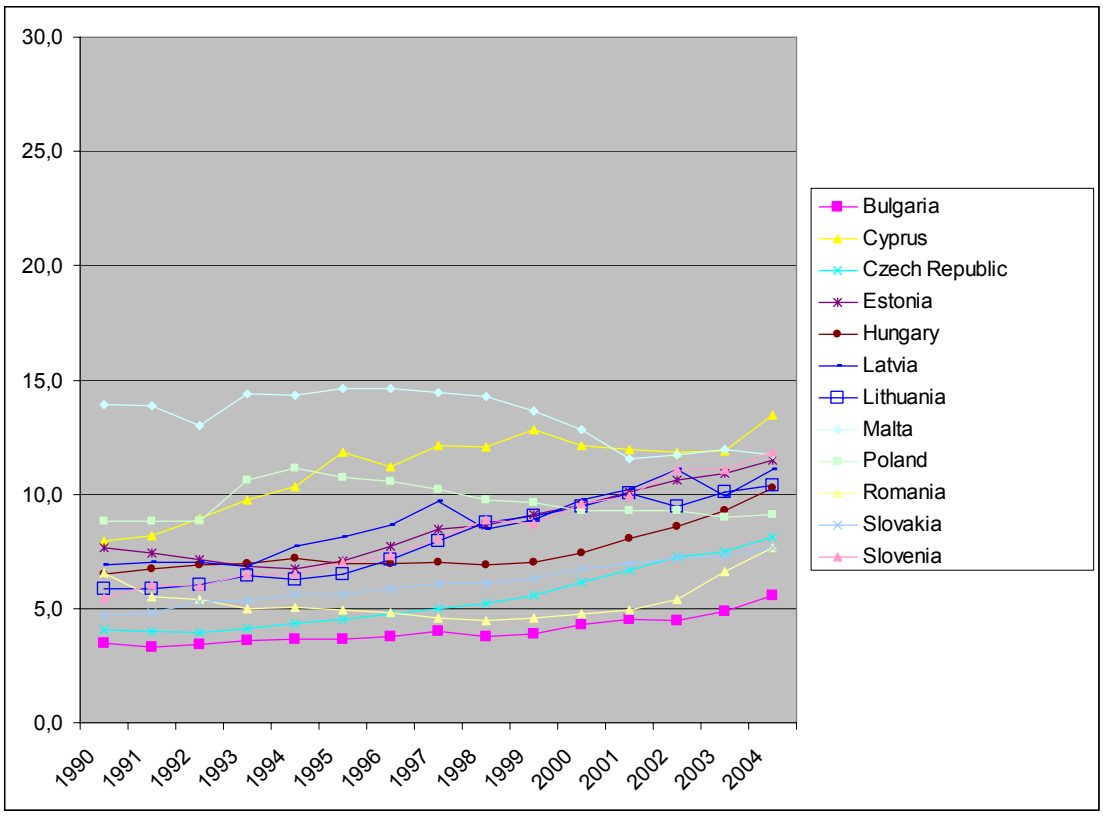
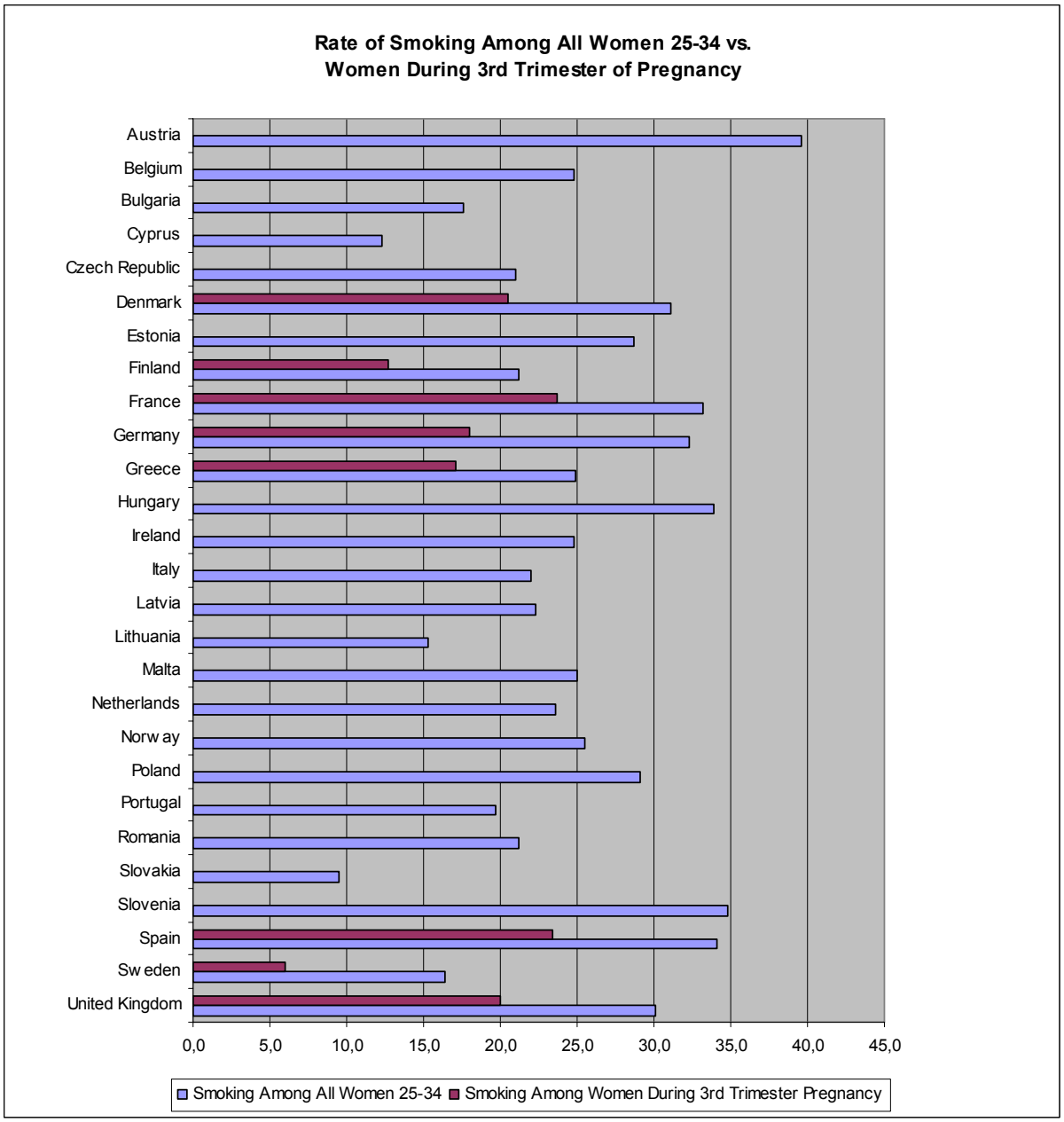


Figure 3 Rate of smoking among women 25-34 years & women smoking in 3rd trimester of pregnancy for selected countries (Source: Eurostat, Peristat)



4 Fetal, neonatal and infant mortality and morbidity

4.1 Key indicators

EURO-PERISTAT indicators on fetal, neonatal and infant health
C=core, R=recommended, F=future development
C: Fetal mortality rate by gestational age, birth weight, plurality
C: Neonatal mortality rate by gestational age, birth weight, plurality
C: Infant mortality rate by gestational age, birth weight, plurality
C: Birth weight distribution by vital status, gestational age, plurality
C: Gestational age distribution by vital status, plurality
R: Prevalence of selected congenital anomalies
R: Distribution of APGAR score at 5 minutes
F: Causes of perinatal death/deaths due to congenital anomalies
F: Prevalence of cerebral palsy
F: Prevalence of hypoxic-ischemic encephalopathy
F: Prevalence of late induced abortions
F: Severe neonatal morbidity among babies at high risk

The principal determinants of perinatal death in Europe today include congenital anomalies, very preterm birth, and stillbirths associated with fetal growth restriction [41-44]. Preterm birth and low birth weight are important risk factors for morbidity in infancy and childhood. Changes in antenatal and delivery care have reduced morbidity from intra partum asphyxia and dystocia among babies born at term. Nonetheless, hypoxic ischaemic encephalopathy (HIE), when it does occur together with fetal distress before or during labour, can result in long-term cerebral motor dysfunction, ie. cerebral palsy. The APGAR score, which assesses the infant's state at delivery is a valuable indicator because of its correlation with adverse neonatal outcome [45]. Cerebral palsy is diagnosed in childhood, but measures the longer-term consequences of perinatal events, such as preterm delivery, low birthweight and HIE. This indicator is discussed in section 6. Late induced abortion are of importance because of the large differences in approaches to pregnancy termination in the EU [46, 47]. An indicator that specifically monitors neonatal health outcomes among babies at highest risk is also considered a priority for development. This dimension is also captured by the EURONEONET project, presented in a separate chapter in this report.

4.2 Measurement and methods

Fetal and neonatal Mortality rates are particularly sensitive to biases related to the registration of collection of data. For example, changes in birth notification and registration practices can cause major changes in these rates. In France in 2001, the registration of stillbirths was reduced from 28 to 22 weeks and fetal mortality rates rose from 6 to over 9 per 1000 [48]. The European study, EURONATAL, compared perinatal mortality rates from 15 European countries and demonstrated that substantial differences in published perinatal mortality rates between western European countries are due to the use of different cutoff points for birth weight and gestational age [49]. For these reasons, EURO-PERISTAT indicators are computed by key subcategories which are an integral part of the indicator definition. Fetal and neonatal mortality should be presented by gestational age or birth weight groups in order to improve the interpretation and reliability of these data by making it possible to separate out the groups, such as extremely low birth weight babies, for which comparability between countries is questionable.

Differences in the way that gestational age (GA) is determined may also affect the comparability of this essential indicator. GA can be determined from the date of the last menstrual period (LMP) or data from ultrasound scans (US). Use of LMP or US data affects the gestational age distribution and the proportion of preterm and postterm pregnancies [50].

Despite these measurement issues, which require further research, indicators of the gestational age distribution provide valuable information on differences in health and health care practices [51].

Cause-of-death data exist almost everywhere, at least for neonatal deaths. Most countries code causes of death according to ICD9 or ICD10. Each country, however, has its own classification system for analysing and reporting these data. These differences in classification systems mean that it is not possible to produce a comparative table of causes of death. Some countries use some version of the WHO perinatal certificate for recording cause of death, but there is no agreed way to code it for international comparisons. Nonetheless, all classification systems include a category for deaths from congenital anomalies; the EURO-PERISTAT project is working to develop a common classification for European reporting.
Morbidity indicators also require more collaborative work before they can be used for international comparisons. Hypoxic-ischemic encephalopathy is defined according to ICD-10 (a disturbance in cerebral function manifested in the first few days of life by an altered level of consciousness, by a disturbance of muscle tone and posture and by seizures, associated with signs of peripartum hypoxia (ICD-10: P91.0)). In the EURO-PERISTAT feasibility study, few countries could provide these data from hospital discharge data and the rates provided varied dramatically (6.8 per 10 000 in Denmark, 1.8 per 10 000 in Finland, and 7.8 per 10 000 in Bavaria, Germany). Similar data is probably available in other countries, but not presently accessed. More research on the quality of hospital discharge data is necessary before this indicator can be reported on a European level.

4.3 Data on incidence, prevalence and time trends

Data on the full set of EURO-PERISTAT core and recommended indicators are not currently reported on the European level. Data are available on fetal, neonatal and infant mortality, causes of infant deaths as well as low birthweight, but some caution in interpretation is necessary, as explained in 4.2. Good quality data on congenital anomalies are provided routinely by the EUROCAT network.

Table 2 presents data on mortality rates for 2005 or most recent year and illustrates the large variation that exists between countries in Europe. For instance, neonatal mortality varies from about 2 per 1,000 births in Sweden, Luxembourg, Czech Republic, Norway and Finland to over 5 per 1,000 in Bulgaria, Latvia and Romania. Similar disparities are observed for mortality in the first year of life (from 2 to 15 per 1,000), as well as for fetal mortality (from 2 to 8 per 1,000). In EU today, there are approximately 50,000 deaths in the last trimester and first year of life. If every country had the mortality of those with the lowest rates, this number would be halved. There are marked differences in rates of neonatal mortality between countries based on their date of accession to the European Union. Among countries who joined prior to 2004 (the original 15 members) and Norway, the median rate of neonatal mortality in 2004 was 2.7 per 1,000 births. This median rate was much higher (4.4/1,000) among countries that joined the EU in 2004 (Czech Republic, Cyprus, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovenia, and Slovak Republic), and was more than three times greater (8.5/1,000) among countries that acceded in 2007 (Bulgaria and Romania).
As shown in Figure 4, there has been a significant decline in the rate of neonatal mortality in the last thirty years. In 1975, neonatal mortality rates ranged from 6.4 to 22.1 per 1,000 total births in current EU member states.

Table 2 Births, deaths and rates of fetal, neonatal and infant mortality in the EU countries & Norway 2005 (Source: Eurostat Population Data [48])

Country	Total live births	Fetal deaths	Early neonatal deaths	Neonatal deaths	Infant deaths	Late fetal mortality rate	Early neonatal mortality rate	Neonatal mortality rate	Infant mortality rate
Austria	78190	289	172	230	327	3 .7	2 .2	2 .9	4 .2
Belgium (2002)	111225				441				4 .4
²Bulgaria	71075	565	296	444	739	7 .9	4 .2	6 .2	10 .4
Cyprus	8243		18	22	33		2 .2	2 .7	4 .0
Czech Republic	102211	287	116	206	347	2 .8	1 .1	2 .0	3 .4
Denmark	64282	313	177	215	280	4 .8	2 .8	3 .3	4 .4
Estonia (2003)	13036	63	39	52	91	4 .8	3 .0	4 .0	7 .0
Finland	57745	113	100	120	174	2 .0	1 .7	2 .1	3 .0
France (2004)	800240	7511	1476	2128	3225	9 .3	1 .8	2 .7	4 .0
Germany	685795	2487	1330	1733	2696	3 .6	1 .9	2 .5	3 .9
Greece	107545	421	190	284	409	3 .9	1 .8	2 .6	3 .8
Hungary	97496	506	262	395	607	5 .2	2 .7	4 .1	6 .2
Ireland (2001)	57854	358	177	230	331	6 .1	3 .1	4 .0	5 .7
Italy (2003)	544063	1702	1077	1526	2134	3 .2	2 .0	2 .9	4 .0
Latvia	21497	132	81	121	168	6 .1	3 .8	5 .6	7 .8
Lithuania	30541	152	79	124	209	5 .0	2 .6	4 .1	6 .8
Luxembourg	5371	21	5	8	14	3 .9	0 .9	1 .5	2 .6
Malta	3858	8	12	17	23	2 .1	3 .3	4 .4	6 .0
Netherlands	187910	760	548	693	928	4 .0	2 .9	3 .7	4 .9
Norway	56756	182	86	102	175	3 .2	1 .5	1 .8	3 .1
Poland	364383	1283	1233	1633	2340	3 .5	3 .4	4 .5	6 .4
Portugal	109399	306	170	240	382	2 .8	1 .6	2 .2	3 .5
Romania	221020	1262	1321	1871	3310	5 .7	6 .0	8 .5	15 .0
Slovakia	54430	195	153	225	392	3 .6	2 .8	4 .1	7 .2
Slovenia	18157	76	45	54	75	4 .2	2 .5	3 .0	4 .1
Spain	466371	1538	761	1127	1765	3 .3	1 .6	2 .4	3 .8
Sweden	101346	301	115	150	246	3 .0	1 .1	1 .5	2 .4
United Kingdom (2004)	715996	3962	1891	2458	3607	5 .5	2 .6	3 .4	5 .0
Total	5156035	24793	11930	16408	25468				

Table 3 Infant mortality by main cause of death in the EU countries & Norway
Source: WHO Mortality Database (WHO Regional Office for Europe)

	Infant mortality[1)]	% Perinatal conditions	Congenital malformations	Other causes	Year
Austria	4 .1	56	27	17	2005
Belgium	5 .6	41	32	28	1997
Bulgaria	12 .3	31	21	48	2004
Cyprus	3 .1	48	12	40	2005
Czech Republic	3 .5	54	22	23	2005
Denmark	4 .6	49	28	23	2001
Estonia	5 .5	37	27	36	2005
Finland	3 .1	43	34	23	2005
France	3 .9	47	21	32	2004
Germany	4 .1	49	27	25	2004
Greece	3 .8	48	35	16	2005
Hungary	6 .4	55	25	19	2005
Ireland	4 .0	41	39	20	2005
Italy	4 .7	55	30	15	2001
Latvia	8 .0	47	24	29	2005
Lithuania	6 .9	41	33	26	2005
Luxembourg	2 .6	57	21	21	2005
Malta	5 .9	61	26	13	2005
Netherlands	4 .3	51	34	15	2004
Norway	3 .3	43	34	23	2004
Poland	6 .5	50	34	16	2005
Portugal	3 .9	56	24	20	2004
Romania	17 .3	39	20	40	2004
Slovakia	7 .2	41	28	31	2005
Slovenia	4 .2	63	23	15	2005
Spain	4 .1	54	27	20	2004
Sweden	3 .2	39	31	30	2004
United Kingdom	5 .2	55	22	23	2004
EU	5 .2	49	26	25	2005

1) The number of infant deaths per 1000 inhabitants aged 0 years.

Figure 4 Trends in neonatal mortality in European Union and Norway
(Source: EUROSTAT Population data [48])

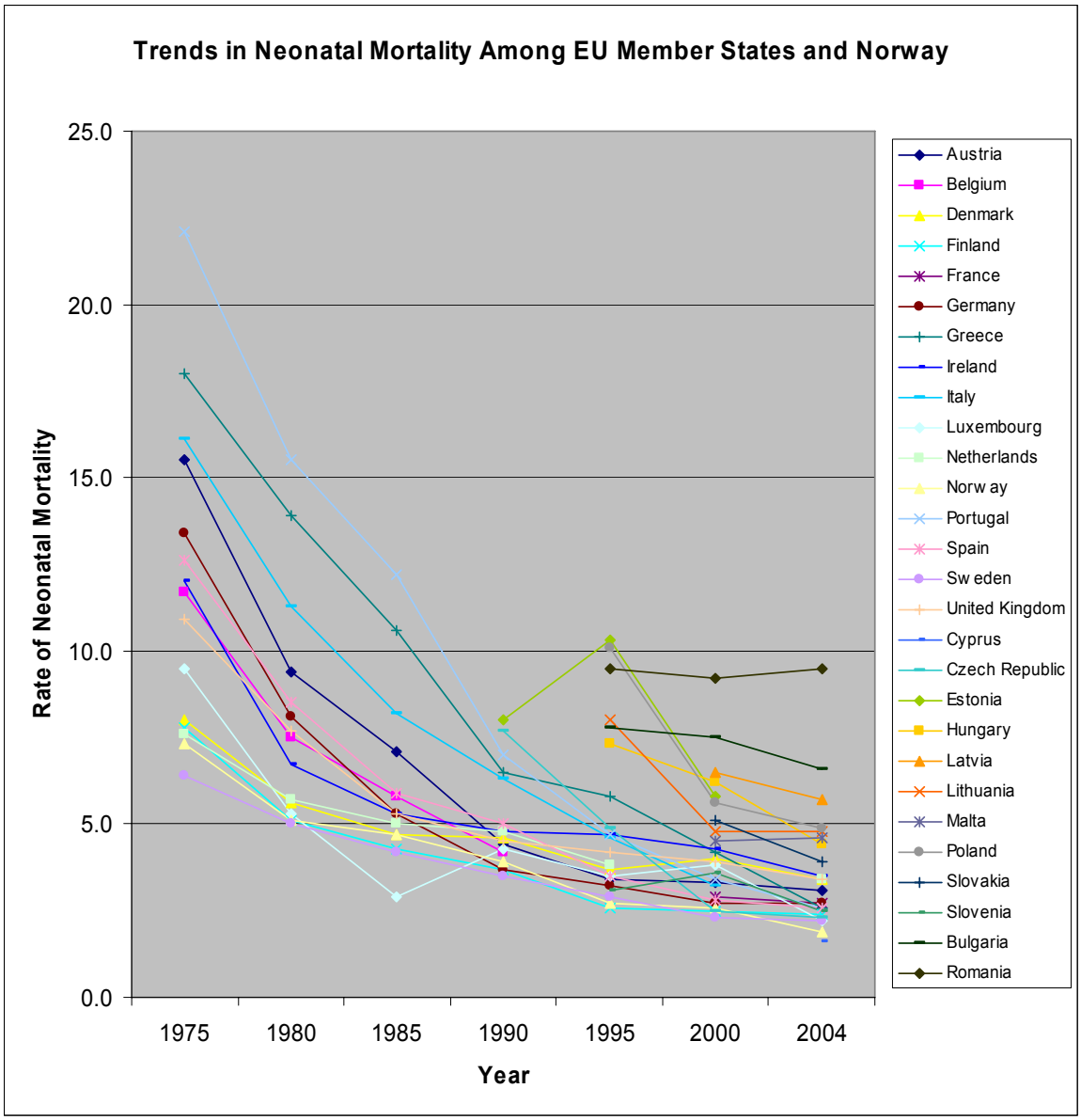


Figure 5 Percent of live births with a birthweight less than 2500 g, last available data
(source WHO Health for all - statistical database)

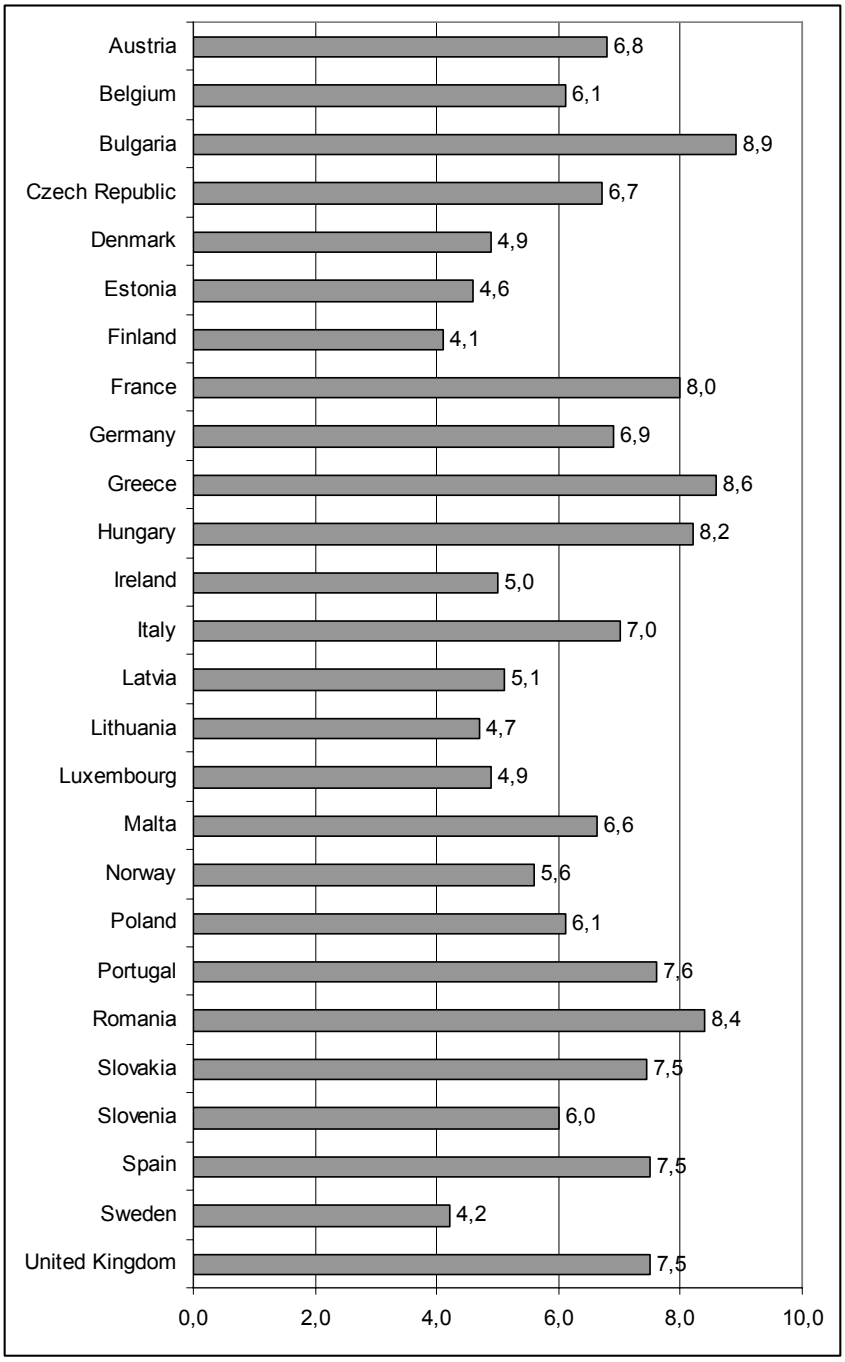


Figure 5 presents rates of low birthweight in the EU; between 4 and 9% of all live births have a birthweight less than 2500 grams. These babies include those that are preterm, with normal or low birthweights and babies born at term with growth restriction; all these groups are at higher risk of having longer-term impairments in childhood than term babies with normal birthweight.

Data on preterm babies are not currently reported routinely, but this information is very important for evaluating perinatal health outcomes. Very preterm babies have the highest rates of long-term health problems, including cerebral palsy, severe learning disabilities, chronic lung disease, visual and hearing impairments and poor growth. However even babies born between 33 and 35 weeks of gestation, often termed mildly or moderately preterm births, have higher mortality and are more likely than others to have motor and learning difficulties than term babies [52-54]. The preterm birth rate has increased in many countries over the past decade [55]; these trends, which cannot be monitored using currently reported indicators, are essential for monitoring the health of babies in the EU. The EURO-PERISTAT feasibility study showed that these data are available in a majority of European countries.

5 Maternal mortality and morbidity

5.1 Key indicators

EURO-PERISTAT indicators Maternal health
C=core, R=recommended, F=future development
C: Maternal mortality ratio by age, mode of delivery
R: Maternal mortality by cause of death
R: Prevalence of severe maternal morbidity
F: Prevalence of trauma to the perineum
F: Prevalence of faecal incontinence
F: Postpartum depression

The EURO-PERISTAT indicator list includes one core indicator for monitoring maternal health, the maternal mortality ratio, as well as two recommended indicators, maternal deaths by cause and the prevalence of severe maternal morbidity [56]. The causes of maternal death can be separated into those directly attributed to pregnancy, which include thromboembolism, amniotic fluid embolism, haemorrhage, hypertension, infections/sepsis, obstetrical complications, and 'indirect' causes, such as cardiac and other maternal conditions that are aggravated by pregnancy. Committees that audit maternal deaths regularly report that 40-60% of them are associated with substandard care [57-59]. The prevalence of "severe" maternal morbidity, defined in one European project, by severe hemorrhage, sepsis and hypertensive disorders of pregnancy, ranged from 0.07-8.23% with a case-fatality ratio ranging from 0.02-37% [60].

Other proposed indicators for future development cover important dimensions of women's health, but are difficult to compile given existing data systems. Postpartum depression is estimated to affect up to 20% of women in the 6 weeks following delivery [61, 62] and represents a significant cause of morbidity for women and their families, but the harmonization of definitions and methods for case identification has yet to be done. Interest has risen over the last twenty years in the risks of pregnancy or childbirth-related injuries that lead to urinary and faecal incontinence, but further research is necessary before a feasible indicator definition can be proposed.

5.2 Measurement and methods

The principal definition of what constitutes a maternal death in European statistics is early obstetrical death, both direct (the pregnancy directly caused the death) and indirect (death is due to a cause which preceded the pregnancy but would presumably not have been lethal without it). The time period covered is from conception to 42 days after the outcome of the pregnancy. This means that so-called “fortuitous” or coincidental (not causally related to pregnancy) and “late” (between 43 and 365 days after the outcome of pregnancy) deaths are excluded. The maternal mortality ratio is a complex fraction in which the numerator is maternal deaths and the denominator is live born children. This denominator is a surrogate for a more desirable but more difficult to assess denominator: pregnant women, the full population at risk for maternal death. Accurate MMRs require the inclusion of a sufficiently large number of births, certainly no fewer than 100 000. For smaller countries, this requires a span of several years.

Data quality for maternal deaths must be considered on two levels: ascertainment (completeness of registration) and case description. Improvement of ascertainment has been studied thoroughly and includes all of the following: record linkage (births, deaths, induced abortions, antenatal surveillance program data), a pregnancy check box on the death certificate, and an informant network [63]. Nonetheless, problems remain, even where all these methods are employed. In some European countries, for example, a maternal death of a woman who is an illegal resident or an asylum seeker would not be counted. Audits of maternal deaths exist in many countries and are important for obtaining good quality data. The Confidential Enquiry on Maternal Deaths in the UK, which began more than half a century ago, is often considered to be the model for this procedure (more information about the history, methods, reports and other publications from this enquiry can by found at their website http://www.cemach.org.uk). Other European countries have now adopted similar procedures for undertaking systematic reviews of deaths as for example in France since 1996 [64] or the Netherlands [65].

Severe maternal morbidity, which is a EURO-PERISTAT recommended indicator, requires a consensus on conditions to include and a common methodology for identifying cases. The EURO-PERISTAT group is currently testing the feasibility and quality of an indicator based on a set of conditions and medical interventions that have a clear definition and can be identified using hospital discharge data. This indicator consists of the following components: The number of women experiencing any combination of the following conditions or procedures as a proportion of all women delivering live and still-born babies: (1) eclamptic seizures, (2) surgery (other than tubal ligation or caesarean section) or embolisation (3) blood transfusion (4) hospitalization in an ICU for more than 24 hours.

5.3 Data on incidence, prevalence and time trends

Maternal mortality is currently the only EURO-PERISTAT indicator on maternal outcomes available in international databases.

Maternal Mortality
As shown in Figure 6 the maternal mortality ratio in the European Union has declined from 20 maternal deaths per 100,000 live births in the early 1980s to 7 deaths per 100,000. The most significant decline is observed in Romania, which had the highest ratio in Europe, between 140 and 160 per 100,000 in the 1980s. After the liberalisation of abortion act, the ratio has declined to 26 per 100,000 in 2002-2004, which is still the highest among the EU member states. The three Baltic countries also had relatively high ratios in the 1990s, but their ratios have declined, especially in Latvia and Lithuania (10-11/100,000 in 2003-2005), but also in Estonia (24/100,000).

Figure 6 Maternal deaths per 100,000 live births in the EU countries, three years moving average, 1970-2004
(source WHO Health for all - statistical database)

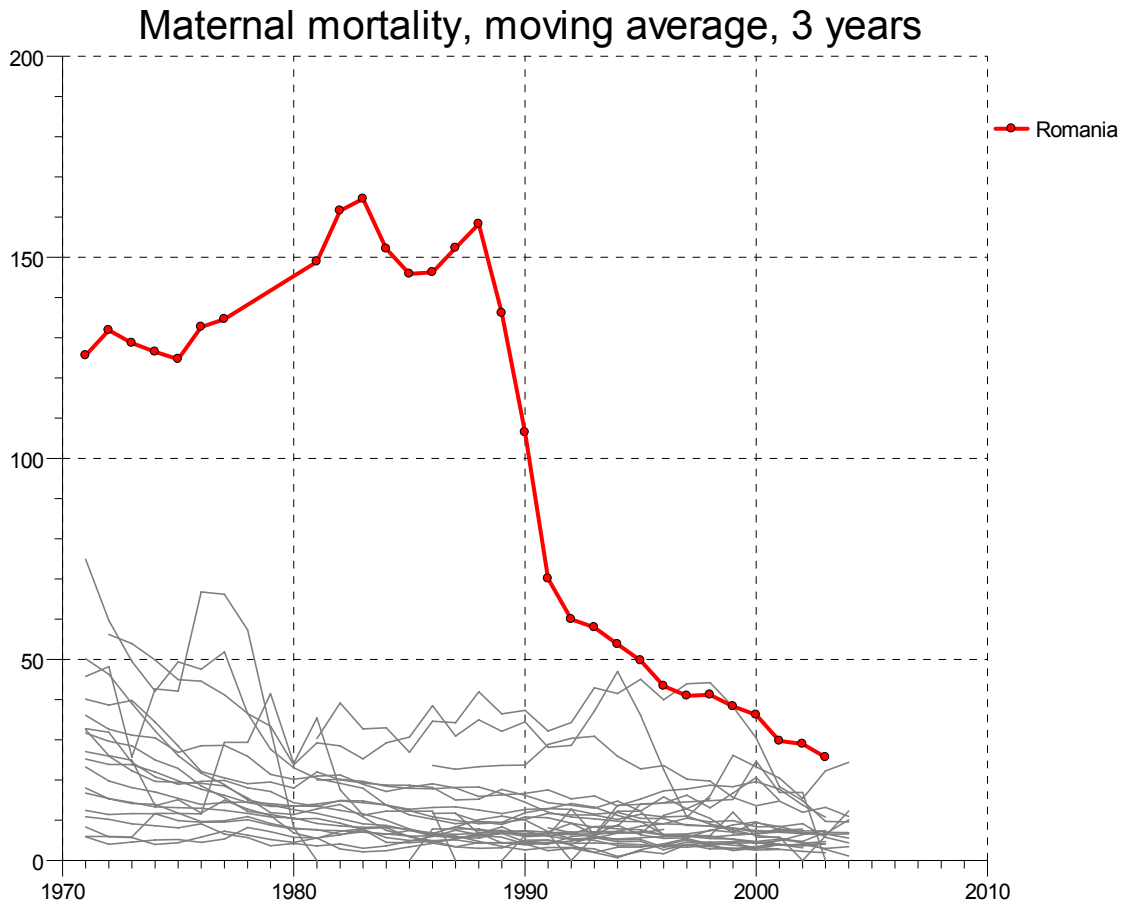
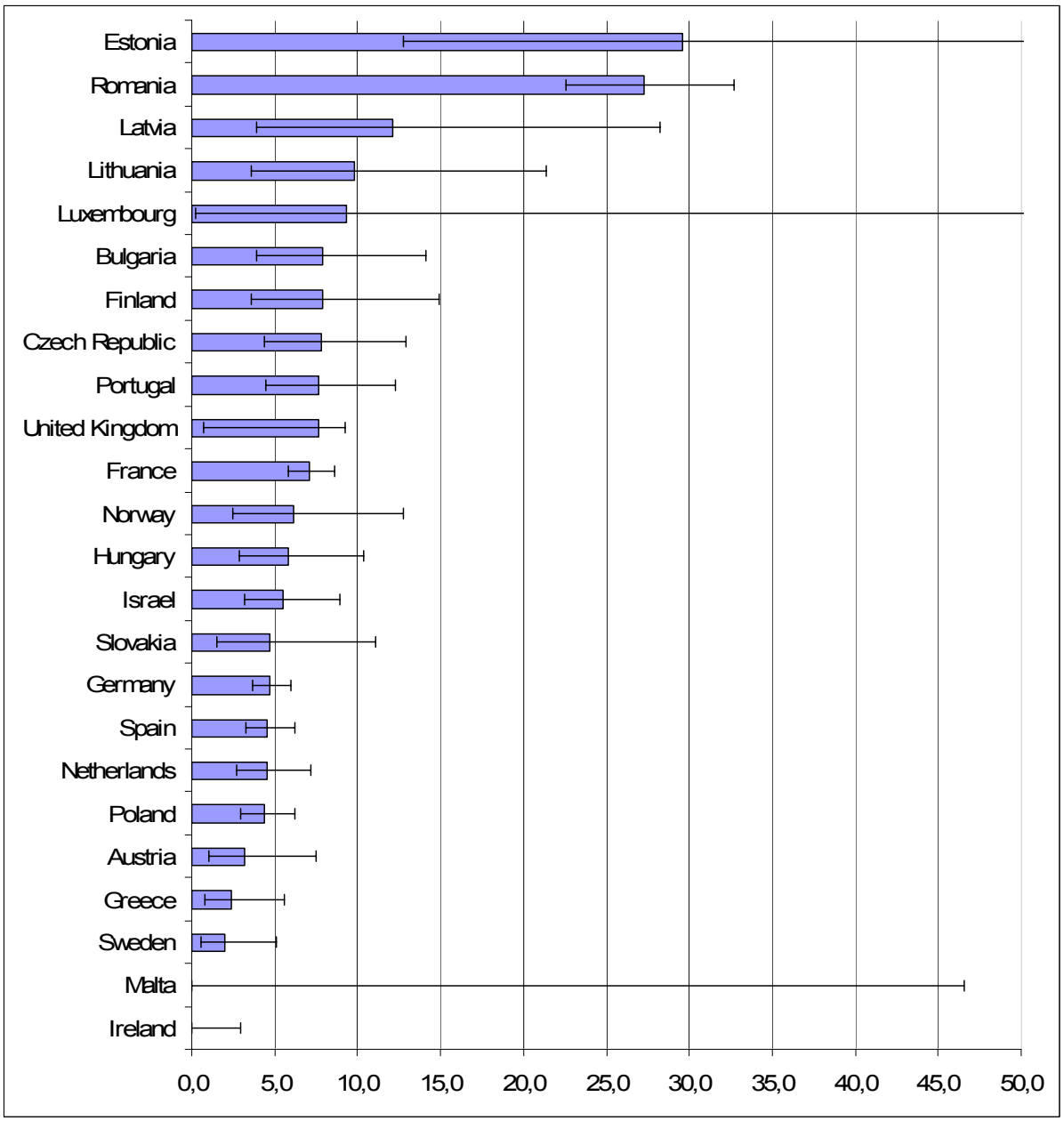


Figure 7 Maternal deaths per 100,000 live births in the EU countries for years 2003 and 2004 (source WHO Health for all - statistical database)



As shown in Figure 7, which gives the maternal mortality ratios for the two-year period 2003 and 2004, there is currently substantial variation in Europe. This figure also includes the 95% confidence intervals for these rates. These illustrate that in many cases, MMR are generated using a small number of events and total births and that observed differences between countries are not statistically significant.

For a few countries - Denmark, Iceland, Finland, the Netherlands, Slovenia, Spain and Switzerland - the most recent data shows the same or even higher maternal mortality ratios after year 2000 than in the early 1990s. Improved quality of maternal mortality statistics may explain this negative trend, but the deterioration can also be explained by increased risk factors among pregnant women (such as advanced maternal age, the increased proportion of women with migrant origin, the more common prevalence of chronic diseases and maternal conditions, the higher multiple birth rates caused by more common use of procedures to manage subfertility) and the increased use of medical technology in delivery (such as invasive pain relief and Caesarean section).

6 Cerebral palsy : longer term consequences of perinatal events on child health

6.1 Indicator definition

Cerebral Palsy (CP) is the indicator chosen by PERISTAT for monitoring longer term childhood health impairments, due to its frequent association with adverse perinatal events. It is the commonest disabling condition in childhood; it occurs in 1.5 to 2.5 per 1000 live births, and the disabling condition is permanent during the life of the affected children.
CP is an umbrella term covering different clinical patterns such as unilateral or bilateral spastic, dystonic/choreo-athetotic, or ataxic cerebral palsy sub-types. Clinical symptoms appear during the first years of life, and it is necessary to wait until child is 4 years old before deciding if the condition is CP or not. Although ICD codes exist we do not trust that DRG system can properly identify affected children.

6.2 Measurement and methods

The SCPE (Surveillance of Cerebral Palsy in Europe) network started in 1999, and at present, it includes 24 registers in 13 countries. Most of these registers do not cover the whole country. When the CP register does not cover the whole country, it is supposed that the covered area is representative of the country. The representativeness is generally based on the socio-economic status and age distribution of the population living in the covered area. The minimum size of an area for a CP register is set at 10,000 live births. Quality control on case ascertainment and completeness of ascertainment are performed regularly in morbidity registers.

The rates retrieved from these registers are prevalence rates and not incidence rates (since cases may have died before diagnosis), and the best term to use is "birth cohort prevalence rates". SCPE network has already produced guidelines for inclusion/exclusion criteria, decision trees, classification of CP types and a CD-RoM with video pieces. Its next efforts are concentrated on developing guidelines for imaging results. The SCPE common database contains now more than 11,000 cases of CP children born from 1975 to 1998.

Efforts are also concentrated on extending coverage. For the birth cohorts 1990-1998, data on CP prevalence rates are available for 16 registers from 10 different countries, representing 350,000 live births per year, or 6 % of the live births in Europe (27 countries +

Norway). Our aim is to get at least one CP register in each country and to cover 10 % of European live births.

6.3 Data on prevalence and risk factors

The principal results on prevalence rates for the last decade are those shown in tables 4 and 5. The prevalence rate of CP is 2 per 1000, among children born with normal BW this rate is around 1 per 1000, among children born with a BW 1500 to 2499g the rate is around 1 per 100, and among children born with a very low birthweight (<1500g) the rate is around 6 per 100. The cerebral palsy rate in VLBW decreased between 1980 to 1996 from 60.6 to 39.5 per 1000 liveborn VLBW infants [66].

Further work in SCPE will explore the prevalence of CP in specific subgroups. It has been already shown that multiple born infants have a four times higher risk of developing cerebral palsy than singletons, mainly related to the higher risk of preterm birth in multiples [67]. More boys are affected by CP than girls, this difference has to be analysed and understood, stratified by BW groups, and studied jointly with data on neonatal mortality. It has been shown that children from low socio-economic status are at higher risk of developing CP later. We need a common indicator of socio-economic status across Europe in order to be able to analyse this effect.

SCPE is also involved in studying CP and childhood disability. Some work has already been performed to assess the quality of life and participation of CP children in Europe (SPARCLE study [68]). CP registers are collecting routinely information on impairment and activity limitation, but not on participation and quality of life. More work is needed to assess in a common manner the severity of the impairment in order to be able to answer to the question about severity of CP over time: are CP cases more severe now than before?

Table 4 CP rates per 1,000 live births in 10 European countries, birth cohorts 1990-1998 (results from 16 CP registers in 10 different European countries) (source: SCPE collaborative network)

Country	Name of the CP register	N CP cases	Live births	CP rate	95 % CI
Denmark	East Denmark	649	316 330	2.1	[1.8 ; 2.2]
France	Isere + Haute Garonne counties	390	234 033	1.7	[1.5 ; 1.8]
Ireland	Cork and Kerry, East Ireland, Galway	581	306 428	1.9	[1.7 ; 2.1]
Italy	Viterbo + Bologna	139	63 928	2.2	[1.8 ; 2.6]
Lithuania	Kaunas study	130	60 925	2.1	[1.8; 2.5]
Norway	Tonsberg	213	121 744	1.7	[1.5 ; 1.9]
Portugal	Lisbonne	114	71 993	1.6	[1.3 ; 1.9]
Spain	Madrid	80	48 356	1.7	[1.3; 2.1]
Sweden	Gothenburg region	394	196 273	2.0	[1.8 ; 2.2]
United Kingdom	Northern Ireland, Northern region, Oxford	1907	829 135	2.3	[2.2 ; 2.4]
Total		**4597**	**2 249 145**	**2.0**	**[2.0 ; 2.1]**

Table 5 CP rates among VLBW babies in 9 European countries, birth cohorts 1990-1998 (source: SCPE collaborative network)

Country	n CP cases born <1500g	Live births <1500g	CP rate	95% CI
Denmark	114	2 734	41.7	[34.5 ; 49.9]
France	89	639	139.3	[113.4 ; 168.6]
Ireland	133	809	164.4	[139.5 ; 191.8]
Italy	40	625	64.0	[46.1 ; 86.1]
Lithuania	15	560	26.8	[15.1 ; 43.8]
Norway	45	1 005	44.8	[32.8 ; 59.5]
Spain	21	256	82.0	[51.5 ; 122.7]
Sweden	86	1 366	63.0	[50.7 ; 77.2]
United Kingdom	419	8 324	50.3	[45.7 ; 55.3]
Total	**962**	**10 250**	**93.9**	[88.3 ; 99.7]

- Data not available from Portugal

7 Health services provided to pregnant women and their newborns

7.1 Key indicators

EURO-PERISTAT indicators Health care services
C=core, R=recommended, F=future development
C: Distribution of births by mode of delivery by parity, plurality, presentation, prev. Caesarean
R: Percentage of all pregnancies following fertility treatment
R: Distribution of timing of 1st antenatal visit
R: Distribution of births by mode of onset of labour
R: Distribution of place of birth
R: Percentage of infants breast-feeding at birth
R: Percentage of very preterm births delivered in units without NICU
F: Indicator of support to women
F: Indicator of maternal satisfaction
F: Births attended by midwives
F: Births without medical intervention
F: Neonatal screening policies
F: Content of antenatal care

The EUROPERISTAT project includes a series of indicators for monitoring health care provided to pregnant women and newborns. Medical technologies associated with the perinatal period continue to advance quickly, particularly those related to the management of sub-fertility and the care of preterm infants, and describing variations in the use and success of these medical technologies is an important task of health monitoring in the European Union. Describing how clinicians support women and babies through the process of healthy pregnancy and birth also enhances our understanding and comparisons of health in the perinatal period at the European level. Descriptions of health care services must measure interventions implemented to prevent death and morbidity, but must also incorporate aspects of health care quality, as assessed by mothers themselves.

European countries can learn by sharing their experiences in health care provision. There is a large variability in approaches to health care and these may have an effect on outcomes [69-71]; for instance, some countries have higher rates of obstetrical interventions, such as indicated caesarean sections for twins or induced deliveries for postterm pregnancies, which in turn have an impact on rates of preterm and postterm births [51, 72]. Similarly there is a large variability in the organization of care for very preterm babies which may also impact on their health [73].

A key challenge is the identification of meaningful indicators that perform similarly across different health care systems. Many indicators that are useful at a national level cannot be transposed for comparisons between member states because they reflect different realities in the different models of care present in Europe.

8 Conclusion

One of the key principles established by EURO-PERISTAT was to improve the quality of existing indicators, by implementing common definitions, data collection procedures and methods for constructing and presenting indicators. The group focused on developing valid indicators based on existing data sources, before suggesting new data for collection. The EURO-PERISTAT core set of indicators includes indicators that are relatively 'robust', on the grounds that it is better to have unbiased and comparable indicators that may not be extremely specific or sensitive, than indicators that are (theoretically) specific or sensitive, but will be unreliable and measured with bias at the European level.

The importance of developing truly usable indicators was a central tenet of the EURO-PERISTAT discussions. The project incorporated this principle into the framework used for classifying the indicator set, by clearly distinguishing between indicators that can be used now and those that were desirable but require further work. Consequently, not all issues are covered in equal density in the core PERISTAT indicator set. Maternal health and health care service related measures, for instance, are not equally represented at the core indicator level. Indicators to measure the intensity and quality of antenatal care provided for women are clearly needed. Nonetheless, the creation of a routine health information based on the current list of indicators is an essential first step for reporting on perinatal health. Once these basic data are produced routinely on a European level, this framework can be expanded to address other essential dimensions of the health and care of mothers and babies in Europe.

Reference list

1 Cans C, Guillem P, Fauconnier J, Rambaud P, Jouk PS. Disabilities and trends over time in a French county, 1980-91. Arch Dis Child 2003;88(2):114-7.

2 Effer SB, Moutquin JM, Farine D, Saigal S, Nimrod C, Kelly E, et al. Neonatal survival rates in 860 singleton live births at 24 and 25 weeks gestational age. A Canadian multicentre study. Bjog 2002;109(7):740-5.

3 Draper ES, Manktelow B, Field DJ, James D. Prediction of survival for preterm births by weight and gestational age: retrospective population based study. Bmj 1999;319(7217):1093-7.

4 Wood NS, Marlow N, Costeloe K, Gibson AT, Wilkinson AR. Neurologic and developmental disability after extremely preterm birth. EPICure Study Group. N Engl J Med 2000;343(6):378-84.

5 Doyle LW. Outcome at 5 years of age of children 23 to 27 weeks' gestation: refining the prognosis. Pediatrics 2001;108(1):134-41.

6 Hansen M, Kurinczuk JJ, Bower C, Webb S. The risk of major birth defects after intracytoplasmic sperm injection and in vitro fertilization. N Engl J Med 2002;346(10):725-30.
7 Jackson RA, Gibson KA, Wu YW, Croughan MS. Perinatal outcomes in singletons following in vitro fertilization: a meta-analysis. Obstet Gynecol 2004;103(3):551-63.
8 Zeitlin J, Wildman K, Breart G, Alexander S, Barros H, Blondel B, et al. Selecting an indicator set for monitoring and evaluating perinatal health in Europe: criteria, methods and results from the PERISTAT project. Eur J Obstet Gynecol Reprod Biol 2003;111 Suppl 1:S5-S14.
9 Zeitlin J, Papiernik E, Breart G. Regionalization of perinatal care in Europe. Semin Neonatol 2004;9(2):99-110.
10 Lee SK, McMillan DD, Ohlsson A, Pendray M, Synnes A, Whyte R, et al. Variations in practice and outcomes in the Canadian NICU network: 1996-1997. Pediatrics 2000;106(5):1070-9.
11 Rogowski JA, Horbar JD, Staiger DO, Kenny M, Carpenter J, Geppert J. Indirect vs direct hospital quality indicators for very low-birth-weight infants. Jama 2004;291(2):202-9.
12 Bertollini R, DiLallo D, Spadea T, Perucci C. Cesarean section rates in Italy by hospital payment mode: an analysis based on birth certificates. Am J Public Health 1992;82(2):257-61.
13 Le Ray C, Carayol M, Zeitlin J, Breart G, Goffinet F. Level of perinatal care of the maternity unit and rate of cesarean in low-risk nulliparas. Obstet Gynecol 2006;107(6):1269-77.
14 Macfarlane A, Gissler M, Bolumar F, Rasmussen S. The availability of perinatal health indicators in Europe. Eur J Obstet Gynecol Reprod Biol 2003;111 Suppl 1:S15-32.
15 Hilder L, Moser K, Dattani N, Macfarlane A. Pilot linkage of NHS Numbers for Babies data with birth registrations. Health Stat Q 2007(33):25-33.
16 Gissler M, Louhiala P, Hemminki E. Nordic Medical Birth Registers in epidemiological research. Eur J Epidemiol 1997;13(2):169-75.
17 Blondel B, Supernant K, Du Mazaubrun C, Breart G. La sante perinatale en France metropolitaine de 1995 a 2003. Resultats des enquetes nationales perinatales. J Gynecol Obstet Biol Reprod (Paris) 2006;35(4):373-87.
18 Anthony S, van der Pal-de Bruin KM, Graafmans WC, Dorrepaal CA, Borkent-Polet M, van Hemel OJ, et al. The reliability of perinatal and neonatal mortality rates: differential under-reporting in linked professional registers vs. Dutch civil registers. Paediatr Perinat Epidemiol 2001;15(3):306-14.
19 Surveillance of cerebral palsy in Europe: a collaboration of cerebral palsy surveys and registers. Surveillance of Cerebral Palsy in Europe (SCPE). Dev Med Child Neurol 2000;42(12):816-24.
20 Maher J, Macfarlane A. Inequalities in infant mortality: trends by social class, registration status, mother's age and birthweight, England and Wales, 1976-2000. Health Stat Q 2004(24):14-22.
21 Canterino JC, Ananth CV, Smulian J, Harrigan JT, Vintzileos AM. Maternal age and risk of fetal death in singleton gestations: USA, 1995-2000. J Matern Fetal Neonatal Med 2004;15(3):193-7.
22 Raymond EG, Cnattingius S, Kiely JL. Effects of maternal age, parity, and smoking on the risk of stillbirth. Br J Obstet Gynaecol 1994;101(4):301-6.
23 Reddy UM, Ko CW, Willinger M. Maternal age and the risk of stillbirth throughout pregnancy in the United States. Am J Obstet Gynecol 2006;195(3):764-70.
24 Cleary-Goldman J, Malone FD, Vidaver J, Ball RH, Nyberg DA, Comstock CH, et al. Impact of maternal age on obstetric outcome. Obstet Gynecol 2005;105(5 Pt 1):983-90.
25 Luke B, Brown MB. Elevated risks of pregnancy complications and adverse outcomes with increasing maternal age. Hum Reprod 2007;22(5):1264-72.
26 Prysak M, Lorenz RP, Kisly A. Pregnancy outcome in nulliparous women 35 years and older. Obstet Gynecol 1995;85(1):65-70.

27 Bai J, Wong FW, Bauman A, Mohsin M. Parity and pregnancy outcomes. Am J Obstet Gynecol 2002;186(2):274-8.
28 Cnattingius S, Forman MR, Berendes HW, Graubard BI, Isotalo L. Effect of age, parity, and smoking on pregnancy outcome: a population-based study. Am J Obstet Gynecol 1993;168(1 Pt 1):16-21.
29 Huang DY, Usher RH, Kramer MS, Yang H, Morin L, Fretts RC. Determinants of unexplained antepartum fetal deaths. Obstet Gynecol 2000;95(2):215-21.
30 Kahn B, Lumey LH, Zybert PA, Lorenz JM, Cleary-Goldman J, D'Alton ME, et al. Prospective risk of fetal death in singleton, twin, and triplet gestations: implications for practice. Obstet Gynecol 2003;102(4):685-92.
31 Luke B, Brown MB. Contemporary risks of maternal morbidity and adverse outcomes with increasing maternal age and plurality. Fertil Steril 2007;88(2):283-93.
32 Magee BD. Role of multiple births in very low birth weight and infant mortality. J Reprod Med 2004;49(10):812-6.
33 Ananth CV, Joseph KS, Demissie K, Vintzileos AM. Trends in twin preterm birth subtypes in the United States, 1989 through 2000: impact on perinatal mortality. Am J Obstet Gynecol 2005;193(3 Pt 2):1076-82.
34 Garite TJ, Clark RH, Elliott JP, Thorp JA. Twins and triplets: the effect of plurality and growth on neonatal outcome compared with singleton infants. Am J Obstet Gynecol 2004;191(3):700-7.
35 Stillman RJ, Rosenberg MJ, Sachs BP. Smoking and reproduction. Fertil Steril 1986;46(4):545-66.
36 Castles A, Adams EK, Melvin CL, Kelsch C, Boulton ML. Effects of smoking during pregnancy. Five meta-analyses. Am J Prev Med 1999;16(3):208-15.
37 Cnattingius S. The epidemiology of smoking during pregnancy: smoking prevalence, maternal characteristics, and pregnancy outcomes. Nicotine Tob Res 2004;6 Suppl 2:S125-40.
38 Kaminski M, Blondel B, Saurel-Cubizolles M-J. La santé périnatale. In: INSERM LD, editor. Les inégalités sociales. Paris, 2000:173-192.
39 Kramer MS, Seguin L, Lydon J, Goulet L. Socio-economic disparities in pregnancy outcome: why do the poor fare so poorly? Paediatr Perinat Epidemiol 2000;14(3):194-210.
40 Olausson PM, Cnattingius S, Goldenberg RL. Determinants of poor pregnancy outcomes among teenagers in Sweden. Obstet Gynecol 1997;89(3):451-7.
41 De Galan-Roosen AE, Kuijpers JC, Meershoek AP, van Velzen D. Contribution of congenital malformations to perinatal mortality. A 10 years prospective regional study in The Netherlands. Eur J Obstet Gynecol Reprod Biol 1998;80(1):55-61.
42 Glinianaia SV, Pharoah P, Sturgiss SN. Comparative trends in cause-specific fetal and neonatal mortality in twin and singleton births in the North of England, 1982-1994. Bjog 2000;107(4):452-60.
43 Holt J, Vold IN, Odland JO, Forde OH. Perinatal deaths in a Norwegian county 1986-96 classified by the Nordic- Baltic perinatal classification: geographical contrasts as a basis for quality assessment. Acta Obstet Gynecol Scand 2000;79(2):107-12.
44 De Reu PA, Nijhuis JG, Oosterbaan HP, Eskes TK. Perinatal audit on avoidable mortality in a Dutch rural region: a retrospective study. Eur J Obstet Gynecol Reprod Biol 2000;88(1):65-9.
45 Casey BM, McIntire DD, Leveno KJ. The continuing value of the Apgar score for the assessment of newborn infants. N Engl J Med 2001;344(7):467-71.
46 Papiernik E, Zeitlin J, Delmas D, Draper ES, Gadzinowski J, Kunzel W, et al. Termination of pregnancy among very preterm births and its impact on very preterm mortality: results from ten European population-based cohorts in the MOSAIC study. Bjog 2008;115(3):361-8.
47 PA Boyd, C DeVigan, B Khoshnood, M Loane, E Garne, H Dolk and the EUROCAT

working group. Survey of prenatal screening policies in Europe for structural malformations and chromosome anomalies, and their impact on detection and termination rates for Neural Tube Defects and Down's syndrome.Bjog (in press).
48 EUROSTAT. http://epp.eurostat.ec.europa.eu/extraction/evalight/EVAlight.jsp?A=1&language=en&root=/theme3/demo/demo_minfind 2006;accessed January 2008.
49 Graafmans WC, Richardus JH, Macfarlane A, Rebagliato M, Blondel B, Verloove-Vanhorick SP, et al. Comparability of published perinatal mortality rates in Western Europe: the quantitative impact of differences in gestational age and birthweight criteria. Bjog 2001;108(12):1237-45.
50 Blondel B, Morin I, Platt RW, Kramer MS, Usher R, Breart G. Algorithms for combining menstrual and ultrasound estimates of gestational age: consequences for rates of preterm and postterm birth. Bjog 2002;109(6):718-20.
51 Zeitlin J, Blondel B, Alexander S, Breart G. Variation in rates of postterm birth in Europe: reality or artefact? Bjog 2007;114(9):1097-103.
52 Escobar GJ, Clark RH, Greene JD. Short-term outcomes of infants born at 35 and 36 weeks gestation: we need to ask more questions. Semin Perinatol 2006;30(1):28-33.
53 Kramer MS, Demissie K, Yang H, Platt RW, Sauve R, Liston R. The contribution of mild and moderate preterm birth to infant mortality. Fetal and Infant Health Study Group of the Canadian Perinatal Surveillance System. Jama 2000;284(7):843-9.
54 Marret S, Ancel PY, Marpeau L, Marchand L, Pierrat V, Larroque B, et al. Neonatal and 5-year outcomes after birth at 30-34 weeks of gestation. Obstet Gynecol 2007;110(1):72-80.
55 Langhoff-Roos J, Kesmodel U, Jacobsson B, Rasmussen S, Vogel I. Spontaneous preterm delivery in primiparous women at low risk in Denmark: population based study. Bmj 2006;332(7547):937-9.
56 Alexander S, Wildman K, Zhang W, Langer M, Vutuc C, Lindmark G. Maternal health outcomes in Europe. Eur J Obstet Gynecol Reprod Biol 2003;111 Suppl 1:S78-87.
57 Why mothers die 1997-1999: The confidential enquiries into maternal deaths in the United Kingdom. London: Stationery Office. 2001.
58 Bouvier-Colle MH, Varnoux N, Breart G. Maternal deaths and substandard care: the results of a confidential survey in France. Medical Experts Committee. Eur J Obstet Gynecol Reprod Biol 1995;58(1):3-7.
59 Schuitemaker N, van Roosmalen J, Dekker G, van Dongen P, van Geijn H, Bennebroek Gravenhorst J. Confidential enquiry into maternal deaths in The Netherlands 1983-1992. Eur J Obstet Gynecol Reprod Biol 1998;79(1):57-62.
60 Zhang WH, Alexander S, Bouvier-Colle MH, Macfarlane A. Incidence of severe pre-eclampsia, postpartum haemorrhage and sepsis as a surrogate marker for severe maternal morbidity in a European population-based study: the MOMS-B survey. Bjog 2005;112(1):89-96.
61 Evins GG, Theofrastous JP, Galvin SL. Postpartum depression: a comparison of screening and routine clinical evaluation. Am J Obstet Gynecol 2000;182(5):1080-2.
62 Stowe ZN, Nemeroff CB. Women at risk for postpartum-onset major depression. Am J Obstet Gynecol 1995;173(2):639-45.
63 Atrash HK, Alexander S, Berg CJ. Maternal mortality in developed countries: not just a concern of the past. Obstetrics & Gynecology 1995;86(4 Pt 2):700-5.
64 Philibert M, Boisbras F, Bouvier-Colle M-H. Epidémiologie de la mortalité maternelle en France, de 1996 à 2002 : fréquence, facteurs et causes. BEH 2006;50(392-5).
65 van Roosmalen J, Schuitemaker NW, Brand R, van Dongen PW, Bennebroek Gravenhorst J. Substandard care in immigrant versus indigenous maternal deaths in The Netherlands. Bjog 2002;109(2):212-3.
66 Platt MJ, Cans C, Johnson A, Surman G, Topp M, Torrioli MG, et al. Trends in cerebral palsy among infants of very low birthweight (<1500 g) or born prematurely (<32 weeks) in 16 European centres: a database study. Lancet 2007;369(9555):43-50.

67 Topp M, Huusom LD, Langhoff-Roos J, Delhumeau C, Hutton JL, Dolk H. Multiple birth and cerebral palsy in Europe: a multicenter study. Acta Obstet Gynecol Scand 2004;83(6):548-53.
68 Dickinson HO, Parkinson KN, Ravens-Sieberer U, Schirripa G, Thyen U, Arnaud C, et al. Self-reported quality of life of 8-12-year-old children with cerebral palsy: a cross-sectional European study. Lancet 2007;369(9580):2171-8.
69 Alran S, Sibony O, Oury JF, Luton D, Blot P. Differences in management and results in term-delivery in nine European referral hospitals: descriptive study. Eur J Obstet Gynecol Reprod Biol 2002;103(1):4-13.
70 Langer B, Caneva MP, Schlaeder G. La surveillance prenatale de routine en Europe: comparaison de l'experience de 9 services de gyneco-obstetrique situes dans 8 pays differents. J Gynecol Obstet Biol Reprod (Paris) 1997;26(4):358-66.
71 Stephenson PA, Bakoula C, Hemminki E, Knudsen L, Levasseur M, Schenker J, et al. Patterns of use of obstetrical interventions in 12 countries. Paediatr Perinat Epidemiol 1993;7(1):45-54.
72 Blondel B, Macfarlane A, Gissler M, Breart G, Zeitlin J. Preterm birth and multiple pregnancy in European countries participating in the PERISTAT project. Bjog 2006;113(5):528-35.
73 Van Reempts P, Gortner L, Milligan D, Cuttini M, Petrou S, Agostino R, et al. Characteristics of neonatal units that care for very preterm infants in Europe: results from the MOSAIC study. Pediatrics 2007;120(4):e815-25.

Appendix

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B Very Low Gestational Age and Very Low Birth Weight infants

Acronyms and abbreviations

BW	Birth weight
CLD	Chronic lung disease
CMV	Conventional mechanical ventilation
CP	Cerebral palsy
ESPR	European Society for Paediatric Research
GA	Gestational age
IVH	Intraventicular Haemorrhage
MS	Member States
n-CPAP	Continuous positive airway pressure
NEC	Necrotising enterocolitis
NICU	Neonatal Intensive Care unit
NMR	Neonatal mortality rate
PDA	Patent ductus arteriosus
PIVH	Periventricular intraventricular Haemorrhage
PVL	Periventricular leukomalacia
ROP	Retinopathy of prematurity
SCPE	Surveillance of Cerebral Palsy in Europe
SNMR	Standardised neonatal mortality rate
VLBW	Very low birth weight
VLGA	Very low gestational age

1 Introduction

1.1 Scope of the chapter

This chapter will consider the health implications of “being born too soon, too small”. The neonatal care process for very low gestational age (VLGA, <32 weeks) and very low birth weight (VLBW, <1501 grams) infants will be reviewed. Weight-specific neonatal mortality rate (NMR), perinatal risk and preventive factors, frequent therapeutic interventions and significant short-term morbidity will be considered. Long-term consequences on postnatal well-being and neurosensorial development in terms of disabilities and quality of life will also be discussed.

1.2 Perinatal impact of VLGA/VLBW infants

Outcomes of VLGA and/or VLBW infants, although only <l.2% of all live births (0.04 in Luxembourg to 1.24% in the UK1, have a major impact on perinatal, neonatal, post-neonatal and infant mortality2. Moreover, the long-term consequences of extreme prematurity are considerable in terms of compromise of their well-being as children and adults3, causing stress for families4 and economic burden for health systems5.

Weight-adjusted neonatal mortality rate (NMR) for VLBW infants is nowadays about 150/1000 livebirths, more than 50 times higher than the overall NMR, that varies among European countries from 2.4 to 6.8/1000 livebirths6. Furthermore, most disabilities of perinatal origin are more frequent in premature than in term infants.

1.3 Historical overview

It is estimated that over 2 million VLBW infants are born every year world-wide and prevalence of prematurity is rising everywhere including most European countries, despite efforts to prevent it7. One possible cause is the increased number of twin pregnancies, related to increasing maternal age and accessibility to assisted reproduction techniques8. Moreover, the better survival probabilities may lead to an increasing number of VLGA babies to be considered “livebirths”, rather than stillbirths.

European health care systems are not uniform but all member states offer government-paid access to neonatal intensive care units (NICUs), usually adjacent to perinatal centres where these babies are born9 thus preventing the need for postnatal transfer of them from hospitals where they are born to neonatal intensive care units (NICUs) 10. Moreover, intrauterine transfer is frequently used. A further advantage of regionalisation to facilitate access of VLBW to intensive care is that it makes it easier to account for every baby born within a given area.

Neonatal mortality reporting systems from civil and birth registers are well established but have traditionally included weight-specific data only for the whole category of Low-Birth-Weight (i.e. LBW; <2500 g)11, and more detailed information was not available. Years ago data from more immature infants was often under-reported because at those low gestational ages and weights mortality was extremely high. In the last few decades, improvements in perinatal and neonatal care have pushed back the limits of viability, so collecting data from those immature infants has become extremely important. Despite this fact, these data are not widely available. Data from survey and hospital discharges are becoming available, but are not systematically aggregated by central registers or by the EUROSTAT.

Currently, to evaluate perinatal and neonatal health care of VLBW/VLGA infants some Member States (MS) report only data on gestational age and weight-specific neonatal mortality, as the PERISTAT project recommended12. This project collects aggregated perinatal data (maternal morbidity and mortality and neonatal mortality), but not data on short-term morbidity and long-term disability outcomes for these very high risk infants. Only MOSAIC, a research project, gathers population-based data on VLGA infants from a few European regions, but data has not yet been published in full yet13. SCPE project collects population-based data on Cerebral Palsy (CP)14, which is the most frequent motor disability experienced by VLBW/VLGA children.

A neonatal network for data collection on the short- and long-term health consequences of VLBW and VLGA infants born in Europe was much needed. In 2006, such a network (EuroNeoStat) was financed by DG SANCO15,16, and it has completed the collection and analysis of a cohort of VLBW/VLGA infants born in several MS.

1.4 Neonatal networking

Internet-based communication technologies make collaboration among scientists and clinicians possible. In the medical field, networking has been used to improve the quality of health care provided to patients by means of disseminating information.
Existing neonatal networks collect standardised patient data to promote excellence in clinical practice by use of benchmarking and comparisons of outcomes, to promote research, continued education and quality improvement projects. Networks maintain databases keeping patient and unit identities anonymous. Periodic reports are generated with standardised comparisons of selected outcomes used by participating units to identify opportunities for improving care processes and evaluating effects of improvement efforts. For many reasons (Table I), most neonatal networks have focused on outcomes of care for

VLBW/VLGA infants, a group for which the development of an epidemiological information system is justified.

Table I Advantages of a European Information System for VLBW/VLGA infants

- Prematurity rates are increasing in Europe and throughout the world (8-12% of live births)
- Outcomes of VLGA/VLBW infants contribute significantly to neonatal and infant mortality rates (up to 60-70%).
- These infants have even higher rates of short and long-term morbidity associated with later developmental disabilities.
- The total number of VLGA/VLBW infants is relatively small (1-2% of live births).
- All infants are immediately and easily identified at hospitals.
- Many initial risk factors are known and can be used to standardise outcomes, and to some extent outcome is related to the quality of care received which paves the way to the implementation and assessment of quality improvement strategies.
- Larger and increasing amounts of resources are consumed for their short and long-term care.
- Several evidence-based interventions have been shown to improve outcome (e.g. antenatal steroids and postnatal surfactant)
- Nosocomial infection is prevalent and increases risk for poor outcomes but is potentially preventable.
- Surviving infants often have neurological and respiratory disabilities requiring follow-up, multiple therapeutic interventions, prolonged care and re-hospitalisations.
- Overall, perinatal, neonatal and long-term care of VLBW infants is one of the most demanding health problems involving increasingly large health resources.

Modified with permission from JP Diaz Rosello, CLAP, Montevideo, Uruguay.
Personal communication.

There are several neonatal networks in other areas of the world17-20, and in some European countries (Belgium21, Ireland22, Portugal23, Spain24) and regions (Basque Country and Navarre25, Lazio26 and England's Regional Networks27). However, there was no European-wide network to allow comparisons of outcomes for VLGA/VLBW infants, specifically designed to meet the peculiarities of perinatal care in the different MS. In 2005 **EuroNeoStat** (www.euroneostat.org) was funded by DG SANCO as a information system, and this neonatal network started data collection in 200615,16.

EuroNeoStat has developed by consensus a set of standardised perinatal indicators with uniform definitions of perinatal risk and protective factors, neonatal interventions and significant short-term outcomes, based on the Vermont-Oxford Network database with their approval (Table II). These indicators can be used for many purposes (Table III). The 24-months follow-up set of indicators to assess health and neurodevelopment status can be considered temporary. Final indicators will be developed after a one-year pilot study and will be agreed upon with EuroPeriStat II project (Table IV).

Table II 2007 EuroNeoStat Perinatal Dataset

- Gestational age (weeks and days)
- Birthweight, length and head circumference
- Gender
- Death in delivery room?
- Location of birth (inborn vs. outborn)
- Prenatal care
- Prenatal steroids: number of doses, additional courses
- Mode of delivery
- Multiple birth, total number of foetuses and order at delivery
- Apgar score at 1 and 5 minutes
- Resuscitation at birth: oxygen, bag/mask ventilation, endotracheal intubation
- Epinephrine and/or cardiac compression.
- Age at admission (days and hours)
- Surfactant at any time and total number of doses
- Supplemental oxygen on day 28 and 36 weeks adjusted gestational age
- Steroids for BPD
- Indomethacin/Ibuprofen (prophylactic and/or therapeutic)
- Ductus arteriosus ligation
- Retinopathy of prematurity (ROP) and ROP Grade
- Necrotising enterocolitis (NEC) or Focal Gastrointestinal Perforation
- Surgery for NEC
- Other major surgery (description)
- Respiratory Distress Syndrome
- Pneumothorax
- Cranial imaging and intraventricular haemorrhage (Grade)
- Periventricular leukomalacia
- Early bacterial sepsis and/or meningitis (before day 3) and bacterial pathogen
- Late sepsis and/or meningitis (after day 3) and bacterial pathogen
- Major birth defects
- Oxygen at disposition/discharge
- Apnea or cardio-respiratory monitor at disposition
- Initial disposition from your hospital (age in days)
- Weight, length and head circumference at initial disposition
- Reason for transfer (description)
- Limitation of therapeutic effort?
- Age at death (days and hours)
- Necropsy and cause of death (description)

Modified from Vermont-Oxford Neonatal Dataset (with permission)
Full perinatal dataset and definitions can be downloaded at www.euroneostat.org

Table III Uses for the EuroNeoStat neonatal indicators

1. To compare outcomes from individual NICUs to those of other institutions, to identify areas with opportunities for improvement of results of the care process and to follow the success of the initiatives undertaken.
2. To evaluate health programs and develop priorities for planning, promotion and evaluation of short- and long-term care of these infants by health organisations.
3. To document clinical variability of the care process and its outcomes with the aim of developing the optimal application of health care.
4. To push forward consensus in health policies and strategies to improve care of these high-risk premature infants.

Table IV Health status and developmental follow-up at 24 months CA

- Died after discharge from Neonatal Unit
- Corrected age at assessment
- Weight, height/length and head circumference at assessment
- Congenital Malformations/anomalies
- Able to walk without support?
- Able to sit?
- Able to use hands to feed self?
- Able to control head movement without support or no head control?
- Total hearing impaired, uncorrected even with aids?
- Total blindness or sees light only?
- Assessment with objective test:
  - If performed (normal or not)
  - If not performed indicate:
    . Communicating by speech or other method? YES/NO
    . Able to produce more than 5 recognisable sounds? YES/NO
    . Able to understand words/signs? YES/NO
    . Shows interest in known people or objects? YES/NO
- Convulsions (more than one seizure monthly even with treatment)
- Gastrointestinal function: Normal, requires tube feeding or parental nutrition
- Respiratory function: normal or requires continual or respiratory support?
- Renal function: requires dialysis?
- Cerebral Palsy: absent, permanent disability or considered temporary

2 Health determinants/risk factors

2.1 Overview

As mentioned above, there is no current systematic collection of information on the health determinants/risk factors for VLBW infants at European level, although a few regions on a quasi-population based basis25,26 and MS21-24 do collect data. Studies about variability of mortality rates of VLBW infants related to among others, regional factors28 or to hospital volume29 within the same MS.

Morbidity and mortality data from the 2006 **EuroNeoStat** cohort of immature infants will be used in this report, emphasising the influence of gestational age, birthweight and gender. Clinical variability and possible health inequalities will also be discussed.

2.2 Principal risk factors and determinants

One of the most important determinants for intact survival is accessibility to a NICU in the same hospital where the infant was born30. Rates for babies <32 weeks' gestation born in hospitals with NICUs varied from 33.5% in Greece to 97.7% in the Valencia region in Spain6.

The major biological risk factor for VLBW infant mortality is immaturity. The lower limit for viability is now around the 23-24 weeks of gestation. There are other risk factors related to maternal status, socio-economic level as well as to pregnancy (antenatal care, infection, multiple pregnancy, assisted conception…), infant characteristics (birthweight, congenital anomalies…) and status at birth (Apgar scores, need for resuscitation…)13.

The **EuroNeoStat** 2006 cohort included babies (<1500 g or <32 weeks) from 14 Units in 10 MS (Austria, Czech Republic, Finland, France, Germany, Greece, Italy, Poland, Spain and UK) plus Russia. At this time, the sample size of analysed cases (N = 1520) is still too small to be considered representative of MS or to establish comparisons between regions or countries. Table V shows the infant characteristics of the cohort that had a mean birthweight and gestational age of 1152 g and 28.7 weeks respectively

In the **EuroNeoStat** cohort 24.8% and 17.4% of babies had an Apgar score at one and five minutes below 5 and 7 respectively. The most important protective factor was prenatal corticosteroid use, being given to 81.4% of all babies, a full course to 60.9% of them (Table VI). Prenatal infection was present in 5.5%.

It is noteworthy that at least one major congenital malformation occurred in 9.5% of all babies (Table VI), a factor known to be associated with an increase in mortality and risk for neurodevelopment impairment31. This rate was more that fourfold that reported by EUROCAT for all births (livebirths and stillbirths)32.

Table V **EuroNetStat** 2006 cohort

Variables (*)	**Value**
Birth Weight (g)	
Mean (SD)	1152 (344)
95% CI (Mean)	(1135 – 1170)
Median (P_{25}, P_{75})	1160 (880 – 1400)
Min - Max	376 - 2720
Gestational Age (weeks)	
Mean (SD)	28.7 (2.6)
95% CI (Mean)	(28.6 – 28.8)
Median (P_{25}, P_{75})	29 (27 – 31)
Min - Max	22 - 36
Age at Admission (days)	
Mean (SD)	1.1 (3.6)
95% CI (Mean)	0 (0 -1)
Median (P_{25}, P_{75})	0 - 27
Min - Max	

Data from the EuroNetStat project 2006 cohort of VLBW/VLGA infants.

Table VI **EuroNeoStat** 2006 cohort

Variables (*)	**Value**
1-Minute Apgar Score	
Mean (SD)	6.1 (2.4)
95% CI (Mean)	(6-6.2)
Median (P_{25}, P_{75})	7 (5-8)
Score < 5 (%)	24.8
5-Minutes Apgar Score	
Mean (SD)	8(1.8)
95% CI (Mean)	(7.9-8.1)
Median (P_{25}, P_{75})	8(7-9)
Score < 7 (%)	17.4
Perinatal Infection	
%, Unit Variability (lowest – highest, %)	5.5 (0-14.4)
Congenital Malformations	
%, Unit Variability (lowest – highest, %)	9.5 (1.9-26.7)
Caesarian Section	
%, Unit Variability (lowest – highest, %)	70.8 (52.8-89.2)
Prenatal Corticosteroids	
Complete, %	60.9
Incomplete, %	20.5
Any, Unit Variability (lowest – highest, %)	(3.2-95)

Data from the EuroNetStat project 2006 cohort of VLBW/VLGA infants.

3 Morbidity

3.1 Clinical management and therapies

It should be noted that 18.6% of infants from the 2006 EuroNeoStat cohort were not exposed to prenatal steroids. The reasons for this are unclear, but imminent delivery is likely to be a major contributing factor. Caesarean section was the mode of delivery in 70.8% of babies (Table VI).

3.1.1 Neonatal care at the delivery area

A significant number of babies required some resuscitation at birth. Oxygen was given to 85.1%, bag and mask ventilation to 61.4%, tracheal intubation was required by 42.2%, cardiac compression by 2.8% and epinephrine administration by 2.1% (Table VII). In this population, neonatal resuscitation practices might vary from hospital to hospital, even within the same MS33, possible due to different case-mix and to lack of evidence to guide practice for this high-risk group of VLBW/VLGA infants.

Table VII Early clinical management and interventions

Variables (*)	Value
Resuscitation Manoeuvres (Delivery Room)	
Oxygen, %, Unit Variability (lowest – highest, %)	85.1 (66.1 – 100)
Bag/Mask, %, Unit Variability (lowest – highest, %)	61.4 (1.1 – 100)
Intubation, %, Unit Variability (lowest – highest, %)	42.4 (16.1 – 89.1)
Cardiac Compression, %, Unit Variability (lowest – highest, %)	2.8 (0 – 8.9)
Epinephrine/Adrenaline, %, Unit Variability (lowest – highest, %)	2.1 (0 – 5.7)
Exogenous Surfactant	
%, Unit Variability (lowest – highest, %)	51.6 (35.2 – 77.4)

Table VIII Clinical management at the NICU

Variables (*)	Value
Exogenous Surfactant	
First dose < 1st hour of life of all surfactant treated babies, %	54.8 (2.8 – 96.2)
Respiratory Assistance	
Oxygen, %, Unit Variability (lowest – highest, %)	81.4 (66 – 100)
NCPAP, %, Unit Variability (lowest – highest, %)	62.9 (17.9 – 95.2)
Conventional Ventilation, %, Unit Variability (lowest – highest, %)	47.5 (2.9 – 93.5)
HFV, %, Unit Variability (lowest – highest. %)	11.1 (0 – 25.8)
Surgery	
PDA Ligation,%, Unit Variability (lowest – highest, %)	5.8 (0 – 32.3)
ROP Surgery, %, Unit Variability (lowest – highest, %)	2.4 (0 – 11.1)
NEC Surgery, %, Unit Variability (lowest – highest, %)	2.9 (0 – 12.2)
Other Major Surgery, %, Unit Variability (lowest – highest, %)	6.8 (1.1 – 35.5)
Any Surgery, %, Unit Variability (lowest – highest, %)	15.3 (5.8 – 58.1)
None	84.7
One	13
Two	2
Three	0.3
Nosocomial Infection	
%, Unit Variability (lowest – highest, %)	25 (0 – 41.8)
Periventricular – Intraventricular Haemorrhage	
Cranial Imaging done, %	78.1
Grades III or IV, %	9.9
Unit Variability (lowest – highest, %)	2 – 44.7
Cystic Periventricular Leukomalacia	
%, Unit Variability (lowest – highest, %)	3.4 (0 – 12.5)
Pneumothorax	
%, Unit Variability (lowest – highest, %)	3.8 (0 – 16.3)
Chronic Lung Disease (BPD)	
%, Unit Variability (lowest – highest, %)	20.8 (0 – 51.9)
Necrotising Enterocolitis	
%, Unit Variability (lowest – highest, %)	4.9 (0 – 18.4)
Retinopathy of Prematurity	
Retinal Exam done, %	56.6
Grades > 0, %, Unite Variability (lowest – highest, %)	30.4 (5.5 – 100)
Grades III, IV or V, %. Unit Variability (lowest – highest. %)	5.9 (0 – 50)

CPAP: Constant positive airway pressure; HFV: High frequency ventilation; PDA: Patent ductus arteriosus; ROP: Retinopathy of prematurity; NEC: Necrotsing enterocolitis.
Data from the EuroNeoStat project 2006 cohort of VLBW/VLGA infanis.

3.1.2 Neonatal care at the NICU

After admission to NICUs, 81.4% of babies required oxygen therapy and 62.9% nasal continuous positive airway pressure (n-CPAP), delivered either before or after Conventional Mechanical Ventilation (CMV). CMV was needed by 47.5% and high frequency ventilation by 11.1% of infants (Table VIII). Overall, exogenous surfactant instillation was given to 51.6% of babies (Tables VII), about half of them within the first hour of life (Table VIII). Moreover, 15.3% of babies needed some type of major surgery, 5.8% for patent ductus arteriosus (PDA), 2.9% for necrotising enterocolitis (NEC), 2.4% for severe retinopathy of prematurity (ROP) and 6.8% for other reasons (Table VIII).

3.2 Major short-term morbidity

Nosocomial infection rate was 25% (Table VIII). Rates of intraventricular haemorrhage (IVH) grades 3-4 and cystic periventricular leukomalacia (PVL) were 9.9% and 3.4%, respectively (Table VIII). Pneumothorax was diagnosed in 3.8% of infants and chronic lung disease (CLD) in 20.8%. The rate of NEC was 4.9 and that of stages 3-5 ROP 5.9% (Table VIII).

3.3 Disability

The measurement of specific impairments allows the assessment of major effects of new interventions. A broader approach to health measurement in follow-up studies should include both long-term objective disability assessed by third-party34,35 and subjective self-reported quality of life36, since neonatal interventions which appear to have minimal effect on mortality and neurodevelopment at an early age may profoundly influence the quality of life in later childhood and adult age37.

In the last fifteen years several follow-up studies of VLBW/VLGA in different MS (EPIPAGE group in France38, Leiden study in The Netherlands39 and several studies in the UK34,35) have documented that most survivors are in mainstream school and coping well as they enter adult life, although some will continue to need additional health, educational and social services.

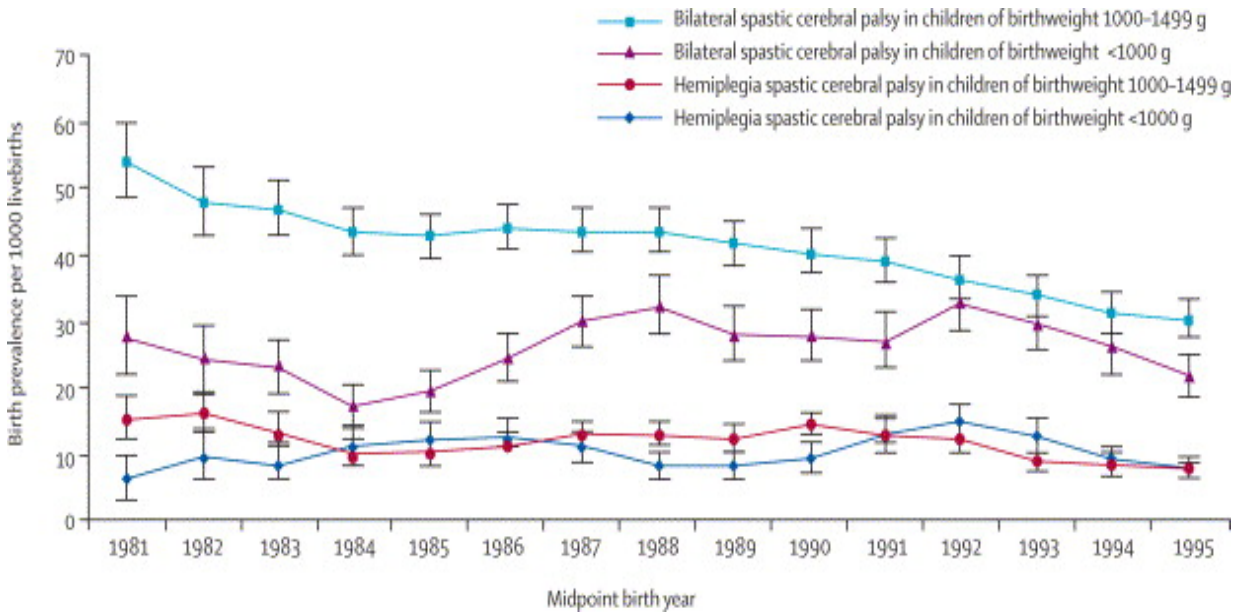
Overall, parents of teenagers reported a higher incidence of problems in physical functioning and family life, and in all areas of learning, teachers rated the ability of the VLBW teenagers lower than for their term peers37.

Even though published follow-up studies did not use comparable outcome measures, developmental disabilities resulting from cognitive, motor or sensorial impairments were more likely at lower gestational age. Overall, severe disability might be present in 20% of children born under 29 weeks and when assessed at 24-30 months it was a strong predictor of moderate-severe disability at school age34.

CP is a major clinical marker of brain injury. Its frequency increased during the early years of neonatal intensive care as mortality of VLBW infants decreased. The frequency of CP in children born under 29 weeks reflects the quality of perinatal care. Thus there was concern that frequency of CP would continue to increase. Data provided by the SCPE study shows that frequency of CP in VLBW infants decreased significantly from 6% of livebirths in 1980 to 4% in 199640. This improvement occurred despite an increase in VLBW livebirths, a decrease in NMR and an increase in multiple births. The decline in CP occurred mainly in the 1000-1499 g birth weight group. The prevalence of CP for those below 1000 g at birth has not changed41.

Despite this encouraging decrease in the prevalence of CP, the increase in the number of livebirths of VLBW/VLGA might lead to an increase in the number of children with CP (Figure 1). It should be pointed out that not all CP children are severely disable and that there other emerging disabilities (sensorial, cognitive and behavioural).

Figure 1 Cerebral Palsy (CP) rates at different birth weight subgroups. (Taken from Platt MJ et al. SCPE[40])



The **EuroNeoStat** project has developed by consensus a set of indicators to assess health and neurodevelopment status at 24-months (Table IV)., based on those proposed in 1997 by Anne Johnson42,43. (Full definitions available at: www.euroneostat.org).

4 Mortality

4.1 Overview

PERISTAT recommended collecting data on neonatal mortality and post-neonatal specific mortality rates by gestational age, birthweight and plurality1. However, not all MS provide such breakdown of neonatal mortality data and without this information perinatal health can not be assessed in detail, since neonatal mortality of infants below 32 weeks' gestation represented 48% of all neonatal deaths13.
The 28-day NMR of infants of the VLBW/VLGA of the infants admitted to NICUs in 2006 was 10.7% (95%CI 9.1-12.3%, range 1.6 to 17.6%), and post-neonatal, pre-discharge mortality 1.8% for those admitted to NICUs. Early NMR before day 7 and at discharge for all livebirths and for those admitted to NICUs is given in Table IX. Babies who died in the delivery suite represented 3% of all babies born and 20% of all neonatal deaths.

Table X lists the gestational age and birthweight specific NMR. There was an inverse relationship between NMR and both birth weight and gestational age. The NMR was higher for male infants than females (13.9% vs. 10.6%; $p<0.05$).

Table IX Neonatal Mortality Rates

	< 7 days	< 28 days	At Discharge
All livebirths	9.1	13.4	15.1
Admitted babies	6.2	10.7	12.5

Table X Gestational age and birth weight specific neonatal mortality rates

	Mortality rate by gestational age subgroups						
Gestation (wks)	< 24	24-25	26-27	28-29	30-31	> 31	Total
Survivors (%)	26.5	67.1	82	91.1	97	94.1	87.5
Non-survivors (%)	73.5	32.9	18	8.9	3	5.9	12.5
Total	2.3	11.3	17.3	26.7	31.9	10.4	

	Mortality rate by Birth weight subgroups						
Birth Weight (g)	< 501	501-750	751-1000	1001-1250	1251-1500	> 1500	Total
Survivors (%)	48.4	63.2	80.6	94	97.6	96.4	87.6
Non-survivors (%)	51.6	36.8	19.4	6	2.4	3.6	12.4
Total	2.1	12.9	21	22.8	27.8	13.4	

P-value was < 0.001 for both neonatal mortality rate distribution, for both gestational age and birthweight.

5 Health services provided to VLBW/VLGA newborn infants

5.1 Measuring quality of care and health service provision for VLBW infants

To measure the quality of the health care provided to VLBW/VLGA infants in NICUs, clinical variability in the application of evidence-based preventive and therapeutic strategies, and standardised outcome comparisons can be used. These data were not available for European NICUs until the **EuroNeoStat** project started. With this methodology, outcome variability and possible inequalities can be detected allowing units to perform their own benchmarking to discover areas with opportunities to improve the care process and to measure effectiveness of quality improvement initiatives implemented.

Figure 2 shows NMR by gestational age (A) and birthweight (B). The range is greater for the more immature and smaller infants and decreases as gestational age and birthweight increases. However, since the number of babies in these subgroups is small, point estimates of specific NMR are less precise.

It is noteworthy that a wide range was observed among **EuroNeoStat** units in C-section rates (Fig. 3A) and endotracheal intubation at birth (Fig 3B). There was also a wide range in the use of exogenous surfactant (Fig 3C), n-CPAP (Fig. 3D) and use of CMV (Fig. 3D).

Regarding the assessment of quality of care, as measured by the degree of use of evidence-based effective interventions indicates two units had unusually low rates of prenatal steroid use (Fig. 4A). Some NICUs had high rates of pneumothorax (Fig. 4B), BPD (Fig. 4C), IVH (Fig. 4D), cystic PVL (Fig. 4E) and ROP (Fig. 4F).

Figure 2A Neonatal mortality rate by gestational age (A) and birthweight subgroups (B). Standardised Neonatal Mortality Rates (SNMR) by gestational age and birthweight. (C). Mean rate(*) and 95CI are represented. SNMR: was calculated by the indirect method as the observed number of cases per NICU and subgroup divided by the expected number in each NICU and subgroup.

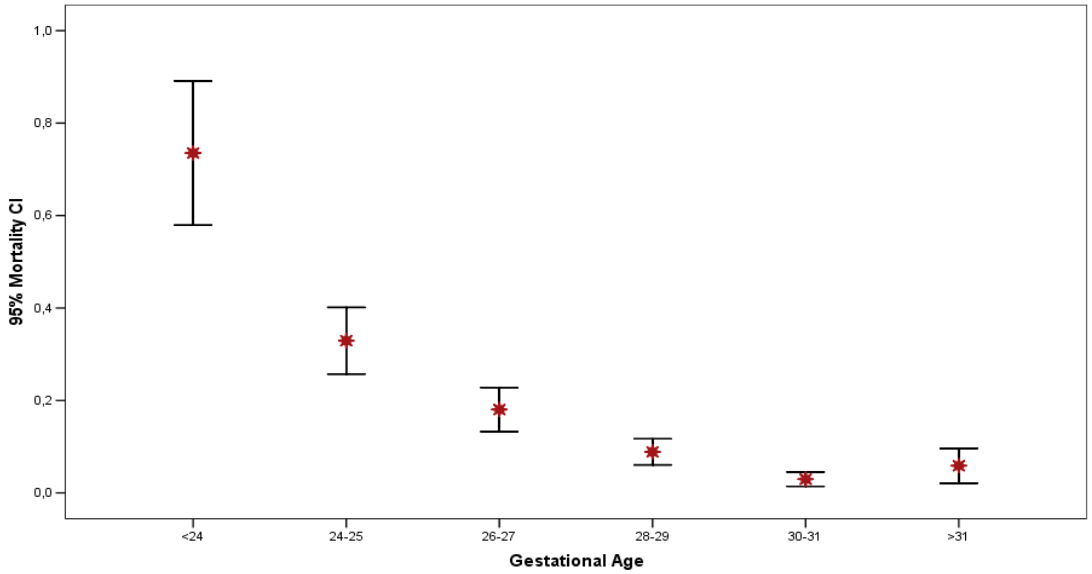


Figure 2B

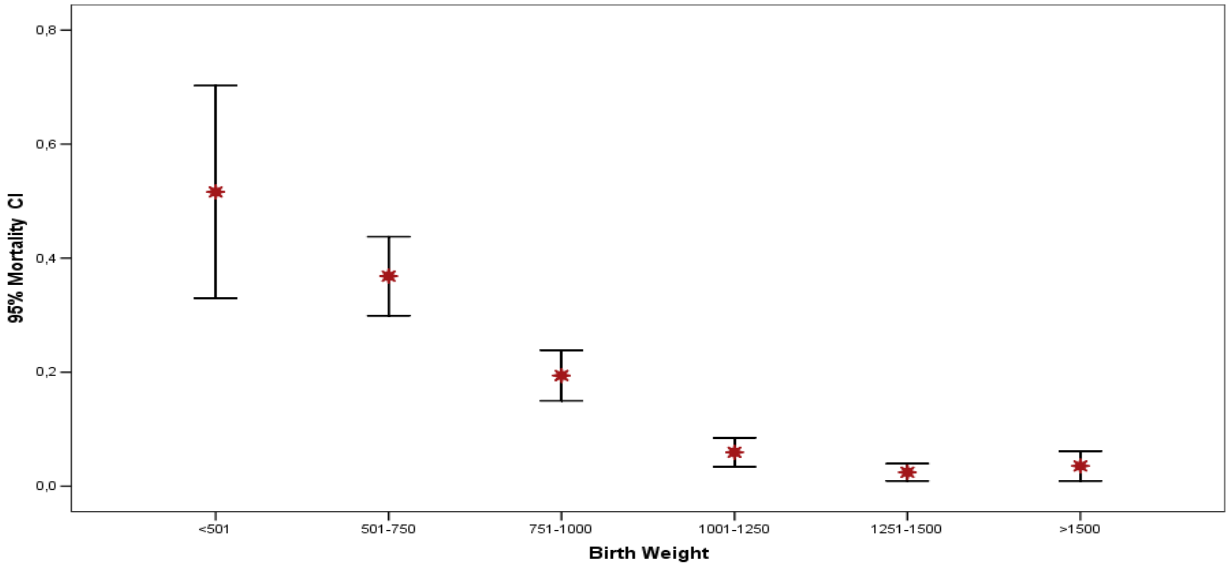
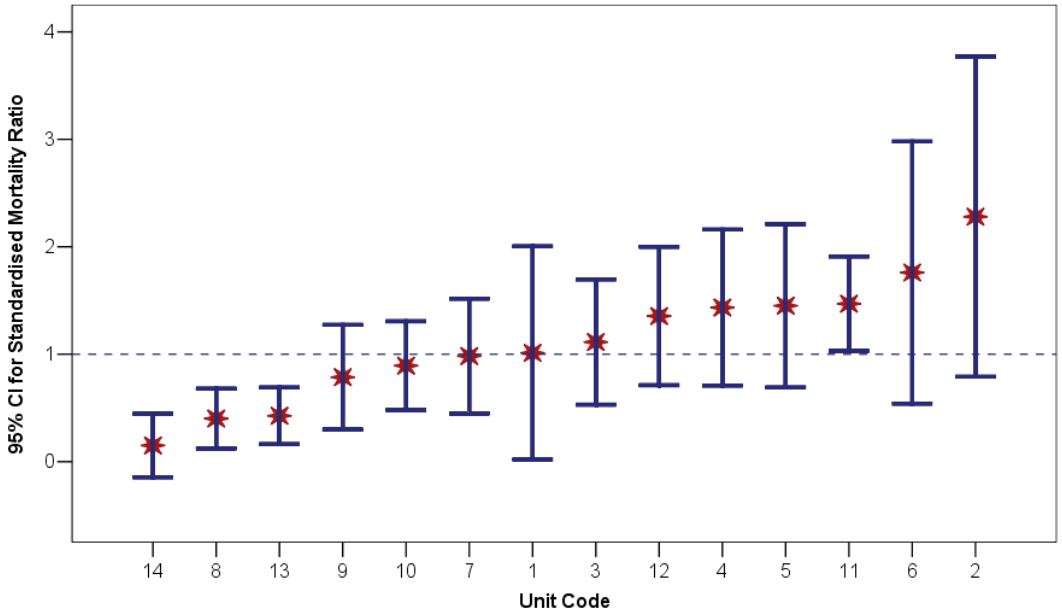


Figure 2C



Standardised by Birth Weight and Gestational Age.

Figure 3A Rates of C-section (A), endotracheal intubation (■), cardiac compression (**X**) and epinephrine administration (▲) during resuscitation at birth (B). Variability of the rates of surfactant administration at any time (■) and during the first hour of life (**X**) (C). Variability of the rates of conventional ventilation (■) and n-CPAP (**X**) after leaving the delivery room (D). Dotted lines (A) and individual marks (A, B, C, D) represent mean rate for all units and for each unit, respectively

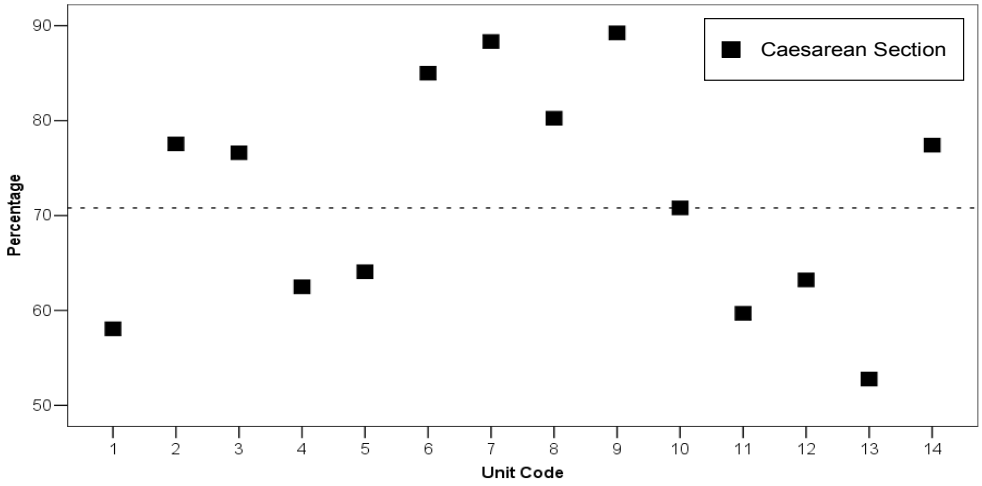
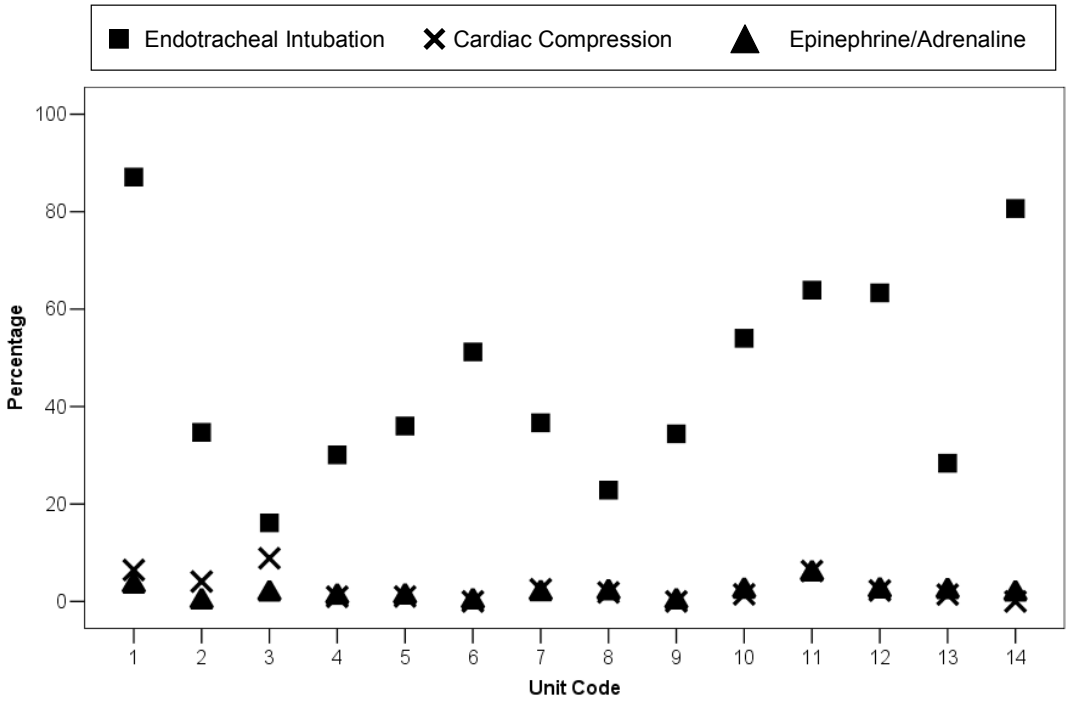


Figure 3B



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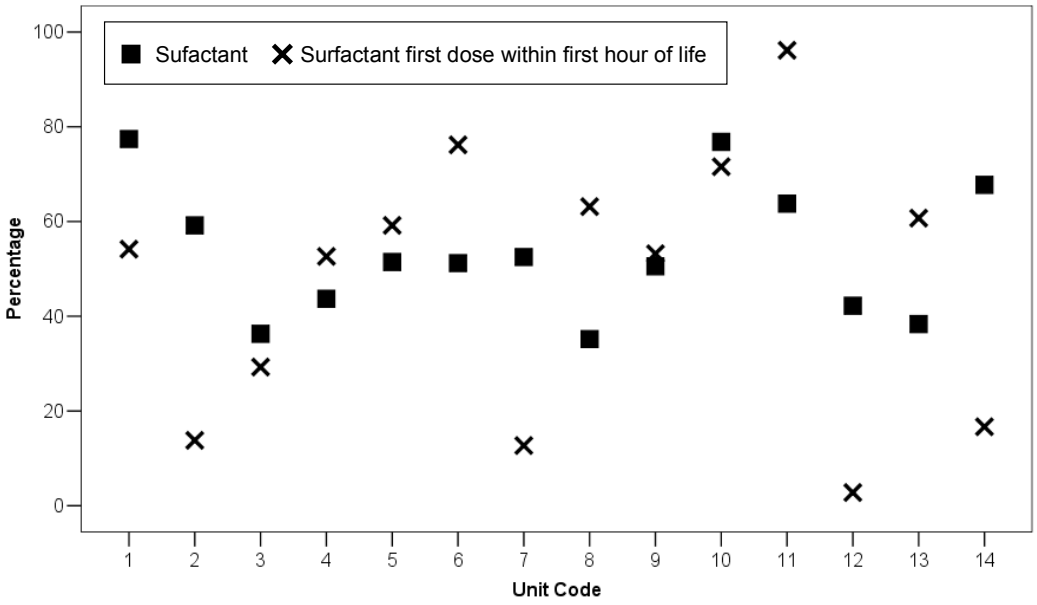


Figure 3D

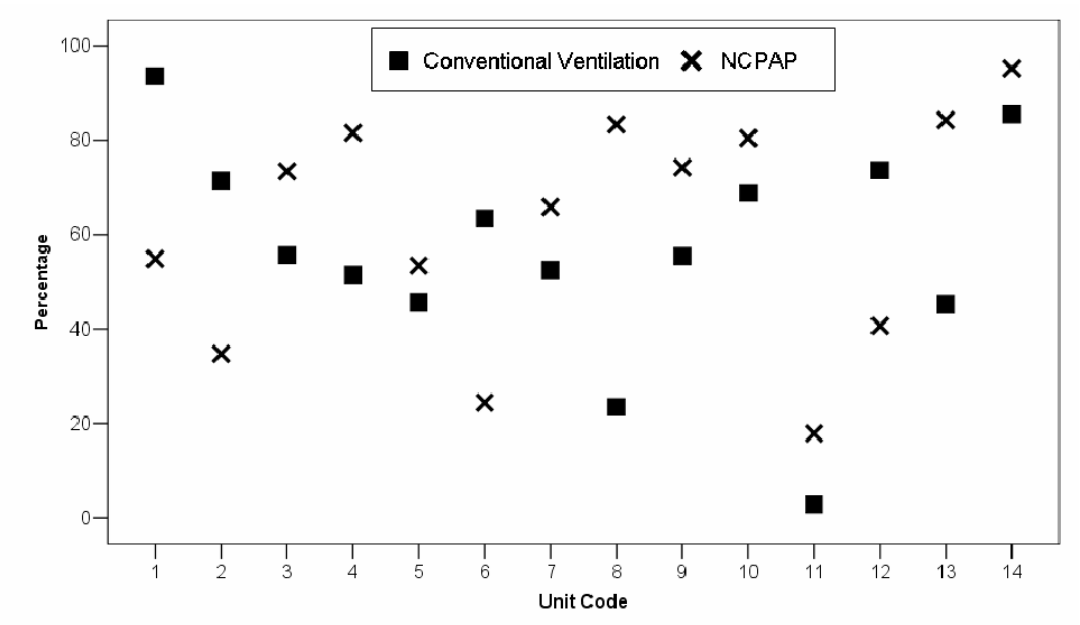


Figure 4A Rates of prenatal corticosteroid administration (A), pneumothorax (B), chronic lung disease (CLD) (C), intraventricular haemorrhage (D), cystic periventricular leukomalacia (E) and retinopathy of prematurity (F). Dotted lines (A, B, C, D, E, F, G) and individual marks represent mean rate for all units and for each unit, respectively

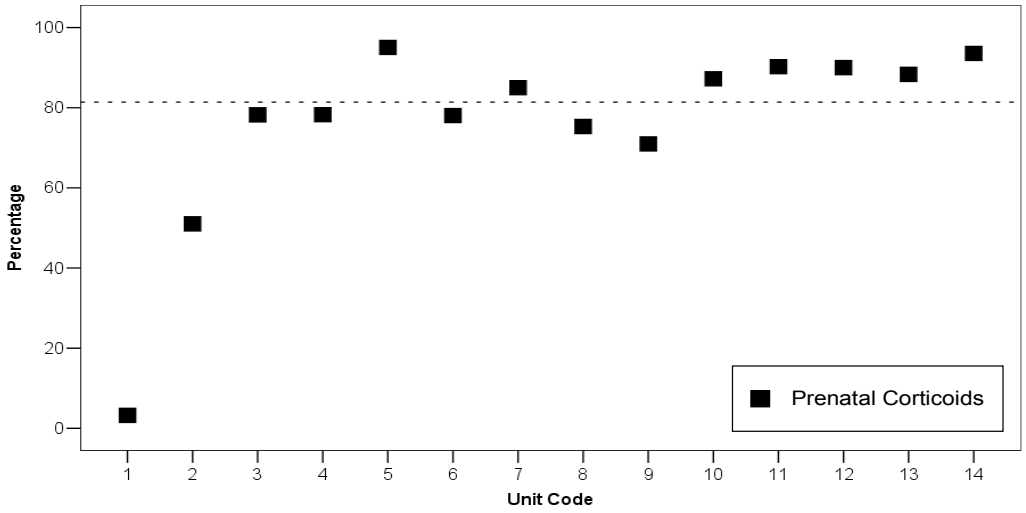


Figure 4B

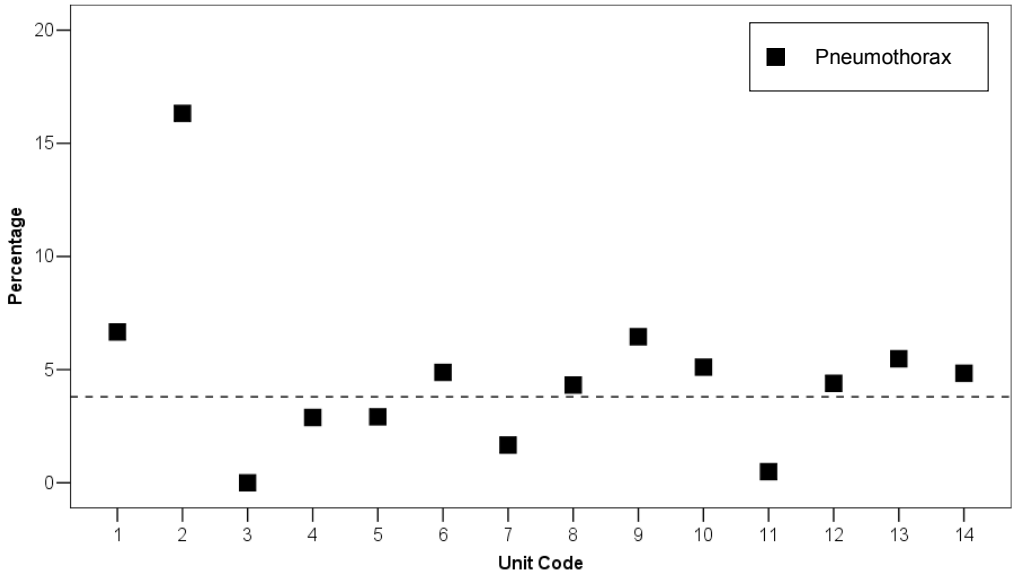


Figure 4C

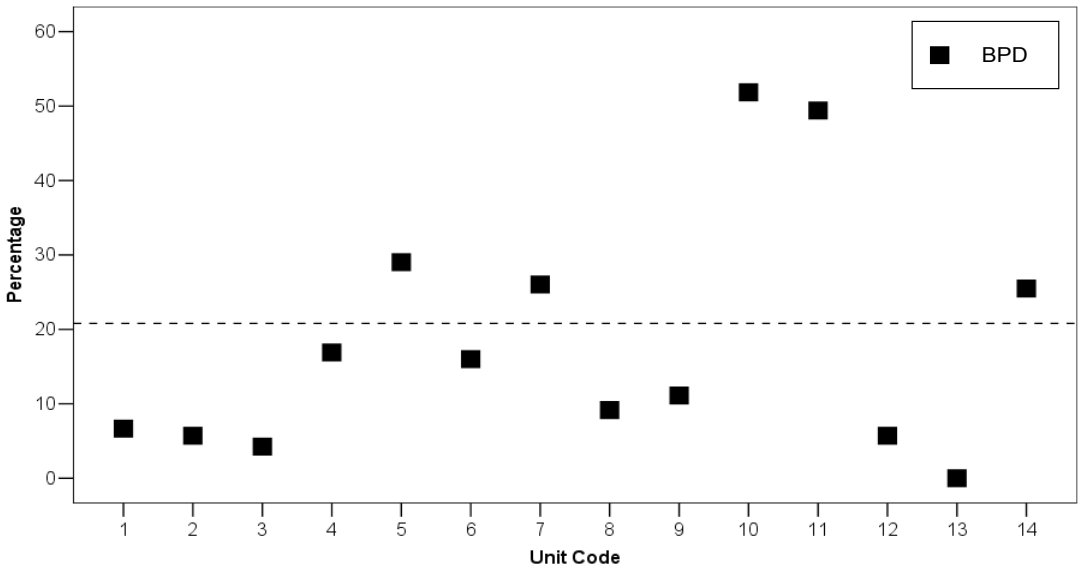
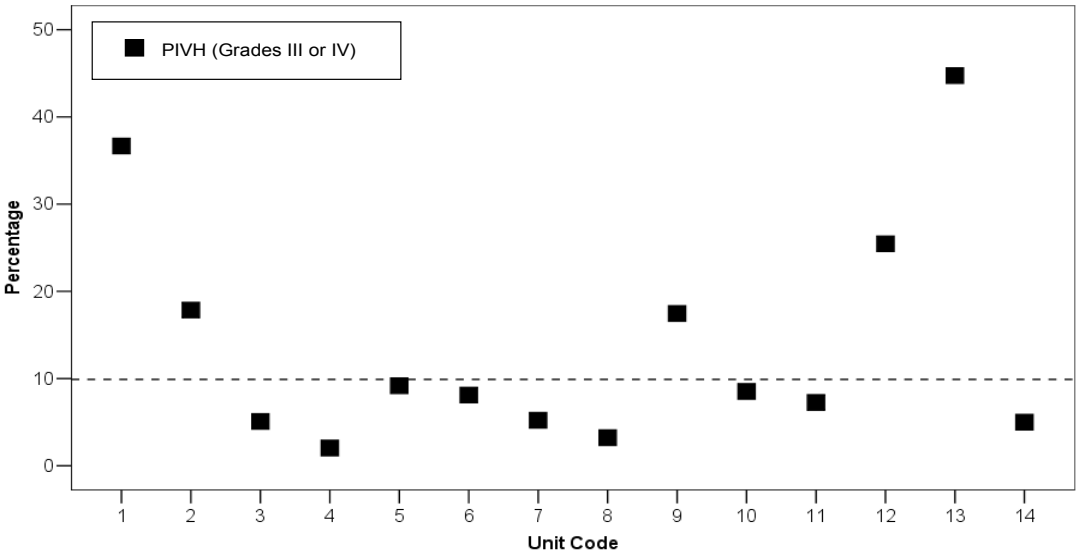


Figure 4D



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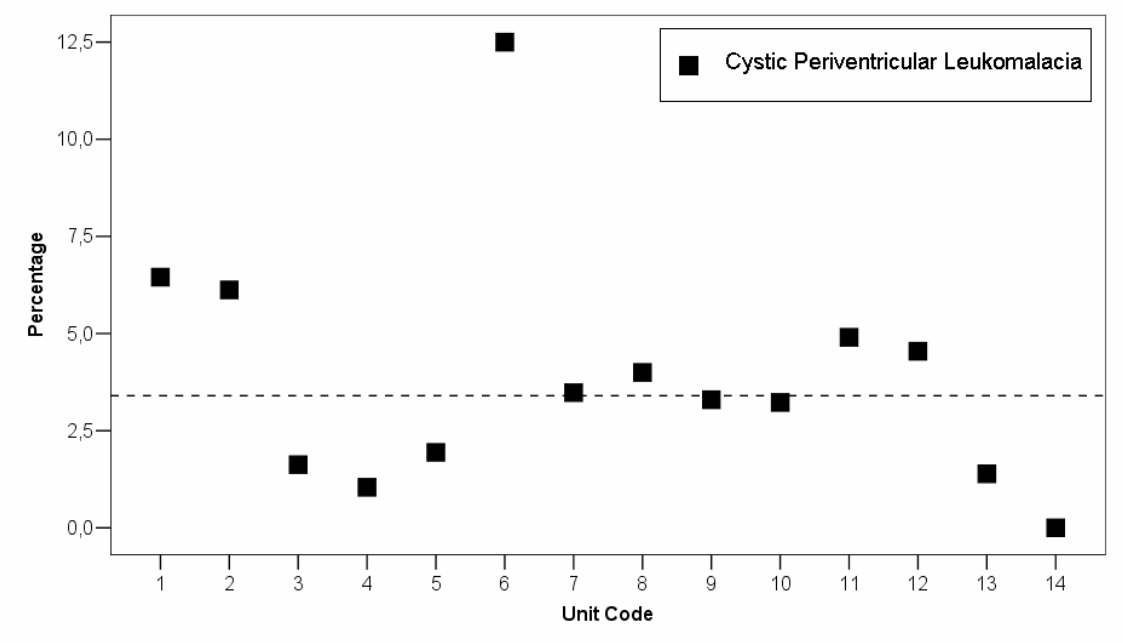
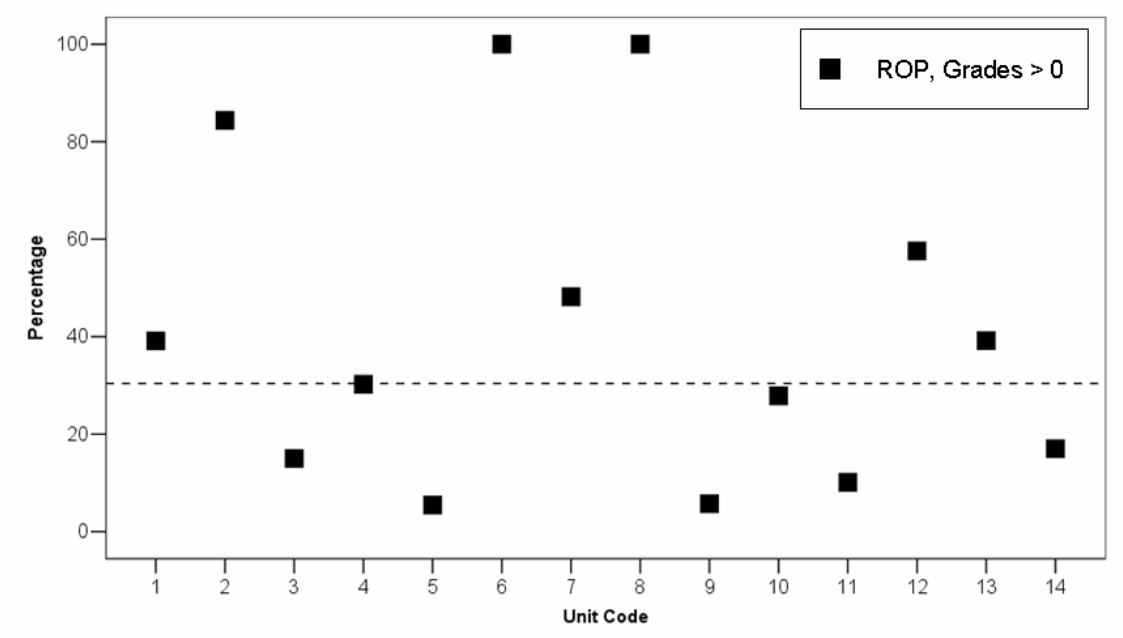


Figure 4F



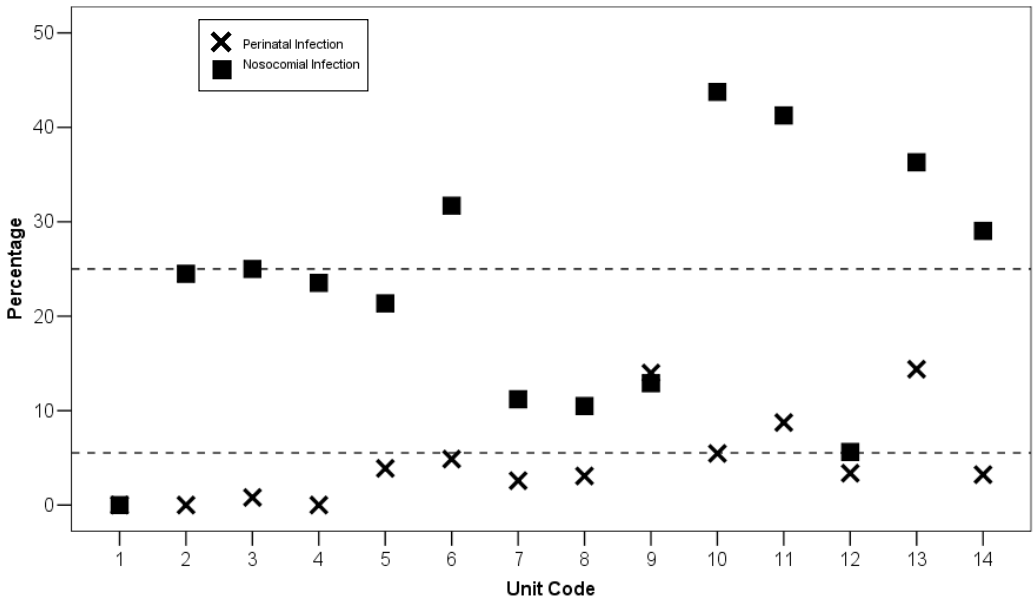
5.2 Patient safety

There is no systematic data collection available on patient safety for VLBW infants. Several countries have developed reporting systems on adverse events and incidents that can be used in NICUs (for example, Scandinavian countries, UK). NEOSAFE (www.neosafe.nl) is a specific system for neonates developed in The Netherlands by a **EuroNeoStat** partner (H. Molendijk). However, no specific data have been reported so far for these immature newborn infants.

Outcomes that could be explored for patient safety are based on the wide variability of rates of nosocomial infection among **EuroNeoStat** units (0 to 41.8%) (Table VIII and Fig. 5) and pneumothorax during CMV (0 to 16.3%) (Table VIII and Fig. 4B). These are areas where there is room for improvement in many NICUs.

The **EuroNeoStat** project includes the **EuroNeoSafe** initiative with a mission is to develop a culture that places the safety for these tiny patients first, by minimising medication errors and other mistakes which might have a significant impact on neonatal morbidity and mortality. Free software for voluntary communication of adverse events and near-misses has been specifically developed to be used in NICUs and is available at the **EuroNeoStat** website (www.euroneostat.org). The purpose of this tool is not to find the guilty party, as to err is human, but to help units to analyse and clarify the causes of incidents and to learn from them to put forward corrective mechanisms to reduce the frequency and consequences of this kind of error.

Figure 5



6 Conclusion

Prematurity is a major health problem of extensive public health impact on neonatal and infant mortality. Its also has long-term consequences on childhood well-being, family stress and prolonged need for health resources. Prevention of very premature delivery, although much sought after, has been elusive. In this context, prenatal pharmacological induction of fetal maturity by prenatal steroids is an effective and efficient intervention. Ready access to intensive care for these high risk infants is mandatory to improve their short and long-term outcomes.

To allow monitoring of the care health process and outcomes of these tiny infants, DG SANCO funded the **EuroNeoStat** project to establish an information system at a European level. This initiative is proposed as a standard for quality assessment and development of patient safety among all European NICUs.

Since the number of neonatal units and MS and thus cases analysed in the 2006 **EuroNeoStat** cohort is still small, results from the 2006 VLBW/VLGA infant cohort should be interpreted with caution. Nevertheless, the network is growing fast and so is the number of cases being collected. The aim would be that in the future most, if not all European NICUs collaborate in the project via **EuroNeoNet** (www.euroneonet.org) a neonatal network affiliated to the European Society for Neonatology/European Society for Paediatric Research (ESPR). The development of population-based national regional or neonatal networks44 in all MS, that later send data to **EuroNeoStat/EuroNeoNet**, could further contribute to establish a true pan-European information system on the consequences of **"being born too soon, too small"**.

VLBW/VLGA-specific NMR is associated with overall neonatal mortality being and excellent indicator of the quality of perinatal care. This weight-specific mortality rates account for about three quarters of the mortality variance observed among countries and regions. For the above reasons, we suggest that WHO should consider including gestational age specific mortality and morbidity among the indicators used to monitor infant health and recommend member states to collect and report such data.

Reference list

1 Buitendijk S, Zeitlin J, Cuttini M, Lanfhoff-Roos J, Bottu J. Indicators of fetal and infant health outcomes. Eur J Obstet Gynecol Reproduct Biol 2003, 111 (suppl 19):S66-77.

2 Hack M, Fanaroff AA. Outcomes of extremely-low-birth-weight infants between 1982 and 1988. NEJM 1989;321:1642-7.

3 Hack M, Cartar L, Sscluchter M, Kleinn N, Forrest CB. Self-perceived health, functioning and well-being of very low birth weight infants at age 20 years. J Pediatr 2007;151:635-41.

4 van der Pal SM, Maguire CM, le Czassie S, Wit JM, Walther FJ, Bruil J. Parental experiences during the first period at the neonatal unit after two developmental care interventions. Acta Pediatr 2007;96:1611-6.

5 Geitona M, Hatzikou M, Hatzistamatiou Z, Anastasiadou A, Theodoratou TD. The economic burden of treating neonates in intensive care units (ICUs) in Greece. http://www.resource-allocation.com/content/5/1/9 .

6 Wildman K, Blondel B, Najihuis J, Defoort P, Bakoula C. European indicators of health care during pregnancy, delivery and the postpartum period. Eur J Obstet Gynecol Reproduct Biol 2003, 111 (suppl 19):S53-65.

7 Simhan HN, Caritis SN. Prevention of preterm delivery. NEJM 2007;357:477-87.

8 Helmerhouse FM, Perquin DAM, Donker D, Keirse MJNC. Perinatal outcome of singletons and twins after assisted conception: a systematic review of controlled studies. BMJ 2004, doi:1,10.1136/bmj.37957.560278.EE.
9 Zeitlin J, Papiernik E, Breart G, the Europet Group. Regionalization of perinatal care in Europe. Semin Neonatol. 2004;9:99-110.
10 Shah PS, Shah V, Qiu Z, Ohlsson A, Lee SK and the Canadian Neonatal Network. Improved outcome of outborn preterm infants if admitted to perinatal centers versus freestanding pediatric hospitals. J Pediatr 2005;146:626-31.
11 United Nations Children's Fund and WHO. Low birthweight. Country, regional and global estimates. UNICEF, New York, 2004.
12 Zeitlin J, Wildman K, Bréart G, Alexandre S, Barros H, Blondel B, Buitendijk S, Gissler M, Macfarlane A. Selecting an indicator set for monitoring and evaluating perinatal health in Europe: criteria, methods and results from the PERISTAT project.. Eur J Pub Health 2003;13 (suppl 3):S5-14.
13 Zeitlin J, Papiernik E, Breart G, Draper E, Kollee L and the MOSAIC Research Group. Presentation of the European project models of organising access to intensive care for very preterm births in Europe (MOSAIC) using European diversity to explore models for the care of very preterm babies. Eur J Obstet Gynecol Reprod Biol. 2005;118:272-4
14 European Network for Cerebral Palsy (SCPEC). http://www-rheop.ujf-grenoble.fr/scpe2/site_scpe/index.php .
15 Valls i Soler A, Halliday HL, Hummler H on behalf of EuroNeoStat project. Steering Committee. Neonatal Networking. a European perspective. NeoReviews 2007;8:275-81.
16 Valls-i-Soler A, Carnielli V, Claris O, de la Cruz Bértolo J, Halliday HL, Hallman M, Hummler M, Weindling M, on behalf of EuroNeoStat Scientific Steering Committee. EuroNeoStat. A European Information System on the Outcomes of care for Very-Low-Birth-Weight Infants. Neonatology 2008;93:7-9.
17 Horbar JD. Vermont-Oxford Trials Network: 1996 Annual Report. Burlington Vermont, 1997.
18 Ehrenkranz RA, Wright LL. NICHD Neonatal Research Network: contributions and future challenges. Semin Perinatol 2003;27:264-80.
19 Lee SK, McMillan DD, Ohlsson A, Synnes A, Whyte R, Li-Yin Chien LY, Sale J and Canadian NICU Network. Variations in practice and outcomes in the Canadian NICU Network: 1996-1997. Pediatrics 2000,106:1070-19.
20 Evans N, Hutchinson J, Simpson JM, Donoghue D, Darlow B, Henderson-Smart D and Australian and New Zealand Neonatal Network. Prenatal predictors of mortality in very preterm infants cared for in the Australian and New Zealand Neonatal Network. Arch Dis Child Fetal Neonat Ed 2007;92:F34-40.
21 Vanhaesebrouck P, Allegaert K, Bottu J, Debauche C, Devlieger H, Docx M et al, for the EPIBEL Study Group. The EPIBEL Study: Discharge from hospital for extreme preterm infants in Belgium. Pediatrics 2004;114:663-75.
22 Jenkins J, Alderdice F, McCall E. Making information available for quality improvement and service planning in neonatal care. Ir Med J 2003;96:171-4.
23 VLBW Infants National Registry Group. VLBW Infants in Portugal. National Multicenter Study 1996-2000. Ed. BIAL Award Clinical Medicine 2002. Portugal, 2002.
24 Figueras-Aloy J, Moro Serrano J, Pérez Rodríguez J, Fernández Pérez C, Roqués Serradilla V, Quero Jiménez J for the SEN1500 Spanish Neonatal Network. Antenatal glucocorticoid treatment decreases mortality and chronic lung disease in survivors among 23- to 28-week gestational age preterm infants. Am J Perinatol 2005;22: 441-4.
25 Valls-i-Soler A, Páramo S, Centeno C, on behalf of Grupo Estudios Neonatales Vasco-Navarro (GEN-VN). Quality control (Q-C) of neonatal intensive care. Study of a cohort of very low birth weight infants (VLBWI) assisted in the Basque Country and Navarre. Biol Neonate 2003; 83:77A.
26 Network dei centri di terapia intensiva del Lazio. Annual report, 2001

27 Redshaw M, Hamilton K. Networks, admissions and transfers: the perspectives of networks, neonatal units and parents. National Perinatal Epidemiology Unit. Oxford Univer., 2006.
28 Corchia C, Orzalesi M. Geographic variations in outcome of very low birth weight infants in Italy. Acta Paediastr 2007;96:35-8.
29 Bertels DB, Wypij D, Wenzlaff O, Dammann O, Poets CF. Hospital volume and neonatal mortality among very low birth weight infants. www.pediatrics.org/cgi/doi/10.1542/peds .2005-1624.
30 Warner B, Musial J, Chenier T, Donovan E. The effect of birth hospital type on the outcome of very low birth weight infants. Pediatrics 2004;113: 35-41.
31 Walden RV, Taylor SC, Hansen NI, Poole WK, Stoll BJ, Abuelo D, Vohr BR for National Institute of Child Health and Human Development Neonatal Research Network. www.pediatrics.org/cgi/doi/10.1542/peds .2007-0354.
32 Dolk H. EUROCAT: 25 years of European surveillance of congenital anomalies. BMJ 2005;90:F355-8 and http://www.eurocat.ulster.ac.uk/pubdata/tables.html .
33 Trevisanuto D, Doglioni N, Ferrarese P, Bortolus R, Zanardo V, Resucitation Study Group, Italian Neonatal Society. Neonatal Resuscitation of extremely low birthweight infants: a survey of practice in Italy. Arch Dis Child Neonat Ed. 2006;91:F123-4.
34 Marlow N, Wolke D, Bracewell Ma, Samara M; EPICURE Study Group. Neurologic and developmental disability at six years of age after extremely preterm birth. NEJM 2005;352:9-19.
35 Johnson A, Bowler U, Yudkin P, Hockley C, Wariyar U, Gardner F, Mutch L. Health and school performance of teenagers born before 29 weeks gestation. Arch Dis Child Fetal Neonat Ed 2003;88:F190-8.
36 Saigal S, Stoskopf B, Pinelli J, Streiner D, Hoult L, Paneth N, Goddeeris J. Self-perceived health-related quality of life of former extremely low birth weight infants at young adulthood. Pediatrics 2006;118:1140-8.
37 Hack N, Cartar L, Schulchter M, Klein N, Forrest CB. Self-perceived health, functioning and well-being of low birth weight infants at age 20 years. J Pediatr 2007;151:635-41.
38 Arnaud C, Daubisse-Marliac L, White-Koning M, Pierrat V, Larroque B, Grandjean H, Alberge C, Marret S, Burguet A, Ancel PY, Supernant K, Kaminski M. Prevalence and associated factors of minor neuromotor dysfunction at age 5 years in prematurely born children: the EPIPAGE study. Arch Pediatr Adolesc Med 2007;161:1053-61.
39 Stoelhorst GM, Rijken M, Martens SE, van Zwieten PH, Feenstra J, Zwinderman AH, Wit JM, Veen S, Leiden follow-up project on prematurity. Developmental outcome at 18 and 24 months of age in very preterm children: a cohort study from 1996 to 1997. Early Hum Dev 2003;72:83-95.
40. Reprinted from The Lancet, 369, Platt MI, Cans C, Johnson A, Surman G, Topp M, Torrioli MG, Krageloh-Mann I. Trends in Cerebral Palsy among infants of very low birthweight (<1500 g) or born prematurely (<32 wks) in 16 European centres: a database study, 43-50, 2007, with permission from Elsevier.
41 Ancel PY, Livinec F, Larroque B, Marret S, Arnaud C, Pirrat V, Dehan M, Escande B, Burget A, Thirez G, Picaud JC, AndréM, Bréart G, Kaminski EPIPAGE study group. Cerebral Palsy among very preterm children in relation to gestational age and neonatal ultrasound abnormalities: the EPIPAGE cohort study. Pediatrics 2006;117:828-35.
42 Johnson A. Follow up studies: a case for a standard minimum data set. Arch Dis Child 1997;76:F61-F63.
43 Field D, Draper ES, Gompels MJ, Green C. Johnson A, Shortland D, Blair M, Manktelow B, Lamming CR, Law C. Measuring later health status of high risk infants: randomised comparison of two simple methods of data collection. BMJ 2001;323:1-5.
44 Acolet D. Quality of neonatal care and outcome. Arch Dis Child Fetal Neonat Ed 2008;93:F69-73.

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11 Multiple Sclerosis

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Abbreviations

CDMS	Clinically Definite Multiple Sclerosis
CIS	Clinically Isolated Syndrome
CPMS	Clinically Probable Multiple Sclerosis
CNS	Central Nervous System
DALYs	Disability Adjusted Life Years
DMSR	Danish Multiple Sclerosis Registry
DSS	Disability Status Scale
EBV	Epstein Barr Virus
EDMUS	European Database for Multiple Sclerosis
EDSS	Expanded Disability Status Score
EMEA	European Medicines Agency
EMSP	European Multiple Sclerosis Platform
FS	Functional Systems
HRQoL	Health-Related Quality of Life
ICD	International Classification of Diseases
LSDMS	Laboratory-Supported Definite Multiple Sclerosis
LSPMS	Laboratory-Supported Probable Multiple Sclerosis
MS	Multiple Sclerosis
MSFC	Multiple Sclerosis Functional Composite
MSTCG	Multiple Sclerosis Therapy Consensus Group
MRI	Magnetic Resonance Imaging
PPMS	Primary Progressive Multiple Sclerosis
PwMS	Person with Multiple Sclerosis
QoL	Quality of Life
RPMS	Relapsing Progressive Multiple Sclerosis
RRMS	Relapsing-Remitting Multiple Sclerosis
SF-36	36-Item Short Form Health Survey
SPMS	Secondary Progressive Multiple Sclerosis
YLDs	Years Lived with Disability
WHO	World Health Organization

1 Introduction

1.1 Scope of chapter

This chapter describes how the Multiple Sclerosis Information Dividend (MS-ID) project contributes to the EU Health and Knowledge system about Multiple Sclerosis in the European Union.

The general aims of the MS-ID project are threefold:

- To raise awareness across the EU on multiple sclerosis (MS) enabling stakeholders both at European level and in the Member States to better understand the condition and share information on: the positive impact of high quality treatments, therapies, social support, and the benefits of good MS management.
- To identify and address the major inequalities of MS treatment and care across the European Union and within the EU Member States by developing new and effective strategies and indicators. These will enhance the quality, comparability, applicability and transfer of both statistical and factual data and qualitative information on MS across EU Member States.

- To use high quality comparable data at EU and transnational levels to positively impact on EU / national policy and programmes towards MS and to ultimately empower EU citizens directly and indirectly affected by MS.

The MS-ID project is led by the European Multiple Sclerosis Platform (EMSP) and has the collaboration and partnership of participant national MS societies in Germany, Iceland, Poland, Romania, Spain and the UK.
The information outlined in this chapter relates specifically to material that has been compiled within the auspices of the MS-ID project.

Multiple sclerosis (MS) is a chronic progressive potentially highly disabling disorder with considerable social impact and economic consequences despite its relatively limited prevalence. It is the major cause of non-traumatic disability in young adults (Sadovnick and Ebers, 1993).

It is an acquired inflammatory and neurodegenerative immuno-mediated disorder of the central nervous system (CNS), characterised by inflammation, demyelination and primary or secondary axonal degeneration (Trapp et al, 1998).
It clinically manifests with signs of multiple neurological dysfunctions (e.g., visual and sensory disturbances, limb weakness, gait problems and bladder and bowel symptoms) followed by either recovery or, especially over time, by increasing disability due to irreversible functional impairment (Ebers, 1998). However, aspecific symptoms such as fatigue (80% patients) can alone interfere with patients' quality of life and productivity (Freal et al, 1984; Krupp et al, 1988).
There are no specific tests for the diagnosis of MS. Diagnostic criteria require evidence of dissemination of neurologic signs and symptoms in space and time, based on history, clinical and paraclinical evidences (Poser et al, 1983; McDonald et al, 2001).

The evaluation of the 'severity' of MS takes into account clinical course and degree of disability. Clinical course shows various degrees of heterogeneity among patients. It can also be unpredictable within the same patient, being characterized by phases with predominant occurrence of relapses versus progression. Among the most frequently used measures for disability are the Expanded Disability Status Score (EDSS) (Kurtzke, 1983) and the MS Functional Composite (MSFC) scale (Cutter et al, 1999) (see Morbidity).
MS social costs are high. The economic burden of MS for year 2005 was €13 billion, i.e., €27 per European inhabitant. Intangible costs would add an additional € 8 billion (Sobocki et al, 2007).

By the beginning of the 20th century, MS had already become one of the most common reasons for admission to a neurological ward. Now, MS is recognised throughout the world, with around 2.5 million affected individuals. Several diagnostic classifications have so far been made ((Poser and Brinar, 2004). In 1982, Charles Poser and a panel of European and Northern American experts established a set of diagnostic criteria aimed at meeting epidemiological research needs (Poser et al, 1983). The criteria of Poser et al consisted of two large categories for definite and probable MS, each applicable on a purely clinical and paraclinical basis or with laboratory support: clinically definite MS (CDMS), laboratory-supported definite MS (LSDMS), clinically probable MS (CPMS) and laboratory-supported probable MS (LSPMS). In 2001, an international committee of neurologists headed by W. Ian McDonald published new diagnostic guidelines (2001) by incorporating magnetic resonance imaging (MRI), eliminating the "probable MS" and reintroducing the "possible MS". The primary progressive form of MS was also taken into account. These criteria were further revised in 2005 to include the clinically isolated syndrome (CIS) (Polman et al, 2005).
MS clinical course has also been categorised based on relapse presentation and/or progression (Lublin and Reingold, 1996). The following classes are most frequently referred to: (a) relapsing-remitting MS (RR-MS), a disease with relapses and full recovery, or sequelae upon recovery; the periods between relapses does not show progression, (b)

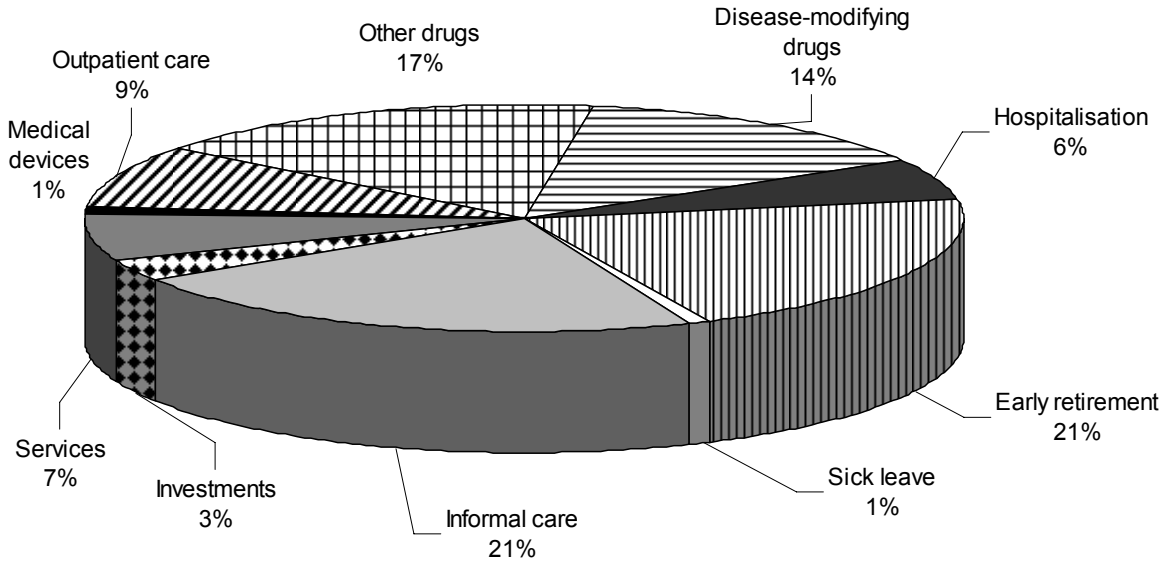
progressive-relapsing MS (PR-MS), progressive disease from onset, with clear superimposed relapses, with or without full recovery; periods between relapses are characterised by continuing progression; (c) secondary-progressive MS (SP-MS), initial RR course followed by progression with or without occasional relapses, minor remissions and plateaus; (d) primary-progressive MS (PP-MS), disease with progression from onset with plateaus and temporary minor improvements.

There is no cure for MS, but disease-modifying treatments have been available in the past 10 years.

1.2 MS socio-economic burden in Europe

The disability adjusted life years (DALYs) is one of the most commonly used measures in evaluating the burden of MS in health economics. The total DALY for MS in Europe is 307 000 years and varies according to mortality strata, being 157 000 in the very-low-child/very-low-adult stratum, 63 000 in the low-child/low-adult and 87 000 in the low-child/high-adult mortality strata respectively (WHO, 2004). Few studies measuring DALYs have been carried out so far for MS as compared to other neurological disorders. Furthermore, comorbidity in MS and associated symptoms (e.g., depression, urinary tract infections) are often overlooked when measuring DALYs in MS. The general decreasing trend of mortality rates over time reported for many countries and subsequent increased survival time after MS onset will increase the disease burden due to the greater number of years lived with disability (YLDs). The majority of those countries with higher life expectancy are found to also have higher MS incidence (WHO, 2004), thus a proportionally greater burden of disease in the future is expected.
MS social costs are high. Cost data have been extrapolated for Europe in year 2005 based on a model, using economic indexes adjusting for price level differences in different sectors between countries (Sobocki et al, 2007), and presented as total annual cost per patient, total direct costs (healthcare costs [inpatient care, outpatient care, drug costs and tests], non-medical costs [services, and investments] and informal care), indirect costs (production loss due to sick-leave and early retirement), and intangible costs (comparison of patients' health-related quality of life to that of age- and gender matched general population). The estimated economic burden of MS in year 2005, with regards to direct medical and non medical costs, and indirect costs, was €13 billion, i.e., €27 per European inhabitant. Intangible costs would add an additional € 8 billion. The cost per MS case in Europe ranges from €10 000 to €54 000, with a mean of €31 000. The distribution of the estimated total cost of MS in Europe in 2005 by resource use components is reported in Figure 1. A patient with mild disability at the EDSS (the greatest proportion in the MS population) costs €14 300 per year, €31 200 per year if with moderate disability, and €58 300 per year if with severe disability.

Figure 3 Distribution of total cost of MS in Europe (year 2005) by resource use components



Modified from: Sobocki et al, 2007

2 Health determinants/risk factors

MS etiology is unknown. MS is believed to be a complex polifactorial disorder, initiated by environmental factors interacting with genetically susceptible individuals (Noseworthy et al, 2000). The disease shows heterogeneity with respect to its pathogenesis, clinical manifestations, prognosis and pathology (Lucchinetti et al, 1996).
Because MS causative agents are unknown, there are subsequently no data on the distribution of such risk factors per European Member State. Some ethnic groups (e.g., the Sami) are believed to be genetically resistant to MS, whereas others (e.g., Scandinavians, Sardinians) are at higher risk for the disease (Rosati, 2001).

Genetic factors
As for the genetic component, MS is a 'complex trait'. It means that few or multiple genes are believed to interplay independently or interactively with non-heritable exogenous agents and lead to MS. The change in the recurrence risk ratio in families of individuals with MS shows that first-, second- and third-degree relatives are more likely to develop MS than the general population, and according to the degree of biological relatedness (Dyment et al, 1997; 2004). The steep drop in rates observed between monozygotic twins (30.8%) and first-degree relatives (3.46%), and the further, yet less dramatic declines between first- and second-degree relatives and second- and third-degree relatives favours the synergic role of few genes in determining the susceptibility to the disease.

Environmental risk factors
Reviews on the role of environmental factors (Lauer, 1997; Martinelli, 2000; Coo and Aronson, 2004; Marrie, 2004; Schwarz and Leweling, 2005; Giovannoni and Ebers, 2007; Hawkes, 2007; Ascherio and Munger, 2007) in MS etiology highlight the complexity in

identifying proper specific design approaches and in interpreting the findings obtained. Potentially any environmental agent can have a role in determining MS in susceptible populations and yet be neither a necessary nor a sufficient cause. Potential risk factors investigated have been infectious disorders, vaccines, stress, occupation, climate and nutrition.
Lately, the focus has been put on Epstein Barr Virus (EBV) as a probable causative agent for MS. Patients with MS are seropositive for EBV, and the titres of virus-specific antibodies are higher in individuals with the disease than in the healthy population (Ascherio et al, 2001). Such difference is more prominent in child MS (83% vs 42% in age-matched healthy individuals) (Alotaibi et al, 2004). Recently, evidence of EBV persistence and reactivation in the CNS was found in nearly 100% of the MS cases examined and not in other inflammatory neurological diseases (Serafini et al, 2007). Among other putative environmental risk factors, a low vitamin D status through sun exposure and diet has been found in association with a higher risk for MS, as well as cigarette smoking (Riise et al, 2003; Mikaeloff et al, 2007).

3 Incidence/prevalence

The most commonly used epidemiological measures in MS are the incidence rate, the mortality rate and the prevalence ratio. The incidence rate refers to the number of new cases of disease during a defined time interval and in a specified population. An incident case of MS is usually defined as any individual who experiences symptoms or shows signs that are later related to MS (Poser, 1995). The mortality rate, or death rate, is the number of deaths from disease over a specified population and time interval. For MS, annual incidence and death rates are usually expressed per 100,000 population. The prevalence ratio is the proportion of individuals with MS (prevalent cases) within a specified population at one time.
Given the low frequency of MS in the general population and the wide spectrum of age of onset, cross-sectional studies are much more frequently designed in MS research than prospective cohort studies. Population surveys on MS are prevalence studies based on individuals receiving health care rather than on surveys on the general populations. Morbidity data for MS come from investigating the general population or a community or from health system records, whereas mortality data usually come from national official sources (e.g., death certificates).

MS prevalence by gender, age and European Country (where data were available) and MS total annual incidence rates by European Country, are summarised in Tables 1-4. Mean rates are higher in northern countries, but this is likely ascribed to a better degree of disease ascertainment, i.e. better accuracy in survey methodology (nationwide investigations and the use of registry systems) and repeated assessments over time. A certain extent of prevalence heterogeneity was found within countries, such as in Sardinia (Italy), Scotland (UK), or southern Norway. Therefore, the role of environmental factors and their interaction with the population specific genetic susceptibility in increasing MS frequency cannot be ruled out. A tendency for a decreasing variability in prevalence rates among and within countries has been observed over time, pointing to a widespread improvement of case ascertainment and survey methodology in the same time frame.
The female:male ratio ranged ranges from 1.1 to 3.4. Prevalence rates are higher for women in each of the countries considered.
The highest prevalence estimates have been reported for age group of 35–49 for all countries considered, with the exception of Ireland, UK (northern Ireland and Scotland) and Norway, where prevalence was higher in the age group of 50–64 years.

Table 1 Prevalence (per 100 000) of MS in Europe

Country	Country pop. size	Study pop. size (% of country pop.)	Prev year	Crude rate (95% CIs)	Adjusted rate	Reference
Belgium (Flanders)	10 200 000	250 393 (2.5%)	1991	88 (76-99)	86	Van Ooteghem et al, 1994
Bulgaria (Svoge and Trojan)	7 900 000	53 573 (0.7%)	1995	39 (24-60)	-	Milanov et al, 1997
Czech Republic (west)	10 300 000	-	1984	71 (-)	-	Jedlicka, 1989
Denmark	5 300 000	nationwide	1996	122 (115-120)	116	Brønnum-Hansen et al, 2006
Germany	82 000 000	nationwide	-	127 (-)	-	Hein and Hopfenmüller, 2000
Estonia (south)	1 330 000 [a]	392 009 (29.5%)	1989	51 (44-59)	56	Gross et al, 1993
Ireland (Donegal Co.)	3 700 000	129 994 (3.5%)	2001	185 (162-210)	216	McGuigan et al, 2004
Ireland (Wexford Co.)	3 700 000	104 372 (2.8%)	2001	121 (101-144)	135	McGuigan et al, 2004
Greece (Evros)	10 500 000	143 752 (1.4%)	1999	39 (29-51)	31	Piperidou et al, 2003
Spain (Mostoles, central)	39 400 000	195 979 (0.5%)	1998	43 (35-54)	39	Benito-Léon et al, 1998
Spain (Teruel, east)	39 400 000	143 680 (0.4%)	1996	32 (23-41)	36	Modrego-Pardo et al, 1997
Spain (Valladolid, north)	39 400 000	92 632 (0.2%)	1997	58 (44-76)	55	Tola et al, 1999
France	60 400 000	nationwide	2003	65 (63-68)	-	Vukusic et al, 2007
Italy (Ferrara, north)	57 600 000	358 808 (0.6%)	1993	69 (62-79)	65	Granieri et al, 1996
Italy (L'Aquila, central)	57 600 000	297 838 (0.5%)	1996	53 (45-62)	55	Totaro et al, 2000
Italy (Padua, north)	57 600 000	820 318 (1.4%)	1999	81 (70-91)	-	Ranzato et al, 2003
Italy (Sardinia, insular)	57 600 000	454 904 (0.8%)	1997	144 (134-156)	140	Pugliatti et al, 2001
Italy (Sicily, insular)	57 600 000	337 332 (0.6%)	1995	58 (51-68) [b]	61	Nicoletti et al, 2001
Cyprus	800 000	108 600 (13.6%)	1988	39 (28-52)	-	Middleton and Dean, 1991
Latvia	2 400 000	-	1980	55 (-)	-	Boiko, 1994
Hungary (Csongrad Co.)	10 200 000	400 128 (3.9%)	1999	62 (55-70)	-	Bencsik et al, 2001
Malta	400 000	378 518 (94.6%)	1999	17 (13-22)	17	Dean et al, 2002
The Netherlands (Groningen)	15 800 000	560 000 (3.5%)	1992	76 (-)	-	Minderhoud and Zvanniken, 1994
Austria	8 100 000	nationwide	1999	98 (92-104)	-	Baumhackl et al, 2002
Poland (west)	38 600 000	50 000 (0.1%)	1995	55 (-)	-	Potemkowski, 1999
Portugal	10 800 000	62 621 (0.6%)	1998	47 (30-64)	-	De Sã et al, 2006
Romania (Mures Co.)	22 400 000	615 032 (2.7%)	1986	21 (18-25) [c]	-	Becus and Popoviciu, 1994
Slovenia	2 000 000	-	1992	83 (-)	-	Koncan-Vracko, 1994
Slovenia Croatia (Kocevje-Gorski Kotar)	2 000 000	-	1999	152 (123-187)	156	Peterlin et al, 2006
Finland (Seinäjoki)	5 100 000	197 042 (3.9%)	1993	188 (168-211) [c]	-	Sumelahti et al, 2001
Finland (Uusimaa)	5 100 000	1 277 932 (25.1%)	1993	93 (87-99) [c]	-	Sumelahti et al, 2001
Finland (Vaasa)	5 100 000	179 079 (3.5%)	1993	107 (91-125) [c]	-	Sumelahti et al, 2001
Sweden (Västerbotten Co.)	8 900 000	259 163 (2.9%)	1997	154 (139-170)	153	Sundström et al, 2003
UK (E Scotland)	58 600 000	395 600 (0.7%)	1996	184 (171-198)	184	Forbes et al, 1999
UK (Leeds Health Auth.)	58 600 000	732 061 (1.2%)	1996	97 (90-105) [d]	103	Ford et al, 1998
UK (N Cambridgeshire)	58 600 000	378 959 (0.6%)	1993	107 (98-118) [d]	126	Robertson et al, 1995
UK (Northern Ireland)	58 600 000	151 000 (0.3%)	1996	168 (148-189)	186	McDonnell and Hawkins, 1998a
UK (S E Scotland)	58 600 000	864 300 (1.5%)	1995	187 (178-196)	185	Rothwell and Charlton, 1998

Country	Country pop. size	Study pop. size (% of country pop.)	Prev year	Crude rate (95% CIs)	Adjusted rate	Reference
Croatia (Osijek-Baranya)	4 400 000	298 600 (6.8%)	1998	50 (42-59) [c]	-	Materljan and Sepcic, 2002
Republic of Macedonia	2 030 000 [a]		1991	16 (-)	-	Ljapchev and Daskalovska, 1994
Iceland	290 000 [a]	285 000 (98.3%)	1999	119 (106-133)	-	Benedikz et al, 2002
Norway (Nord-Trøndelag Co.)	4 620 000 [a]	127 108 (2.7%)	2000	164 (142-188)	165	Dahl et al, 2004
Norway (Oslo)	4 620 000 [a]	483 401 (10.5%)	1995	120 (111-131) [c]	121	Celius and Vandvik, 2001
Norway (Troms and Finnmark)	4 620 000 [a]	224 724 (4.9%)	1993	73 (62-85)	74	Grønlie et al, 2000
Norway (Hordaland Co.)	4 620 000	441 660 (9.4%)	2003	151 (140-163	-	Grytten et al, 2006
Switzerland (Canton of Berne)	7 250 000 [a]	920 000 (12.7%)	1986	110 (103-117) [d]	112	Beer and Kesselring, 1994
Albania	3 130 000 [a]	3 091 400 (98.8%)	1988	10 (-)[e]	-	Kruja, 1994
Russia (Novosibirsk)	143 200 000 [a]	-	?	60 (-)	-	Boiko et al, 2004
Russia (Ufa)	143 200 000 [a]	-	?	31 (-)	-	Boiko et al, 2004
Ukraine (Vinnytsya)	46 480 000 [a]	390 500 (0.8%)	2001	41 (35-48)	-	Korbut and Korniychuk, 2001
Yugoslavia (Belgrade)	10 500 000 [a]	1 602 226 (15.2%)	1996	51 (47-55)	42	Pekmezovic et al, 2001

Adjustment to the European standard population (Doll and Hill, 1966)
[a] EUROPA, 2004, Global Health Atlas, 2005
[b] onset-adjusted prevalence rate
[c] only Poser Committee et al. definite MS
[d] approx.
[e] Rose et al. definite and probable MS
Source: modified from Pugliatti et al, 2006

Table 2 Prevalence (per 100 000) of MS in Europe by gender

Country	Prev. year	Women (95% CIs)	Men (95% CIs)	Woman:Man Ratio	Reference
Belgium (Flanders)	1991	101 (80-115)	74 (59-89)	1.4	Van Ooteghem et al, 1994
Bulgaria (Svoge and Trojan)	1995	52 (28-87)	26 (10-54)	2.0	Milanov et al, 1997
Czech Republic	?	-	-	1.5	Lensky, 1994
Denmark	1996	155 (145-165)	89 (84-95)	1.8	Brønnum-Hansen et al, 1994
Germany (South Lower Saxony)	1986	-	-	2.9	Poser et al, 1989
Estonia (south)	1989	63 (53-75)	37 (29-47)	2.0	Gross et al, 1993
Ireland (Donegal Co.)	2001	282 (243-327)	85 (64-111)	3.4	McGuigan et al, 2004
Ireland (Wexford Co.)	2001	154 (122-191)	88 (64-117)	1.7	McGuigan et al, 2004
Greece (Evros)	1999	-	-	2.8	Piperidou et al, 2003
Spain (Mostoles, central)	1998	54 (40-70)	33 (23-47)	1.6	Benito-Léon et al, 1998
Spain (Teruel, east)	1996	41 (26-55)	24 (12-35)	1.7	Modrego-Pardo et al, 1997
Spain (Valladolid, north)	1997	74 (52-102)	41 (24-65)	2.0	Tola et al, 1999
France	2003	96 (92-101)	42 (39-45)	2.2	Vukusic et al, 2007
Italy (Ferrara, north)	1993	91 (78-106)	46 (36-58)	2.1	Granieri et al, 1996
Italy (L'Aquila, central)	1996	68 (57-83)	37 (28-48)	2.1	Totaro et al, 2000
Italy (Padua, north)	1999	111 (99-123)	50 (41-58)	2.3	Ranzato et al, 2003
Italy (Sardinia, insular)	1997	205 (188-224)	83 (72-95)	2.5	Pugliatti et al, 2001
Italy (Sicily, insular)	1995	62 (51-75)	55 (44-68)	1.2 [a]	Nicoletti et al, 2001
Cyprus	1988	39 (24-59)	37 (23-57)	1.1	Middleton and Dean, 1991
Hungary (Csongrad Co.)	1999	182 (-)	66 (-)	2.7	Bencsik et al, 2001
Malta	1999	20 (14-27)	13 (8-19)	1.5	Dean et al, 2002
The Netherlands (Groningen)	1992	-	-	1.7	Minderhoud and Zvanniken, 1994
Austria	1999	-	-	2.5 [b]	Baumhackl et al, 2002
Portugal	1998	68 (39-96)	23 (6-41)	2.9	De Sã et al, 2006
Romania (Mures Co.)	1986	-	-	1.3	Becus and Popoviciu, 1994
Slovenia-Croatia (Kocevje- Gorski Kotar)	1999	176 (-)	128 (-)	1.4	Peterlin et al, 2006
Finland (Uusimaa)	1993	123 (114-132)	60 (54-67)	2.3 [c]	Sumelahti et al, 2001
Sweden (Västerbotten Co.)	1997	202 (179-228)	105 (89-125)	1.9	Sundström et al, 2003
UK (E Scotland)	1996	262 (241-285)	100 (86-115)	2.8	Forbes et al, 1999
UK (Leeds Health Auth.)	1996	141 (-)	52 (-)	2.8	Ford et al, 1998
UK (N Cambridgeshire)	1993	-	-	2.2	Robertson et al, 1995
UK (Northern Ireland)	1996	230 (-)	104 (-)	2.3	McDonnell and Hawkins, 1998a
UK (S E Scotland)	1995	257 (242-272)	112 (102-122)	2.5	Rothwell and Charlton, 1998
Croatia	1969-1991	-	-	1.8	Materljan and Sepcic, 2002
Republic of Macedonia	1990s	-	-	1.7	Ljapchev and Daskalovska, 1994
Iceland	1999	157 (136-181)	72 (59-88)	2.2	Benedikz et al, 2002
Norway (Nord-Trøndelag Co.)	2000	205 (171-243)	123 (97-153)	1.7	Dahl et al, 2004
Norway (Oslo)	1995	-	-	2.1 [b]	Celius and Vandvik, 2001

Country	Prev. year	Women (95% CIs)	Men (95% CIs)	Woman:Man Ratio	Reference
Norway (Troms and Finnmark)	1993	89 (73-108)	58 (46-73)	1.4	Grønlie et al, 2000
Norway (Hordaland Co.)	2003	191 (174-210)	110 (96-125)	1.7	Grytten et al, 2006
Switzerland (Canton of Berne)	1994	137 (127-148)	62 (56-69)	1.8	Beer and Kesselring, 1994
Albania	1988	11(-)	10(-)	1.1 [d]	Kruja, 1994
Yugoslavia (Belgrade)	1996	54 (49-59) [b]	28 (24-32) [b]	1.9	Pekmezovic et al, 2001
Ukraine (Vinnytsya)	2001	-	-	2.1	Korbut and Korniychuk, 2001

[a] onset-adjusted prevalence rate
[b] only Poser Committee et al. definite MS
[c] age-adjusted data
[d] Rose et al. definite and probable MS
Source: modified from Pugliatti et al, 2006

Table 3 Prevalence (per 100 000) of MS in Europe, by age (best estimates)

Country	Prev. year	0-17 yrs	18-34 yrs	35-49 yrs	50-64 yrs	65-74 yrs	75+ yrs	Reference
Belgium (Flanders)	1991	1	61	161	157	86	32	Van Ooteghem et al, 1994
Denmark	1996	5	51	195	236	228	112	Brønnum-Hansen et al, 2006
Estonia (south)	1989	1	47	141	71	17	8	Gross et al, 1993
Ireland (Wexford and Donegal Co.)	2001	4	84	346	358	224	94	McGuigan et al, 2004
Greece (Evros)	1999	5	59	85	41	5	5	Piperidou et al, 2003
Spain (Mostoles, central)	1998	6	43	88	37	8	8	Benito-Léon et al, 1998
Spain (Teruel, east)	1996	2	51	78	33	6	6	Modrego-Pardo et al, 1997
Spain (Valladolid, north)	1997	22	91	78	57	5	5	Tola et al, 1999
Italy (Ferrara, north)	1993	6	63	125	104	38	13	Granieri et al, 1996
Italy (L'Aquila, central)	1996	10	86	103	51	7	7	Totaro et al, 2000
Italy (Sardinia, insular)	1997	7	147	312	163	82	61	Pugliatti et al, 2001
Italy (Sicily, insular)	1995	5	65	137	77	25	0	Nicoletti et al, 2001
Malta	1999	0	26	36	28	0	0	Dean et al, 2002
Portugal	1998	6	57	121	51	9	-	De Sã et al, 2006
Slovenia-Croatia (Kocevje-Gorski Kotar)	1999	-	111	229	326	166	-	Peterlin et al, 2006
Sweden (Västerbotten Co.)	1997	4	103	295	267	223	87	Sundström et al, 2003
UK (E Scotland)	1996	4	91	383	358	176	89	Forbes et al, 1999
UK (Leeds Health Auth.)	1996	-	15-70	150-250	200-250	150	60	Ford et al, 1998
UK (N Cambridgeshire)	1993	-	10-75	200-300	250-300	170	75	Robertson et al, 1995
UK (Northern Ireland)	1996	4	81	343	377	313	60	McDonnell and Hawkins, 1998a
UK (S E Scotland)	1995	7	97	356	363	261	103	Rothwell and Charlton, 1998
Norway (Nord-Trøndelag Co.)	2000	0	102	282	349	194	122	Dahl et al, 2004
Norway (Oslo)	1995	2	65	200	255	177	90	Celius and Vandvik, 2001 [a]
Norway (Hordaland Co.)	2003	1	68	259	377	235	57	Grytten et al, 2006
Switzerland (Canton of Berne)	1986	5	55	120-230	220	115-220	40	Beer and Kesselring, 1994

[a] only Poser Committee et al. definite MS
Source: modified from Pugliatti et al, 2006

Table 4 Incidence (per 100 000/year) of MS in Europe

Country	Time interval	Study pop. size (ca.)	Rate (95% CI)	Reference
Czech Republic	1985-1990	-	6.0 (-)[a]	Jedlicka et al, 1994
Denmark	1980-1989	nationwide	5.0 (4.8-5.2)	Koch-Henriksen, 1999
Germany	1979-1992	100 000	4.2 (-)	Lauer, personal data
Ireland (Donegal Co.)	2001	129 994	5.1 (1.6-11.7)	McGuigan et al, 2004
Ireland (Wexford Co.)	2001	104 372	4.5 (0.3-8.7)	McGuigan et al, 2004
Greece (Evros)	1994-1999	143 000	2.4 (1.4-3.7)	Piperidou et al, 2003
Spain (Mostoles)	1994-1998	196 000	3.8 (2.7-5.3)	Benito-Léon et al, 1998
Spain (Teruel)	1992-1996	143 000	2.2 (-)	Modrego-Pardo et al, 1997
France	1993-1997	94 000	4.3 (2.9-7.2)	Moreau et al, 2000
Italy (Ferrara, north)	1990-1993	368 000	2.4 (1.6-3.4)	Granieri et al, 1996
Italy (Padua, north)	1995-1999	820 000	4.2 (3.7-4.7)	Ranzato et al, 2003
Italy (Sardinia, insular)	1995-1999	432 000	5.8 (5.1–7.2)	Pugliatti et al, 2005
Italy (Sicily, insular)	1990-1994	338 000	3.9 (3.0-5.0)	Nicoletti et al, 2001
Hungary	1998	400 128	6.0 (-)	Bencsik et al, 2001
Malta	1989-1998	400 000	0.8 (-)	Dean et al, 2002
Poland (West)	1993-1995	50 000	2.2 (-)	Potemkowski, 1999
Romania (Mures Co.)	1976-1986	600 000	0.9 (-)[b]	Becus and Popoviciu, 1994
Slovenia	1990s		2.9 (-)	Koncan-Vracko, 1994
Finland (Seinäjoki)	1979-1993	197 000	11.6 (10.1-13.1)[b]	Sumelahti et al, 2000
Finland (Uusimaa)	1979-1993	1 278 000	5.1 (4.1-6.3)[b]	Sumelahti et al, 2000
Finland (Vaasa)	1979-1993	179 000	5.2 (4.8-5.5)[b]	Sumelahti et al, 2000
Sweden (Västerbotten Co.)	1988-1997	256 000	5.2 (4.4-6.2)	Sundström et al, 2003
UK (N Cambridgeshire)	1990-1995	379 000	4.8 (3.8-6.0)	Robertson et al, 1995
UK (S E Scotland)	1992-1995	864 000	12.0 (10.6-13.3)	Rothwell and Charlton, 1998
Republic of Macedonia	1990s	-	0.7 (-)[a]	Ljapchev and Daskalovska, 1994
Iceland	1991-1995	255 000	3.7 (-)	Benedikz et al, 2002
Norway (Nord-Trøndelag Co.)	1974-1998	127 000	5.3 (3.7-7.5)	Dahl et al, 2004
Norway (Oslo)	1992-1996	484 000	8.7 (6.3-11.9)[b]	Celius and Vandivik, 2001
Norway (Troms and Finnmark)	1989-1992	225 000	4.3 (3.0-5.9)	Grønlie et al, 2000
Norway (Hordaland Co.)	1998-2002	435 167	3.0 (2.3-3.8)	Grytten et al, 2006
Switzerland (Canton of Berne)	1961-1980	920 000	4.0 (3.7-4.3)	Beer and Kesselring, 1994
Albania	1968-1987	3 091 000	0.5 (0.4-0.6)	Kruja, 1994
Russia (Iaroslavl)	1996-2001	-	3.0 (-)	Boiko et al, 2004
Ukraine (Vinnytsya)	1990-1994	390 000	0.7 (-)	Korniychuk and Zheliba, 1995

[a] approx.
[b] only Poser Committee et al. definite MS
Source: modified from Pugliatti et al, 2006

European total mean MS incidence rate is estimated to be 4 cases per 100 000/year. Peaks of incidence rates were registered in Finland, south-eastern Scotland, eastern Norway and Sardinia, Italy.

3.1 MS case registers in Europe

Registries are systems on which demographic, clinical and epidemiological data are recorded within a defined area (Buehler et al, 1998). MS is a relatively rare disease, so population-based registries provide a very relevant information on the epidemiology of MS, and guarantee power to epidemiological studies on those areas. This is why MS registers are being widely designed and implemented in Europe. Some examples follow.

The Danish Multiple Sclerosis Registry (DMSR) was established in 1948, and ever since updated by prospective and retrospective recording information on MS cases from multiple sources: departments of neurology, practicing neurologists, rehabilitation centres, the National Patient Registry, the Danish Multiple Sclerosis Society and departments of neuropathology (Koch-Henriksen et al, 2001). The Registry is estimated to be 90% complete, and diagnostic validity for definite MS was an estimated 94% based on autopsy cases. It is linked with Denmark's Centralized Civil Registry, including the National Registry of Causes of Death, and the Danish Twin Registry. More than 14 000 MS patients were registered at a follow-up in 1997, of whom nearly 11 000 had their onset from 1948 to 1996. The DMSR has proved to be a valuable tool for multiple assessments of incidence, prevalence and survival, for studying the natural history of MS and for case–control and prospective studies providing unselected patient samples (Koch-Henriksen and Hyllested, 1988; Koch-Henriksen et al, 1992; Brønnum-Hansen et al, 1994; Koch-Henriksen, 1999).

The European Database for Multiple Sclerosis (EDMUS) has been available since 1992. It was designed within the European Concerted Action for Multiple Sclerosis funded by the European Commission (Confavreux et al, 1992; Confavreux, 1994) as a dataset containing a minimal set of obligatory information serving MS population-based studies and multicenter collaborative research. EDMUS can automatically generate data by means of algorithms, ensuring a uniform approach and automatically updating new information. EDMUS has been relevant in studying the natural history and physiopathology of MS (Confavreux et al, 2000; 2003).

The Norwegian National Multiple Sclerosis Registry was established in 2001 at the Norwegian Multiple Sclerosis National Competence Centre, Haukeland University Hospital, Bergen, aimed at collecting clinical and demographic information of all prevalent MS patients in Norway (Myhr et al, 2006). In 2007, a biobank unit for collection of biological samples (DNA and serum) from all available MS patients was implemented.

In 2001, a nationwide epidemiological MS register was initiated under the auspices of the German MS Society (Flachenecker et al, 2005). This project aimed at collecting epidemiological data on the number of patients with MS, course of the disease, and their social situation in Germany. To date, standardised data sets of ca. 5800 MS patients have been recorded from 82 centres (Flachenecker et al, 2007).

4 Morbidity

4.1 Clinical management

Early initiation of immunotherapy is warranted based on ongoing inflammatory disease activity, and is aimed at terminating inflammation and at reducing the axonal damage, which develops in the early disease stages (Comi and Martino, 2006). Approval for therapy

following CIS has been received for some beta-interferons only. The MS Therapy Consensus Group (MSTCG, 2004) recommend initiation of therapy after the first episode suggestive for MS and to assess subclinical inflammatory activity by a second cranial MRI inline with the extended diagnostic criteria (Polman et al, 2005) as early as 2–3 months after the onset of the initial episode. MSTCG consists of neurologists with a particular interest and specialisation in MS. They have produced a range of consensus papers and statements identifying what is believed to be the best and most effective clinical practice in a variety of areas that are of relevance and importance to People with MS (PwMS).

The European Medicines Agency (EMEA) is responsible for the scientific evaluation of applications regarding the treatment of MS with drugs in Europe. The results of their evaluation procedure lead to a drug being brought to the market in Europe. However, each member state in turn must then decide if the drug (despite market authorisation by EMEA) can be administered and reimbursed by health insurers in their particular member state. The result is that the availability of drugs for the treatment of MS varies greatly across the European Union.

4.2 Treatment

There is no cure for MS, but disease-modifying treatments are available aiming at reducing the number of reexacerbations, improving recovery, and halting further progression of the disease. Therapies for the initial management of MS are available in Europe but not equally in all populations: intramuscular and subcutaneous interferon beta-1a, interferon beta-1b, glatiramer acetate, and natalizumab, a monoclonal antibody against blood-brain barrier constituents. Mitoxantrone is sometimes used for treating aggressive RRMS and SPMS. Besides the mode and frequency of administration of such drugs, side effects can interfere with MS patients' quality of life and productivity, and reduce patients' compliance to treatment. Other drugs are used, such as azathioprine, intravenous immunoglobulins, cyclophosphamide, and a number of drugs are being tested with satisfactorily results: lamotrigine, campath-alemtuzumab, FTY 720-fingolimod, anti IL 2 receptor monoclonal antibody, teriflunomide, daclizumab, cladribine.
MS is characterized by several symptoms resulting from the impaired nerve conduction by demyelination in different nervous subsystems. Among the most disabling are spasticity, ataxia, tremor, fatigue, double vision, oscillopsia, dysphagia, bladder, bowel, and sexual dysfunction, pain, and cognitive dysfunctions. Depression and other psychiatric disorders may develop as an individuals' reaction to the chronic condition, or in relation to the MS pathology itself. Symptomatic treatments are aimed at ameliorating these symptoms. Palliative care is currently more and more encouraged in severely affected patients.
Rehabilitation strategies represent a further possibility to manage the mentioned MS symptoms, and a fundamental approach for reducing disability, preventing disease complications and to improve patients' independence and autonomy. Rehabilitation is aimed at teaching disabled MS patients to maximise their remaining abilities, to improve mobility, to allow the activities of daily life, and to optimise social participation.

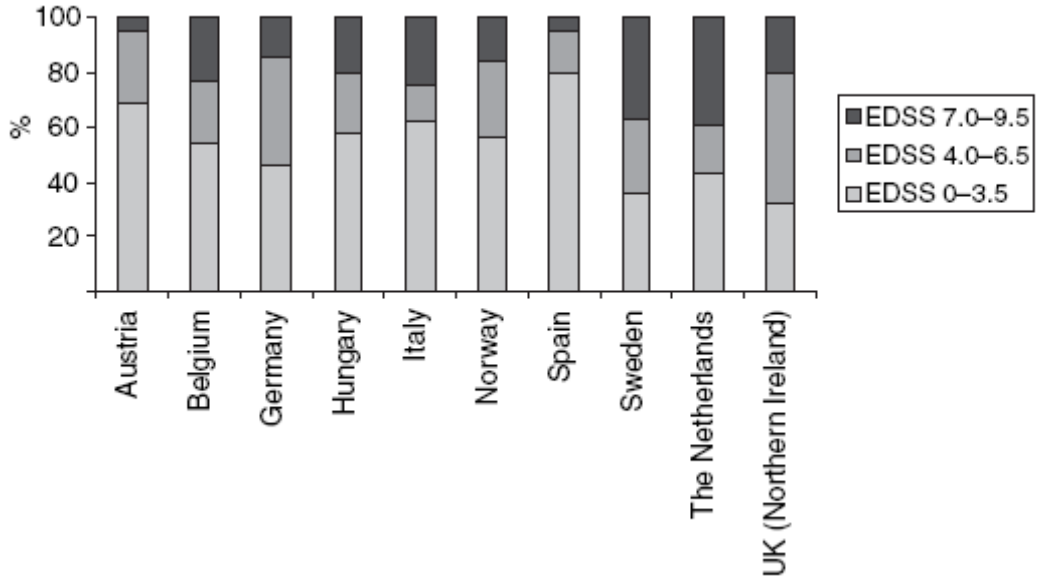
4.3 Survival

Because MS is associated with an elevated risk for death, its survival has been extensively studied over the past 30 years. In Europe, the median survival time after onset varies from 28 years for Danish males (Brønnum-Hansen et al, 1994) to ca. 45 years among Finns (Sumelahti et al, 2002). The DMSR has allowed for an analysis of the trends in survival and causes of death of nearly 10,000 patients' in comparison with those of the general population (Brønnum-Hansen et al, 2004). The median survival time from onset was ~10 years shorter for MS patients as compared to the reference population. However, the probability for survival has improved by nearly half since the 1950s.

4.4 Disability

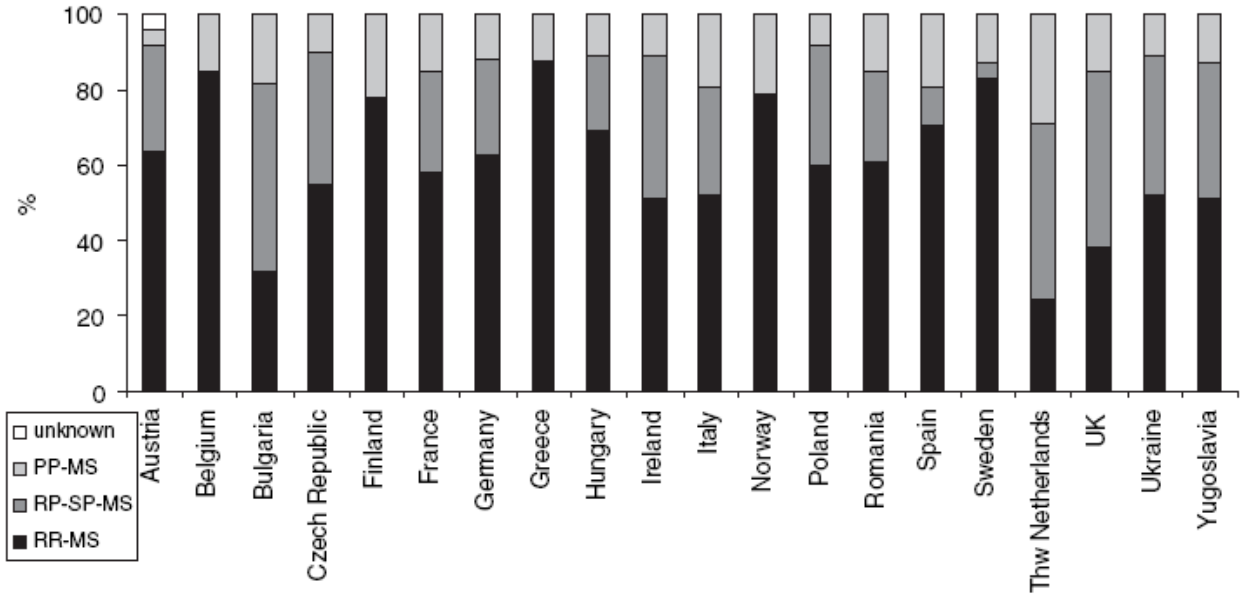
A large proportion of MS patients therefore accumulates disability over time in relation to relapses sequelae, or disease progression. In 1955 Kurtzke described a new scale for evaluating disability in MS, especially devised as an outcome measure in clinical trials: the Disability Status Scale (DSS) (Kurtzke, 1955). The DSS had 10 grades from 0 (normal) to status 10 (death due to MS), and was intended to measure the maximal function of each patient as limited by neurologic deficits. It was based only on objectively verifiable deficits due to MS assessed with neurologic examination, so symptoms were discarded. The final DSS score was based on the scores by Functional Systems (FS) which included the pyramidal, cerebellar, brainstem, sensory, bowel and bladder, visual, cerebral or mental, and other or miscellaneous functions. Based on the believed poor sensitivity of the DSS to changes in the middle ranges, in 1983 the Expanded DSS (EDSS) replaced the DSS, with the FS score assigned to one of the 20 categories (0, 0.5, 1, etc. to 10), i.e., level of disability. Further lumping is often carried out especially in retrospectively collected data when precise scores cannot be assessed, and EDSS 0 to 3.5 would then refer to fully ambulatory patients, 4.0 to 6.5 refers to ambulatory patients, with possible need of constant bilateral assistance to walk 20 m, and 7.0 to 9.5 refers to patients restricted to the wheelchair, confined to bed with need of total and complete assistance. EDSS of 10 is death due to MS.
The estimated prevalence-based distribution of MS disability across European Countries is shown in Figure 2.
Figure shows the estimate for the distribution by disease course (Pugliatti et al, 2006).

Figure 2 Estimated distribution of prevalent MS cases by disability (EDSS) in Europe



EDSS 0 to 3.5: fully ambulatory patients
EDSS 4.0 to 6.5: ambulatory patients, with possible need of constant bilateral assistance to walk 20m
EDSS 7.0 to 9.5: patients restricted to the wheelchair, confined to bed with need of total and complete assistance
Modified from: Pugliatti et al, 2006

Figure 2 Estimated distribution of prevalent MS cases by disease course in Europe



Pugliatti et al, 2006

With regards to the impact of the physical and psychological status in MS patients' life, a number of studies have been published on 'quality of life' (QoL). In the past 30 years, the interest in the concept of QoL has increased significantly, both in MS research and clinical practice. The studies on MS QoL may be classified into three categories (Nortvedt and Riise, 2003): (i) evaluating the development and validity of QoL questionnaires and clinical scales, (ii) evaluating determinants of QoL or comparing the QoL among various groups, and (iii) using QoL as outcome measures in clinical trials and other interventions (Nortvedt and Riise, 2003; Nortvedt et al, 1999). QoL has therefore become an outcome measure for patients with chronic disorders, which is independently used without clinical or biological parameters reflecting the effect of interventions. 'Health-related quality of life' (HRQoL) refers to individual's subjective experience related to his/her health status, disease and disability (WHO, 1947). Among the scales to measure HRQoL, are the SF-36 (Ware and Sherbourne, 1992) and the MSQoL-54 (Solari et al, 1999). MS patients score lower in HRQoL than do patients with other chronic and disabling conditions such as epilepsy, diabetes, rheumatoid arthritis or inflammatory bowel disease. MS patients show markedly and significantly lower mean scores for all perceived health dimensions measured with SF-36 compared with age- and gender-matched general population, and with special regards to physical domains (Nortvedt et al, 1999; Pugliatti et al, in press). Objective scales, such as EDSS are often not sensitive enough to detect such 'disability' in MS first stages (Thompson and Hobart, 1998; Pugliatti et al, in press)

5 Mortality

MS is associated with an elevated risk for death in Europe, with mortality rates ranging from 0.5 to 3.6 per 100,000 (Pugliatti et al, 2006 for review). The total median age at death from MS was found to be 59 years between 1990 and 2001 in the Austrian population, with a 15-year shorter life expectancy than the general population (Ekestern and Lebhart, 2004). Data on MS mortality rates must be taken cautiously, however, when they are retrospectively based on the International Classification of Diseases (ICD) as it may reflect a change in the coding system over time. Also, when MS patients die from other causes or from age-related

diseases, up to 23% misclassification is likely to occur as MS is not mentioned in death certificates (Ford et al, 2002).

6 Objectives of the MS-ID project: state of play

The overall aims of the MS-ID project were refined to produce a series of specific objectives. Here we report on the progress of the first 12 months of the MS-ID project (the calendar year 2007) in relation to each objective.

Objective 1:To raise awareness and exchange information through a major EU conference on multiple sclerosis in 2007, to highlight the current situation of people affected by multiple sclerosis (prevalence, epidemiology, current situation and future challenges) .
The MS-ID Conference took place in May 2007. The outcomes of this conference were used as a launch pad for the project and its activities and were presented to the EU Council of Health Ministers by the Chairperson, German Minister of Health, Ms. Ulla Schmidt.
Objective 2: To critically evaluate current data collection methods of MS management across the European Union.
An evaluation report is underway through an extensive consultation with EMSP members and other known gatherers of data on MS. It will list the initiatives underway in all Member States. The intention is to produce an exhaustive list of data collection that is currently underway around Europe. This report will also identify the most common factors/aspects of MS on which data is currently being collected. The report will be finalised in mid-2008.
Objective 3: To develop and test a pilot data collection system (MS Register) for transnational data analysis and comparison, which could form a basis for an EU wide approach to analyse and compare MS data.
Two questionnaires have been developed through the Scientific Advisory Committee of the MS-ID project – a medical questionnaire and a socio-economic questionnaire. One clinical location in each of six participating countries has been identified. The medical questionnaire will be completed by the clinician, whilst the socio-economic questionnaire will be filled out by the person with MS. The questionnaires will be piloted at the start of 2008 after which they will be refined and then implemented in the six test centres for the remainder of the year. The questionnaires will be sent to a central statistical institute for analysis.
Objective 4: To promote a Code of Good Practice for people with MS on the quality of life, human capital and social support linked to multiple sclerosis which includes the identification of evaluation indicators and feedback mechanisms for use across the EU.
The Code of Good Practice was developed in 2003 in response to a request from the European Parliament when it was brought to their attention that significant inequalities existed between countries on the subject of the management, treatment and care delivered to people with MS. EMSP has developed a Communications Toolkit about the Code of Good Practice that its members may consult in devising the necessary lobbying strategies for the endorsement of the Code by the relevant national authorities in the fields of health, employment and social affairs. EMSP has been extremely active in gathering political support for the Code in the European Parliament, with the EU Commissioner for Health & Consumer Affairs, DG SANCO in the European Commission and the wider neurological and patient representative organizations on whom the Code also impacts.
The EU Commissioner for Health and Consumer Affairs, in follow-up to the MS-ID Conference, has contacted the Minister of Health in each Member State to request an official position on the endorsement and the implementation of the Code of Good Practice in legislative and service delivery structures. This was very welcomed by EMSP and its membership.
The Code of Good Practice is drafted on the basis of a series of expert consensus papers in the fields of immunomodulating therapies, symptomatic treatment, palliative care, MS rehabilitation and Principles promoting the Quality of Life of persons with MS. During the course of the MS-ID project, additional consensus papers will be developed on i) the Health

Economics of MS ii) Paediatric MS and also iii) Criteria for adherence in Centres of Excellence on MS. Another task of the MS-ID project will be to synthesise the consensus papers into an information leaflet/sheet format aimed at people with MS, their families, carers and significant others in the social support network.
Objective 5:To work with national MS societies to ensure that the EU project, its outcomes and resulting information dividend are understood and fully utilised by member countries, through national roll out plans.
In 2008, EMSP will develop an annual national reporting system using the Open Method of Coordination which will consist of:

- Agreeing common objectives for EMSP members in the specific policy area of diagnosis, treatment and accompaniment of MS patients
- Establishing common indicators as a means of comparing best practice and measuring progress
- Translating the objectives of the European Code of Good Practice into national/regional policies on the basis of National Reports prepared by EMSP members
- Publishing a joint European report analysing and assessing the National Reports (peer review)

The reporting using the Open Method of Coordination will commence through the participation of the six national MS societies, it afterwards rolls out to the remaining EMSP membership. The Joint European report will be presented at the Consensus Meeting which marks the closure of the project in May 2009.

7 Conclusion

Despite the wealth of data deriving from systematic epidemiological studies on MS conducted over the past three decades, reliable information on age-specific prevalence rates, on the distribution of prevalent cases by disease severity and course, and on incidence rates lacks for nearly two thirds of all European countries. Redefining the geographical pattern of MS in Europe is a hard task due to: (a) the variability of the surveyed populations with respect to size, age structure, ethnic origin; (b) the capability to detect benign and/or early cases; (c) the different degree of case ascertainment coverage based on geographic and time setting, access to medical care, number of neurologists, availability of new diagnostic procedures, public awareness about MS; (d) the impact of different diagnostic criteria used and the inter-observer variability when comparing incidence and prevalence rates between studies.
MS prevalence and incidence tend to be higher in countries where the degree of disease investigation is also higher, with better accuracy in survey methodology, and where assessments have been repeatedly conducted over time, often based on nation-wide surveys and registry systems. This implies a possible underreporting of cases in countries with less developed health information systems.

The Code of Good Practice in MS - its recognition and political endorsement by a range of interested and relevant stakeholders, should bring with it the possibility to include MS on the health agendas of all national administrations. The role of MS-ID in promoting the Code to the widest range of stakeholders is a matter of priority.

In parallel to such political lobbying and campaigning, the MS-ID project intends to identify the inequalities that exist across member states in relation to the management and treatment of MS. The remit of the project is also to recommend solutions that will bridge the gaps that exist between various countries. MS knows no geographic boundaries. Neither, therefore, should its treatment.

Reference list

Alotaibi S, Kennedy J, Tellier R, Stephens D, Banwell B (2004): Epstein-Barr virus in pediatric multiple sclerosis. JAMA 291:1875–1879.

Ascherio A, Munger KL, Lennette ET, et al (2001): Epstein-Barr virus antibodies and risk of multiple sclerosis: a prospective study. JAMA 286:3083–3088.

Ascherio A, Munger K (2007): Environmental Risk Factors for Multiple Sclerosis. Part II: Non infectious Factors. Ann Neurol 61:504–513

Baumhackl U, Eibl G, Ganzinger U, et al (2002): Prevalence of multiple sclerosis in Austria. Results of a Nationwide Survey. Neuroepidemiology 21:226-234.

Becus T, Popoviciu L (1994): Epidemiologic survey of multiple sclerosis in Mures County, Romania. Rom J Neurol Psychiatry 32:115-122.

Beer S, Kesserling J (1994): High prevalence of multiple sclerosis in Switzerland. Neuroepidemiology 19:14-18.

Bencsik K, Rajda C, Füvesi J, et al (2001): The prevalence of multiple sclerosis, distribution of clinical forms of the disease and functional status of patients in Csongrád County, Hungary. Eur Neurol 46:206-209.

Benedikz J, Magnus S, Guðmundsson J et al (2002): The natural history of untreated multiple sclerosis in Iceland. A total population-based 50 year prospective study. Clinical Neurology and Neurosurgery 104:208-210.

Benito-Léon J, Martín E, Vela L et al (1998): Multiple sclerosis in Móstoles, central Spain. Acta Neurol Scand 98:238-242.

Boiko A, Deomina T, Favorova O, Gusev E, Sudomoina M, Turetskaya R (1995): Epidemiology of multiple sclerosis in Russia and other of the former Soviet Union: investigations of environmental and genetic factors. Acta Neurol Scand 91(Suppl 161):71-76.

Boiko A, Zavalishin IA, Spirin NN, et al (2004): Epidemiology of MS in Russia: first data of United Study of Multiple Sclerosis epidemiology in Russia. Mult Scler 10[Suppl.2]:157 abstract.

Brønnum-Hansen H, Koch-Henriksen N, Hyllested K (1994): Survival of patients with multiple sclerosis in Denmark: a nationwide, long-term epidemiologic survey. Neurology 44:1901–1907.

Brønnum-Hansen H, Koch-Henriksen N, Stenager E (2004): Trends in survival and cause of death in Damish patients with multiple sclerosis. Brain 127:844-850.

Brønnum-Hansen H, Stenager E, Hansen T, Koch-Henriksen H (2006): Survival and mortality rates among Danes with MS. Int MS J 13:66-71.

Buehler JW. Surveillance (1998): In: Rothman KJ, Greenland S (eds). Modern epidemiology, 2nd edn. Baltimore, MD: Lippincott Williams & Wilkins; 435–457.

Celius EG, Vandvik B (2001): Multiple sclerosis in Oslo, Norway: prevalence on 1 January 1995 and incidence over a 25-year period. Eur J Neurol 8:463-469.

Comi G, Martino G (2006) : MS treatment: New perspectives. Clin Neurol Neurosurg 108: 339-345.

Confavreux C, Compston DA, Hommes OR, et al (1992): EDMUS, a European database for multiple sclerosis. J Neurol Neurosurg Psychiatr 55:671–676.

Confavreux C (1994): Establishment and use of multiple sclerosis registers – EDMUS. Ann Neurol 36(suppl):S136–S139.

Confavreux C, Vukusic S, Moreau T, et al (2000): Relapses and progression of disability in multiple sclerosis. N Engl J Med 343:1430–1438.

Confavreux C, Vukusic S, Adeleine P (2003): Early clinical predictors and progression of irreversible disability in multiple sclerosis: an amnesic process. Brain 126:770–782.

Coo H, Aronson KJ (2004): A systematic review of several potential non-genetic risk factors for multiple sclerosis. Neuroepidemiology 23:1–12.

Cutter GR, Baier ML, Rudick RA, et al (1999): Development of a multiple sclerosis functional composite as a clinical trial outcome measure. Brain 122:871-882.

Dahl OP, Aarseth JH, Myhr KM, Nyland H, Midgard R (2004): Multiple sclerosis in Nord-Trøndelag County, Norway: a prevalence and incidence study. Acta Neurol Scand 109:378-384.

De Sã J, Paulos A, Mendes H, et al (2006): The prevalence of multiple sclerosis in the District of Santarem, Portugal. J Neurol 253:914-918.

Dean G, Elian M, Galea de Bono A, et al (2002): Multiple sclerosis in Malta in 1999: an update. J Neurol Neurosurg Psychiatry 73;256-260.

Dyment DA, Sadovnick AD, Ebers GC (1997): Genetics of multiple sclerosis. Hum Mol Genet 6:1693–1698.

Dyment DA, Ebers GC, Sadovnick AD (2004): Genetics of multiple sclerosis. Lancet Neurol ;3:104–110

Ebers (1998). Natural history of multiple sclerosis. In: Compston A (ed). McAlpine's Multiple Sclerosis, 3rd edition. New York: Churchill Livingstone, 1998, pp 191-221.

Ekestern E, Lebhart G (2004). Mortality from multiple sclerosis in Austria 1970–2001: dynamics, trends and prospects. Eur J Neurol 11:511–520.

EUROPA. The EU at a glance. European Governments on-line (2004): Available at: www.europa.eu.int/abc/governments/index_en.htm Accessed Sept 6 2004.

Flachenecker P, Zettl UK , Götze U, et al (2005): [MS registry in Germany --design and first results of the pilot phase]. Nervenarzt 76:967-975. [Article in German]

Flachenecker P, Zettl UK, Elias WG, et al (2007): MS Register in Germany – results of the extension phase 2005/2006. Poster presentation at 23rd European Congress for the European Committee in Treatment and Research in Multiple Sclerosis. Prague, Czech Republic October 2007.

Forbes RB, Wilson SV, Swingler RJ (1999): The prevalence of multiple sclerosis in Tayside, Scotland: do latitudinal gradients really exist? J Neurol 246:1033–1040.

Ford HL, Gerry E, Airey CM et al (1998): The prevalence of multiple sclerosis in the Leeds Health Authority. J Neurol Neurosurg Psychiatry 64:605–610.

Ford HL, Gerry E, Johnson M, Williams R (2002). A prospective study of the incidence, prevalence and mortality of multiple sclerosis in Leeds. J Neurol 249:260-265.

Freal JE, Kraft GH, Coryell JK (1984): Symptomatic fatigue in multiple sclerosis. Arch Phys Med Rehabil 65:135-138.

Giovannoni G, Ebers G (2007): Multiple sclerosis: the environment and causation. Curr Opin Neurol 20:261–268.

Global Health Atlas (2005). Available at: http://atlas.globalhealth.org Accessed June 14 2005.

Granieri E, Malagú S, Casetta I et al (1996): Multiple sclerosis in Italy. A reappraisal of incidence and prevalence in Ferrara. Arch Neurol 53:793-798.

Gross K, Kokk A, Kaasik AE (1993): Prevalence of MS in South Estonia. Evidence of a new border of the Fennoscandian focus. Acta Neurol Scand 88:241-246.

Grytten N, Glad SB, Aarseth JH, et al (2006): A 50-year follow-up of the incidence of multiple sclerosis in Hordaland County, Norway. Neurology 66:182-186.

Grønlie SA, Myrvoll E, Hansen G, et al (2000): Multiple sclerosis in North Norway, and first appearance in an indigeneous population. J Neurol 247;129-133.

Hawkes C (2007) : Smoking is a risk factor for multiple sclerosis: a metanalysis. Mult Scler 13:610-615.

Hein T, Hopfenmüller W (2000): [Projection of the number of multiple sclerosis patients in germany]. Nervenartz 71:288-294.

Jedlicka P (1989): Epidemiology of multiple sclerosis in Czechoslovakia. In: Battaglia MA, Crimi G (eds): An Update on Multiple Sclerosis. Monduzzi Editore, Bologna, pp 253-255.

Koch-Henriksen N, Hyllested K (1988): Epidemiology of multiple sclerosis: incidence and prevalence rates in Denmark 1948–64 based on the Danish Multiple Sclerosis Registry. Acta Neurol Scand 78:369–380.

Koch-Henriksen N, Brønnum-Hansen H, Hyllested K (1992): Incidence of multiple sclerosis in Denmark 1948-1982: a descriptive nationwide study. Neuroepidemiology 11:1-10.

Koch-Henriksen N (1999): The Danish Multiple Sclerosis Registry: a 50-year follow-up. Mult Scler 5:293-296.

Koch-Henriksen N, Rasmussen S, Stenager E, et al (2001). The Danish Multiple Sclerosis Registry. History, data collection and validity. Dan Med Bull 48: 91–94.

Koncan-Vracko B (1994): Epidemiological investigation of multiple sclerosis in Slovenia. In: Firnhaber W, Lauer K (eds): Multiple Sclerosis in Europe: An Epidemiological update. Leuchtturm-Verlag/LTV Press, Darmstadt, p 294.

Konryichuk AG, Zheliba OV (1995): Epidemiology of MS in Vinnytsia Oblast, South-West Ukraine. J Neuroimmunol (suppl 1). Acts of 11th European MS Congress.

Korbut AL, Konryichuk AG (2001): MS in the population of Vinnytsya City, Central Ukraine. Polish Neurology and Neurosurgery. Acts of 33rd International Danube Symposium.

Kruja J (1994): Multiple sclerosis in Albania. In: Firnhaber W, Lauer K (eds): Multiple Sclerosis in Europe: An Epidemiological Update. Leuchtturm-Verlag/LTV Press, Darmstadt, pp 309-315.

Krupp LB, Alvarez LA, LaRocca NG, Scheinberg LC (1988): Fatigue in multiple sclerosis. Arch Neurol 45:435-437.

Kurtzke JF (1955): A new scale for evaluating disability in multiple sclerosis. Neurology (Minneap) 5:580-583.

Kurtzke JF (1983): Rating neurological impairment in multiple sclerosis and expanded disability status scale (EDSS). Neurology 33:1444-1452.

Lauer K (1997): Diet and multiple sclerosis. Neurology 49(Suppl 2):S55–S61.

Lensky P (1994): Geographic disproportion of multiple sclerosis in Czechoslovakia from the point of view of indirect proof. In: Firnhaber W, Lauer K (eds): Multiple Sclerosis in Europe: An Epidemiological Update. Leuchtturm-Verlag/LTV Press, Darmstadt, pp 266-273.

Ljapchev R, Daskalovska V (1994): Epidemiological studies of multiple sclerosis in the Republic of Macedonia. In: Firnhaber W, Lauer K (eds): Multiple Sclerosis in Europe: An Epidemiological Update. Leuchtturm-Verlag/LTV Press, Darmstadt, pp 301-308.

Lublin FD, Rengold SC (1996): Defining the clinical course of multiple sclerosis: results from an international survey. National Multiple Sclerosis Society (USA): Advisory Committee on Clinical Trials on New Agents in Multiple Sclerosis. Neurology 46:907-911.

Lucchinetti CF, Bruck W, Rodriguez M, Lassmann H (1996): Distinct patterns of multiple sclerosis pathology indicates heterogeneity on pathogenesis. Brain Pathol 6:259-274.
Marrie RA (2004): Environmental risk factors in multiple sclerosis aetiology. Lancet Neurol 3: 709–718

Martinelli V (2000): Trauma, stress and multiple sclerosis. Neurol Sci 21:S849–S852.

Materljan E, Sepcic J (2002): Epidemiology of multiple sclerosis in Croatia. Clinical Neurology and Neurosurgery 104:192-198.

Mc Donald WI, Compston A, Edan G, et al (2001): Recommended diagnostic criteria for multiple sclerosis: guidelines from the International Panel on the Diagnosis of Multiple Sclerosis. Annals of Neurology 50:121-127.

McDonnell GV, Hawkins SA (1998a): An epidemiologic study of multiple sclerosis in Northern Ireland. Neurology 50:423-428.

McGuigan C, McCarthy A, Quigley C, et al (2004): Latitudinal variation in the prevalence of multiple sclerosis in Ireland, an effect of genetic diversity. J Neurol Neurosurg Psychiatry 75:572-576.

Middleton LT, Dean G (1991): Multiple sclerosis in Cyprus. J Neurol Sci 103:29-36.

Mikaeloff Y, Caridade G, Tardieu M, ... on behalf of the KIDSEP study group (2007): Parental smoking at home and the risk of childhood-onset multiple sclerosis in children. Brain 130:2589-2595.

Milanov I, Georgiev D, Kmetska K, Jordanova L, Topalov N (1997): Prevalence of multiple sclerosis in Bulgaria. Neuroepidemiology 16:304-307

Miller D, Noseworthy J, Compston A (2006): Care of the person with multiple sclerosis. In: Compston A. (ed). McAlpine's Multiple sclerosis. China: Churchill Livingston Elsevier 671-681.

Minderhoud JM, Zwanniken CF (1994): Increasing prevalence and incidence of multiple sclerosis: an epidemiological study in the province of Groningen, The Netherlands. In: Firnhaber W, Lauer K (eds): Multiple Sclerosis in Europe: An Epidemiological Update. Leuchtturm-Verlag/LTV Press, Darmstadt, pp 113-121.

Modrego Pardo PJ, Pina Latorre MA, López A, Errea JM (1997): Prevalence of multiple sclerosis in the province of Teruel, Spain. J Neurol 244:182-185.

Moreau T, Manceau E, Lucas B, Lemesle M, Urbinelli R, Giroud M (2000): Incidence of multiple sclerosis in Dijon, France : a population-based ascertainment. Neurol Res 22:156-159.

MSTCG (2004): Escalating immunotherapy of multiple sclerosis - New aspects and practical application. J Neurol 251: 1329-1339.

Myhr KM, Grytten N, Aarseth JH, Nyland H (2006): The Norwegian Multiple Sclerosis National Competence Centre and National Multiple Sclerosis registry -- a resource for clinical practice and research. Acta Neurol Scand 183(Suppl):37-40.

Nicoletti A, Lo Bartolo ML, Lo Fermo S, et al (2001): Prevalence and incidence of multiple sclerosis in Catania, Sicily. Neurology 56:62-66.

Nortvedt MW, Riise T, Myhr KM, Nyland HI (1999): Quality of life in multiple sclerosis: measuring the disease effects more broadly. Neurology 53:1098–1093.

Nortvedt MW, Riise T (2003): The use of quality of life measures in multiple sclerosis research. Mult Scler 9:63–72. 43.

Noseworthy JH, Lucchinetti C, Rodriguez M, Weinshenker BG (2000): Multiple sclerosis. N Engl J Med 343;938-952.

Pekmezovic T, Jarebinski M, Drulovic J, Stojsvljevic N, Levic Z (2001): Prevalence of multiple sclerosis in Belgrade, Yugoslavia. Acta Neurol Scand 104:353-357.

Peterlin B, Ristic S, Sepcic J, et al (2006): Region with persistent high frequency of multiple sclerosis in Croatia and Slovenia. J Neurol Sci 247:169-172.

Piperidou HN, Heliopoulos IN, Maltezos ES, Milonas IA (2003): Epidemiological data of multiple sclerosis in the province of Evros, Greece. Eur Neurol 49:8-12.

Polman CH et al (2005): Diagnostic criteria for multiple sclerosis: 2005 revisions to the "McDonald Criteria". Ann Neurol 58: 840-846.

Poser CM, Brinar VV (2004): Diagnostic criteria for multiple sclerosis: an historical review. Clin Neurol Neurosurg 106: 147–158.

Poser CM, Paty DW, Scheinberg L, et al (1983): New diagnostic criteria for multiple sclerosis: guidelines for research protocols. Annals of Neurology 13:227–231.

Poser CM (1995): Onset symptoms of multiple sclerosis. J Neurol Neurosurg Psychiatry 58:253–264.

Poser S, Stickel B, Krtsch U, Burckhardt D, Nordman B (1989): Increasing incidence of multiple sclerosis in South Lower Saxony, Germany. Neuroepidemiology 8:207-213.

Potemkowski A (1999): Epidemiology of multiple sclerosis in the region of Szczecin: prevalence and incidence 1993-1995. Neurol Neurochir Pol 33:575-585.

Pugliatti M, Sotgiu S, Solinas G et al (2001): Multiple sclerosis epidemiology in Sardinia: evidence for a true increasing risk. Acta Neurol Scand 103:20-26

Pugliatti M, Riise T, Sotgiu MA, et al (2005): Increasing incidence of multiple sclerosis in the province of Sassari, northern Sardinia. Neuroepidemiology 25:129–134.

Pugliatti M, Rosati G, Carton H, et al (2006): The epidemiology of multiple sclerosis in Europe. Eur J Neurol 13: 700–722.

Pugliatti M, Riise T, Nortvedt M, et al (in press): Self-perceived physical functioning and health status in fully ambulatory MS patients. J Neurol

Ranzato F, Perini P, Tzintzeva E et al (2003): Increasing frequency of multiple sclerosis in Padova, Italy: a 30-year epidemiological survey. Mult Scler 9:387-392.

Riise T, Nortvedt MW, Ascherio A (2003): Smoking is a risk factor for multiple sclerosis. Neurology 61:1122–1124.

Robertson NP, Deans J, Fraser M, Compston DAS (1995): multiple sclerosis in the North Cambridgeshire districts of East Anglia. J Neurol Neurosurg Psychiatry 59:71–76.

Rosati G (2001). The prevalence of MS in the world: an update. Neurological Sciences 22:117-140.

Rose AS, Ellison GW, Myers LW, Tourtellotte WW (1976): Criteria for the clinical diagnosis of multiple sclerosis. Neurology 26:20-22.

Rothwell PM, Charlton D (1998): High incidence and prevalence of multiple sclerosis in South East Scotland: evidence of a genetic predisposition. J Neurol Neurosurg Psychiatry 64:733 –735.

Sadovnick AD, Ebers GC (1993): Epidemiology of multiple sclerosis: a critical overview. Can J Neurol Sci 20:17-29.

Schwarz S, Leweling H (2005): Multiple sclerosis and nutrition. Mult Scler 11:24–32.

Serafini B, Rosicarelli B, Franciotta D, et al (2007): Dysregulated Epstein-Barr virus infection in the multiple sclerosis brain. J Exp Med

Sobocki P, Pugliatti M, Lauer L, Kobelt G (2007): Estimation of the cost of MS in Europe: Extrapolations from a multinational cost study. Mult Scler Jul 10 [epub].

Solari A, Filippini G, Mendozzi L, et al (1999): Validation of Italian multiple sclerosis quality of life 54 questionnaire. J Neurol Neurosurg Psychiatry 67:158-162.

Sumelahti ML, Tienari PJ, Wikström J, Palo, J, Hakama M (2000): Regional and temporal variation in the incidence of multiple sclerosis in Finland 1979-1993. Neuroepidemiology 19:67-75.

Sumelahti ML, Tienari PJ, Wikström J, Palo, J, Hakama M (2001): Increasing prevalence of multiple sclerosis in Finland. Acta Neurol Scand 103:153-158.

Sumelahti ML, Tienari PJ, Wikström J, et al (2002): Survival of multiple sclerosis in Finland between 1964 and 1993. Mult Scler 8:350-355.

Sundström P, Nyström L, Forsgren L (2003): Incidence (1988-97): and prevalence (1997): of multiple sclerosis in Västerbotten County in northern Sweden. J Neurol Neurosurg Psychiatry 74:29-32.

Thompson AJ, Hobart JC (1998): Multiple sclerosis: assessment of disability and disability scales. J Neurol 245:189–196.

Tola MA, Yugueros MI, Fernández-Buey N, Fernández-Herranz R (1999): Prevalence of multiple sclerosis in Valladolid, northern Spain. J Neurol 246:170-174.

Totaro R, Marini C, Cialfi A, et al (2000): Prevalence of multiple sclerosis in the L'Aquila district, central Italy. J Neurol Neurosurg Psychiat 68:349-352.

Trapp BD, Peterson J, Ransohoff RM, et al (1998): Axonal transection in the lesions of multiple sclerosis. N Engl J Med 338:278-285.

Van Ooteghem P, De Hooghe MB, Vlietnick R, Carton H (1994): Prevalence of multiple sclerosis in Flanders, Belgium. Neuroepidemiology 13:220-225.

Vukusic S, Van Bockstael V, Gosselin S, Confavreux C (2007): Regional variations in the prevalence of multiple sclerosis in French farmers. J Neurol Neurosurg Psychiatry 78:707-709.

Ware JE, Sherbourne CD (1992): The MOS 36-Item Short-Form Health Survey (SF-36) I. Conceptual framework and item selection. Med Care 30:473–483.

World Health Organization (WHO) (1947): The Constitution of World Health Organization. WHO Chronicle 1:29.

World Health Organization (WHO) (2004): Statistical Annex. In: WHO (eds): The world health report 2004 - changing history. WHO, Geneve.

Zivadinov R, Iona L, Monti-Bragadin L, et al (2003): The use of standardized incidence and prevalence rates in epidemiological studies on multiple sclerosis. Neuroepidemiology 22:65-74.

12 Musculoskeletal Conditions

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1 Introduction

The content of this chapter has been contributed to by members of the Bone and Joint Monitor Project, members of the European Indicators for Monitoring Musculoskeletal Problems and Conditions Project (S12.297217) (http://ec.europa.eu/health/ph_projects/2000/monitoring/fp_monitoring_2000_frep_01_en.pdf) (1) and members of the European Bone and Joint Health Strategies Project (SI2.304 598) (http://ec.europa.eu/health/ph_projects/2000/promotion/fp_promotion_2000_frep_15_en.pdf) (2) and uses material and data from these projects in addition to other sources. This material also contributes to the EUGLOREH 2007 Report.

Musculoskeletal problems and conditions are considered as a whole, characterised by pain in the musculoskeletal system with an effect on function. In addition this chapter considers the major musculoskeletal conditions of osteoarthritis (WHO ICD10 M15-19); rheumatoid arthritis (M05; M06; M08.0); osteoporosis (M 81) and fragility fracture (M48.4; M48.5; M80; M82); back pain (M54.5; M40-54); and regional pain syndromes (various M00-99) including those following injury or activity, such as associated with sports or occupation. They are often chronic and were the commonest longstanding condition in the UK General Household Survey, 1998 (3). Musculoskeletal conditions are the main cause of disability in older age groups. They rank in the top 10 causes of disability adjusted life-years (DALY) in Europe (4) and osteoarthritis is the 5th greatest cause of years lived with disability (YLD) in high-income countries (5).

The burden of these conditions is increasing with aging of the population and with changes in lifestyle risk factors such as obesity and reduced physical activity. The options for prevention and effective management are increasing with better understanding of their causes and successful investment in developing new treatments, both pharmacological and surgical.

There is however a lack of data reflecting their burden in member states. There are not routinely collected data that measures their occurrence and impact across Europe to enable this burden to be monitored. Recommendations have been made for monitoring musculoskeletal conditions in the European Community (1) (http://ec.europa.eu/health/ph_projects/2000/monitoring/fp_monitoring_2000_frep_01_en.pdf). The core recommendations are:

1 **Occurrence of self reported musculoskeletal pain**
Self report in health interview survey of pain and limited function from different regions, using a standard question. This will capture all musculoskeletal problems and conditions that have a consequence on function irrespective of specific cause.

2 **Occurrence of rheumatoid arthritis**
Incidence and prevalence of RA in existing and future regional registers

3 **Occurrence of osteoarthritis in hip and knee**
Prevalence of OA in research projects based on health examination surveys, including x-ray

4 **Occurrence of osteoporosis**
Prevalence of bone density monitored in health examination studies

5 **Reduced function**
Prevalence of persons with reduced function, according to diagnosis, measured in health interview surveys as recommended by other in the health monitoring project

6 **Work disability**
Permanent or temporary work disability, according to diagnosis from social security statistics

7 **Occurrence of hip fracture**
Incidence of hip fractures from hospital statistics

8 **Hip and knee arthroplasty**

Incidence and indicators for hip and knee replacement from hospital statistics

9 **Drugs for treatment and prevention of osteoporosis**
Defined daily doses of drugs (ATC M 05B – drugs for treatment of bone diseases) (WHO Collaborating Centre for Drug Statistics Anatomical Therapeutic Chemical Classification System http://www.whocc.no/atcddd/) and actual prescription from wholesale statistics and prescription registers

10 **Drugs for treatment of rheumatoid arthritis**
Defined daily doses of drugs (ATC L 04 A– immunosuppressive agents) (WHO Collaborating Centre for Drug Statistics Anatomical Therapeutic Chemical Classification System http://www.whocc.no/atcddd/) and actual prescription from wholesale statistics and prescription registers

This chapter will consider how readily available this information is as well as other data reflecting the impact of these conditions in the Community on individuals, healthcare and social and employment support. Recommendations are made for how the monitoring of musculoskeletal health can be improved.

2 Health determinants/risk factors

The major determinants of musculoskeletal health and the occurrence or impact related to musculoskeletal conditions were identified by literature review as part of the European Indicators for Monitoring Musculoskeletal Problems and Conditions Project (S12.297217) (1) (http://ec.europa.eu/health/ph_projects/2000/monitoring/fp_monitoring_2000_frep_01_en.pdf) and the European Bone and Joint Health Strategies Project (SI2.304 598) (2) (http://ec.europa.eu/health/ph_projects/2000/promotion/fp_promotion_2000_frep_15_en.pdf).
The major determinants are age, gender, obesity, physical inactivity, smoking, excess alcohol and injuries. Injuries may be in the home, such as a fall, or related to work or leisure activities. These are all on the shortlist of European Community Health Indicators (ECHI) except it is not clear if falls will be separately identified (see recommendations). Family history is a determinant of various musculoskeletal conditions both for genetic and environmental reasons, but this is not on the ECHI shortlist.

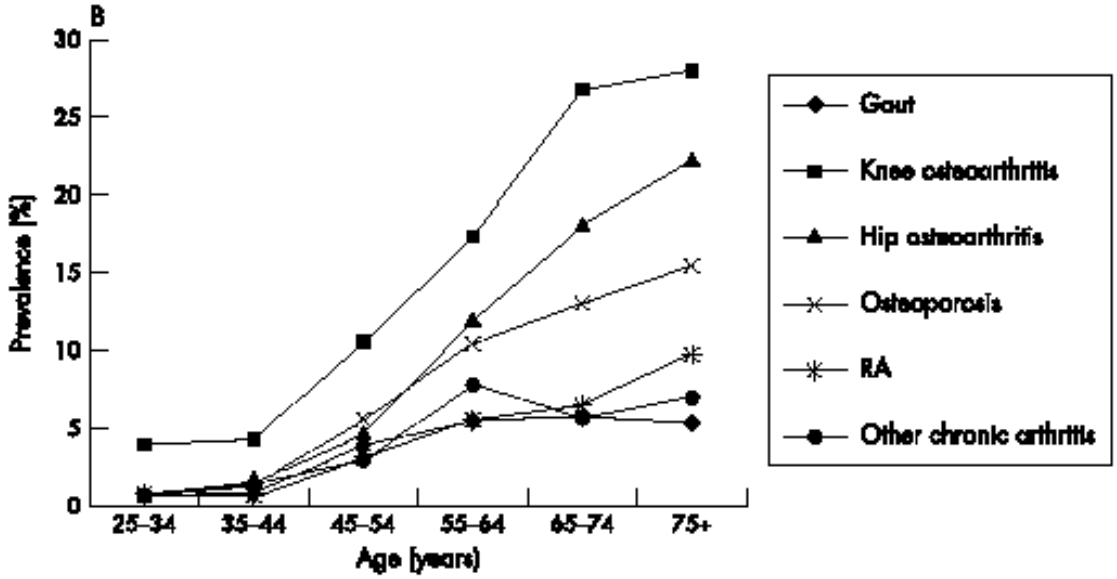
Determinants may be for the occurrence of the condition or for its outcome (severity, chronicity, progression) but it often difficult to separate these out. The major determinants are summarised below and determinants for occurrence and outcome are also considered for the specific conditions. Some of these determinants relate to more than one specific musculoskeletal condition.

Determinants of musculoskeletal health

Gender
Women are at greater risk of developing osteoarthritis, rheumatoid arthritis, osteoporosis and sustaining a fragility fracture. Back pain and musculoskeletal problems related to injuries are more common in men.

Age
The prevalence increases with age because of the accumulative effective of largely chronic conditions such as osteoarthritis and rheumatoid arthritis (Figure 1 (6)). Bone density falls with age and fracture risk increases. Back pain increases with age but its major impact on health and function is in midlife, being a major cause of work loss.

Figure 1 Prevalence of self reported musculoskeletal diseases by age group (6)



Reproduced with permission from the BMJ Publishing Group: Picavet HS, Hazes JM. Prevalence of self reported musculoskeletal diseases is high. Ann Rheum Dis 2003; 62(7):644-650.

Body mass index

An ideal body weight is important for musculoskeletal health. Obesity is associated with the development, progression and symptomatic severity of osteoarthritis of the knee. Avoidance of obesity or reduction in weight will reduce the incidence, progression and impact of knee OA (7). Pain in rheumatoid arthritis can be reduced by weight reduction. Severe obesity may play a part in aggravating a simple low back problem, and contribute to a long-lasting or recurring condition. A low body weight is an established risk factor for osteoporosis and for excess mortality following a fracture.

Physical activity

Physical activity is important for musculoskeletal health. It is important in the development and maintenance of healthy bones, muscles, and joints. It has a beneficial effect on osteoarthritis, back pain and its chronification, and has beneficial effects on bone mineral density and muscle strength. Falls and musculoskeletal injuries may be prevented through maintaining physical fitness and muscle strength through appropriate exercises. Physical exercise is also important in achieving weight loss.

Nutrition

Diet is important in both the prevention and progression of musculoskeletal conditions. Higher levels of calcium intake are associated with higher bone density, in particular higher dietary intake in childhood has been associated with higher bone density in adult life. Older people in general have low calcium intake and the frail elderly are often deficient in vitamin D. In this population calcium and vitamin D supplementation may prevent fracture. Good general nutrition is also important in recovery from hip fracture. A balanced diet is important in maintaining an ideal body weight.

Smoking

Smoking is associated with rheumatoid arthritis, osteoporosis and fracture and is related to back pain. The avoidance of smoking may reduce the incidence of rheumatoid arthritis, osteoporosis and back pain. Currently there are no data on the reduction of risk after stopping smoking.

Alcohol abuse
Excess alcohol is associated with accidents on the road, in the workplace and with falls, osteoporosis and fractures.

Accidental injuries and abnormal use or overuse of the musculoskeletal system
Accidental injuries frequently affect the musculoskeletal system resulting in pain and disability, which is often longterm. Common causes are occupational, sports and falls in older people. Abnormal and overuse of the musculoskeletal system can cause regional pain problems, osteoarthritis and back pain.

Determinants of specific musculoskeletal conditions

Osteoarthritis
Age is the strongest predictor of the development and progression of OA identified radiographically. Almost everyone who reaches 90 years will have radiographic changes of OA in some joint. OA is more common in females, increasing at the age of 50 especially in the hand and knee. The role of the menopause is unclear but hormone replacement therapy (HRT) is associated with a reduced risk of the development and progression of knee OA. Obesity (BMI) is a risk factor for the development of OA of the hand, knee and hip and for progression in the knee and hip (8;9). One study showed obesity to result in an odds ratio of about 8.0 for developing OA knee (10). It is estimated that a decrease of 2 BMI units would decrease the risk of developing knee OA by 20-30% (11). Trauma, particularly in men, is associated with development of knee OA. Other mechanical factors and intensive activity are risk factors for the development of OA of the knee and hip shown by associations with malalignment, repeated knee bends or squatting, intensive sports activities and certain physically demanding occupations (12). Farming presents the greatest relative risk for OA: 4.5 for farming 1-9 years and 9.3 for farming ten years or more (13). There is a negative association with osteoarthritis and smoking (14). These risk factors are summarised in Table 1.

Table 1 Risk factors for incidence and progression of osteoarthritis of the knees, hips, and hands. Adapted from Petersson and Jacobsson, 2002 (12)

	Degree of evidence for association		
Type of osteoarthritis	**Strong**	**Intermediate**	**Suggested**
Incidence			
Knee	Age Female sex Physical activity High bone mass index Bone density Previous injury Hormone replacement therapy (protective)	Vitamin D Smoking (protective) Alignment	Quadriceps strength (protective) Intensive sport activities
Hip	Age	Physical activity High bone mass index	Injury Intensive sport activities
Hand	Age	Grip strength High bone mass index	Occupation Intensive sport activities
Progression			
Knee	Age	Vitamin D Hormone replacement therapy Alignment	Intensive sport activities
Hip	Age	Physical activity	High bone mass index Intensive sport activities

Rheumatoid Arthritis

RA tends to cluster in families. In all European studies there is a consistent association between RA and a shared epitope of the highly polymorphic HLA-DR1 gene of the HLA Class II region. This appears to be the marker for RA disease severity rather than susceptibility (15). Other genes are also involved in RA susceptibility and severity.

There are a number of non-genetic risk factors for RA. Some cases of RA appear to be triggered by common infections or by immunisation. There are complex interactions between the female sex hormones and RA. The onset of RA is rare during pregnancy, pre-existing RA usually goes into spontaneous remission during pregnancy and RA is more common in nulliparous women. By contrast RA onset is more common than expected by chance immediately following childbirth, and women with RA often experience flares in the post-partum period. The oral contraceptive pill, or some other factor associated with its use, appears to protect against the development of the severe RA. The frequency of the pill use, nulliparity and breast-feeding varies considerably between communities and may influence the epidemiology of RA. Smoking and obesity are also risk factors for RA (16). It is likely that the risk factors for RA act in a cumulative fashion.

Base line predictors of future radiological change and for functional disability in patients with early RA that have been identified in various cohorts include older age, female gender, longer disease duration at presentation, presence of rheumatoid factor and more tender and / or swollen joints. Poorer function at base line also predicts future functional disability (17).

Treatment is however one of the most important determinants of outcome in RA. In recent decades the range of drug therapy and the strategies for using existing therapies have improved, and the outlook for patients with RA, providing that they have access to the appropriate expertise, is significantly better now than it was two decades ago. Availability and access to modern management will alter the impact of RA across Europe.

Osteoporosis and fragility fracture

The major determinants of fracture are age, female gender, falling, low bone mass (i.e. osteoporosis), previous low trauma fracture and genetic factors (maternal history of hip fracture). Body build and reproductive variables (loss of ovarian function either naturally at the menopause or surgically; older age at the start of menstruation); other diseases (thyrotoxicosis, rheumatoid arthritis, Cushing's disease, partial gastrectomy, stroke and others) and drugs (steroids, anticonvulsants) are also risk factors. Lifestyle risk factors for osteoporosis include cigarette smoking. The lifetime risk in postmenopausal women who smoke is increased by around 50%. There is a doubling of fracture risk in women with an alcohol consumption of more than eight units weekly. Physical inactivity has also been found to be a risk factor for hip fracture in a number of studies. This may be because physical activity influences bone density, because those who are less active are more at risk of falling, or both. It is not clear whether dietary intake of calcium and vitamin D in the general population affects fracture risk. However, it is clear that dietary supplementation with vitamin D and calcium in nursing home residents reduces fracture risk.

The determinants of fracture are not all independent of each other. Some more clearly relate to risk of falling and others that more relate to bone strength. Frailty and co-morbidity are also risk factors for poor outcome of fracture.

Bone density has the strongest relationship to fracture but many fractures will also occur in women without osteoporosis. The possibility of fracture increases when combining low bone density with the presence of other risk factors for fracture. In particular bone density combined with risk factors that are at least partly independent of bone density (18) can identify those at much increased risk of fracture but the exact interaction of different risk factors is not established. Efforts are being made to use existing data to describe the absolute risk for the individual patient over a time period that is comprehensible, that is 5 to 10 years (19).

Low back pain

Low back pain (LBP) is sometimes associated with specific conditions such as osteoporotic vertebral fracture, prolapsed intervertebral disc, ankylosing spondylitis or malignancy. Degenerative disc disease, a narrow spinal canal, congenital curvature of the spine or post-traumatic deformities can also be associated with LBP. However the majority of cases of LBP are non-specific with no clearly identifiable cause.

Individual life style factors and work-related and non-work related physical and psychosocial factors can play a role in the development of LBP. All these factors can also affect prognosis of LBP and the functional ability of persons with LBP. Several reviews of risk factors are available for work-related factors (20;21), risk factors in general (22;23), specific life style factors (24-29), and psychological factors (24;29). The results of these reviews are summarised in table 2.

The occurrence of non-specific low back pain is associated with age, physical fitness, smoking, excess body weight and strength of back and abdominal muscles. Psychological factors associated with occurrence of back pain are anxiety, depression, emotional instability and pain behaviour. Occupational factors clearly play a role such as heavy work, lifting, bending, twisting, pulling and pushing as well as psychological workplace variables, such as dissatisfaction. Obesity is a risk factor for chronicity.

Psychosocial aspects of health and work are increasingly recognised as major determinants of the development of chronic LBP and related disability.

Table 2 Risk factors for occurrence and chronicity of back pain (adapted from van Tulder, 2002) (30)

	Occurrence	**Chronicity**
Individual factors	Age Physical fitness Strength of back and abdominal muscles Smoking	Obesity Low educational level High levels of pain and disability
Psychosocial factors	Stress Anxiety Mood / emotions Cognitive functioning Pain behaviour	Distress Depressive mood Somatization
General factors	Manual material handling Bending and twisting Whole-body vibration Job dissatisfaction Monotonous tasks Work relations / social support Control	Job dissatisfaction Unavailability of light duty on return to work Job requirement of lifting for ¾ of the day

Regional pain
One of the commonest sites for regional pain is the shoulder. Both physical load and the psychosocial work environment seem to be associated with shoulder pain, although the available evidence was not consistent for most risk factors. The most established risk factors for shoulder pain are repetitive movements, vibration, duration of employment and job satisfaction (31).

3 Incidence/prevalence

Indicators of incidence and prevalence proposed by European Indicators for Monitoring Musculoskeletal Problems and Conditions Project (S12.297217) and on the ECHI Comprehensive Indicator list are

- prevalence of general musculoskeletal pain (ECHI comprehensive indicator list 2.4.2 UW-0, UW-6)
- prevalence of OA hip – by gender, age, region, SES (ECHI comprehensive indicator list 2.3.11 UW-6, UW-18)
- prevalence of OA knee – by gender, age, region, SES (ECHI comprehensive indicator list 2.3.11 UW-6, UW-18)
- incidence of RA – by gender, age, region, SES (ECHI comprehensive indicator list 2.3.11 UW-6)
- prevalence of RA – by gender, age, region, SES (ECHI comprehensive indicator list 2.3.11 UW-6)
- prevalence of low bone density – by gender, age, region, SES (ECHI comprehensive indicator list 3.1.1 UW-6, UW-18)
- incidence of hip fractures – by gender, age, region, SES (ECHI comprehensive indicator list 2.3.17 UW-6, UW-18)

The occurrence of generalised as well as regional pain, such as back pain, can be determined if the questions for general musculoskeletal pain are used that have been recommended by the European Indicators for Monitoring Musculoskeletal Problems and Conditions Project.

The incidence and prevalence of musculoskeletal problems related to injuries (ECHI Comprehensive Indicator List 2.3.17) and working environment (ECHI Comprehensive Indicator List 2.3.18) will only be identifiable if cause can be linked to the occurrence of musculoskeletal pain.

Data available

Data will be given on incidence and prevalence of the conditions being considered and of differences between countries and time trends where available. Data are not routinely collected as part of health monitoring on these musculoskeletal conditions or any of the proposed indicators. Fracture data is most readily available although it is not always easy to separate out hip fractures.

Data are reported from various surveys that have been identified. This data is only available from certain countries. Different case definitions have often been used which limits direct comparison. Recommendations for more consistent case definitions have been made in the European Indicators for Monitoring Musculoskeletal Problems and Conditions Project (S12.297217) and subsequent work by the Bone and Joint Monitor Project. These recommendations are given later.

Musculoskeletal problems and conditions as a whole

The commonest symptoms of musculoskeletal problems and conditions are pain and disability. This can be used to measure the overall occurrence of these problems and conditions.

Musculoskeletal pain is experienced by most people at some time. A survey found that only 15% of 20-72 year-olds reported no pain during the previous year, whereas 58% reported musculoskeletal pain during the previous week and 15% had musculoskeletal pain every day during the last year (32). Musculoskeletal pain may be a regional or generalized pain problem or be associated with a specific musculoskeletal condition. In the EU, just over one-fifth of the population over 15 years report having longstanding trouble with their muscles, bones or joints (33), most prevalent in Hungary (33%) and Belgium (31%) and least prevalent in Greece (12%), Cyprus (13%) and Ireland (10%).

The prevalence of musculoskeletal pain increases in prevalence up to about 65 years of age (34-36), explained partly by a cumulative effect of chronic musculoskeletal conditions, which become more prevalent with older age. A decline in the complaint of pain has been noted over 65 years, a plausible explanation for which could be the decline around the age of retirement of the adverse physical and mental effects of the working place.

Musculoskeletal pain is usually associated with limitations of activities and restricted participation (2), which is greater with more widespread pain, back pain and knee pain (37).

Various health interview surveys have been reviewed through the HIS/HES database. They have usually included questions about limitations of activities and participation but these questions are not always related to the reason and whether related to musculoskeletal conditions, for example. Some surveys use terms such as “rheumatism” or “diseases of the skeletal system” but these is a very non-specific and broad terms that can encompass several conditions. In addition self-reported diagnosis is often asked but the validity of this for some musculoskeletal conditions is not good. Many people with musculoskeletal problems do not consult a doctor.

Any indicator of musculoskeletal pain needs to identify those with musculoskeletal pain that has a consequence on their activities of daily living (1). Musculoskeletal pain also needs to be characterised to know if acute, recurrent or chronic, region affected and if there is a known determinant such as injury or a condition such as RA.

Health inequalities

The occurrence of musculoskeletal conditions and problems is more frequent in women (figure 2). It is also income related (figure 3). The epidemiology of the determinants of musculoskeletal health varies in different societal groups and ethnicities. This will result in inequalities.

Figure 2 Gender-related incidence of chronic illness, 2002 (38)

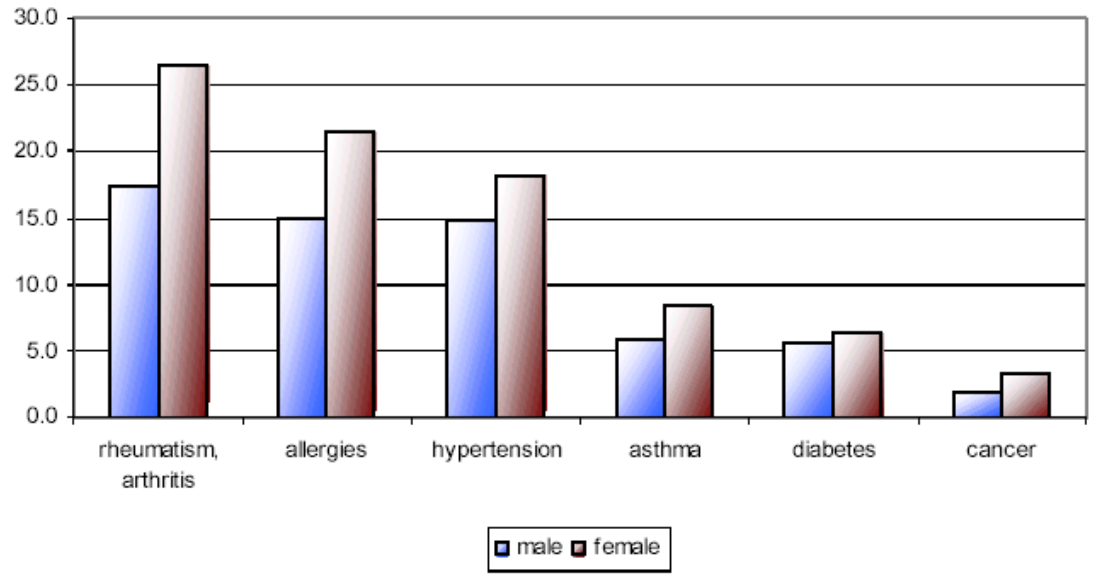
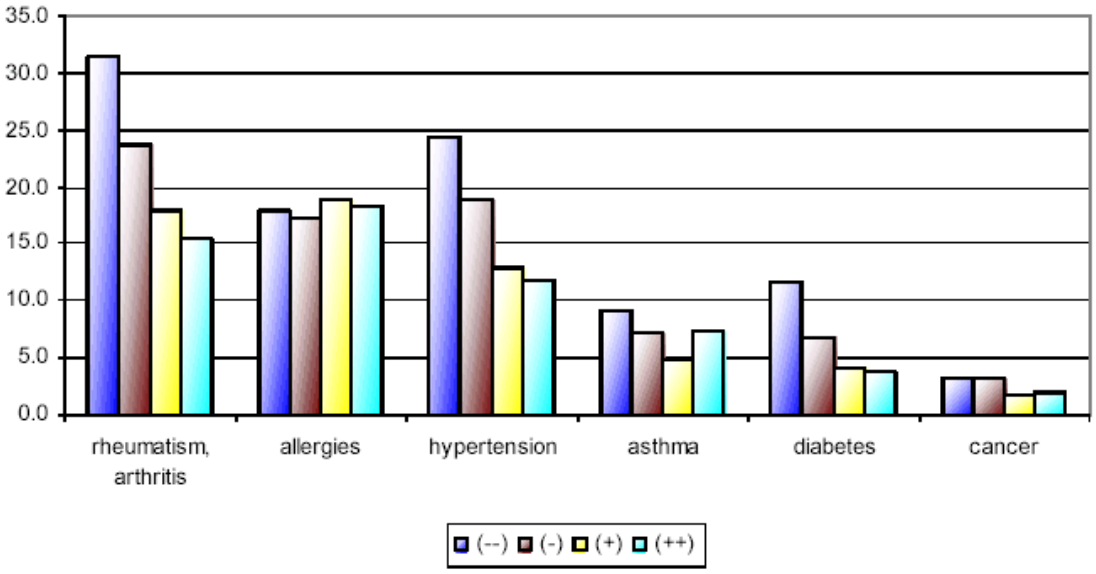


Figure 3 Income-related incidence of chronic illness, 2002 (38)



Trends

Many musculoskeletal conditions are age related and persistent and the prevalence will increase with the aging of the population in Europe as well as a consequence of changes in the epidemiology of determinants such as obesity and lack of physical activity.

Osteoarthritis

Definitions of osteoarthritis should ideally include both symptoms and radiological changes. However many studies have just included those with joint pain attributable to OA or have been radiological surveys without information as to symptoms or function.

The incidence of osteoarthritis is problematic to estimate and there is little data because of its gradual progressive development and difficulties in the definition of a new case. For women

the incidence of osteoarthritis is highest among those aged 65–74 years, reaching approximately 13.5 per 1000 population per year; for men the highest incidence of approximately 9 cases per 1000 population per year occurs in those aged 75 years and over. The incidence of symptomatic OA of the knee was 1% per annum of women aged 70 - 89, which was less than half the incidence of hand or hip OA in a large scale study (N=130,000) in Massachusetts, USA (39). The incidence and rate of progression increases with age.

Prevalence studies of OA at a variety of anatomical sites from 7 European countries were identified in the European Indicators for Monitoring Musculoskeletal Problems and Conditions Project (S12.297217) (table 3, 4). The largest European study was conducted in Zoetermeer in the Netherlands in the mid 1970s. There are too few comparable studies to draw any conclusions about geographical variation in prevalence. The prevalence of radiological osteoarthritis rises with age so that, for example, in people age 55-74 the prevalence of OA of the hand is 70%, foot OA 40%, knee OA 10% and hip OA 3% (40). Below the age of 45 men are affected more often than women. Over the age of 45 women are affected more often. In many people there will be several joints involved and it is estimated in the Global Burden of Disease study that approximately 10% of the population who are 60 years or older have symptomatic problems that can be attributed to OA.

Table 3 Prevalence of Osteoarthritis defined by Clinical Criteria (1)

Country	Location	Years	Sample size	Age group	Gender	Classification Criteria used	Hip OA prevalence %	Knee OA prevalence %	OA of the hand prevalence %
Finland	Orvesi	1985	13 700	0+	Men Women Both	Clinical defined OA		0,5 (0,3 – 0,6) 1,7 (1,5 – 1,9) 1,1 (0,9 – 1,3)	
Finland	MFHS	1993	7 220	30+	Men Women Both	Clinical defined OA	4,1 (3,6 – 4,6) 6,0 (5,5 – 6,6) 5,1 (4,6 – 5,6)		
UK	Wensleydale and Leigh	1954	570 1550	55+	Men Women	Clinical defined OA K&L + pain	5,2 (2,5 – 8,0) 5,4 (2,9 – 7,9)	10,0 (7,8 –12,1) 17,9 (15,3–20,0)	
UK	Chingford	1992	990	45 – 64	Women	Clinical defined OA K&L + pain		5,8 (4,3 – 7,3)	
Spain	Various	2000	2190	20+	Both	American College of Rheumatology		10,2 (8.5 11.9)	6,2 (5.9 – 6.5)
Iceland	Nursing Home	1994	150 97	59–101 62-103	Men Women	American College of Rheumatology			3,3 6,8

Table 4 Prevalence of Osteoarthritis defined by Radiographic Criteria (1)

Country	Location	**Years**	**Sample size**	**Age group**	**Gender**	**Classification Criteria used**	**Hip OA prevalence %**	**Knee OA prevalence %**
Bulgaria	Sofia	1964	4320	15+ 55+	Men Women Men Women	Kellgren and Lawrence	0,9 (0,4 – 1,4) 0,6 (0,3 – 0,9) 2,0 (0,9 – 3,1) 0,8 (0,1 – 1,5)	6,1 (4,9 – 7,3) 5,8 (5,8 – 7,8)
UK	Leigh	1954	501	35 – 74 55 – 64	Men Women Men Women	Kellgren and Lawrence	25,0 (19,5–30,5) 15,0 (10,7–19,3)	21,0 (17,5–24,5) 31,0 (27,2–34,8)
UK	Wensleydale	1958	630	34 – 74 55+	Men Women Men Women	Kellgren and Lawrence	22,0 (14,0–30,0) 16,0 (10,1–21,9)	14,0 (10,0–18,0) 28,0 (23,3–32,7)
UK	Chingford	1988	985	45 – 64	Women	Kellgren and Lawrence		12,0 (10,0–14,0)
Netherlands	Zoetermeer	1975	2600	35+	Men Women	Kellgren and Lawrence		12,2 (10,4–14,0) 19,7 (17,5–21,9)
Czechoslovakia	Piestany	1962	800	35+ 55+	Men Women Men Women	Kellgren and Lawrence	17,0 (11,5–22,5) 10,0 (5,8–14,2)	17,0 (13,2–20,8) 23,0 (19,0–27,0)
Germany	Oberhörlen	1960	120	55+	Men Women	Kellgren and Lawrence		16,0 (5,8–26,2) 10,0 (2,9–17,1)
Switzerland	Azmoos	1970	220	55+	Men Women	Kellgren and Lawrence	17,0 (9,4–24,6) 7,0 (2,6–11,4)	
Iceland	Population	1998	1520	35+	Men Women	Kellgren and Lawrence	12 10	

Trends

There is no evidence as to whether the age and sex specific incidence of OA has changed over recent decades. However the population burden of OA will increase over the next years for two reasons. The first reason is the ageing of the population. All studies have shown that the prevalence of OA at all sites continues to rise into extreme old age. Therefore, as the population ages, so will the proportion of people experiencing pain and physical disability as a consequence of OA. Secondly, the principal non-genetic risk factor for OA (in particular OA knee) is obesity and the prevalence of obesity in Europe is rising.

Rheumatoid arthritis

Rheumatoid arthritis (RA) is the most common form of inflammatory arthritis in Europe. Prevalence studies from 16 countries and incidence studies from 5 countries were identified in the European Indicators for Monitoring Musculoskeletal Problems and Conditions Project (S12.297217) (table 5). The majority (15 out of a total of 21 studies) used the 1987 ACR criteria for the classification of RA (41). Estimates of the annual incidence of RA range from 4–13 per 100,000 for adult males and 13-36 per 100,000 for adult females. Estimates of the

prevalence of RA range from 1-6 per 1000 for men and 3-12 per 1000 for women. In all studies the prevalence was higher in women than men (the ratio varied from 1.7 to 4.0). There is a variation for both men and women between countries and there may be a gradient in the prevalence of RA going from south (lowest) to north (highest) of Europe. For example the prevalence of RA in men in Finland is reported as 0.6%, in France it is 0.32% and in Italy 0.13%. In women the prevalence in the same three countries is 1%, 0.86% and 0.51%. However, these figures are not directly comparable because they are not age standardised but nevertheless.

Table 5 Prevalence and incidence of rheumatoid arthritis from individual studies across Europe (1)

Country North to South	Years	Sample Size (to nearest 10)	Sample Type	Age Group	Gender	Classification Criteria used	Prevalence %	Incidence /100,000	Age bands (yrs)
Iceland	1974-83	13.860	Random	39-67	Both	1958	0.238		0
Finland	1989	13.000	Insurance Register	≥16	Men	1987	0.6		7
					Women		1		
Finland	1974-5	1million	Population, Insurance Register	≥16	Both	1987		42	0
	1980-5							39	
	1990							<39	
Norway	1988-93	356.480	County Register	20-79	Men	1987		13.75	6
					Women			36.73	
Norway	1994	10.000	Population	20-79	Men	1987	0.19		6
					Women		0.67		
Sweden	1965-67	15.270	Population	31-74	Both	1987	0.27		0
Russia	1998	380	Population	≥20	Both	1987	1.42		6
Denmark	?	19.100	?	≥15	Men	?	0.3		
					Women		1.2		
UK	2000	6.590	GP Register	≥16	Men	1987	0.44		4
					Women		1.16		
UK	1991	2.800	Population	≥15	Men	1987		12.7	8
					Women			34.3	
Czech Republic	1965	1.420	Population	≥15	Men	1958	0.3		6
					Women		0.5		
Germany	1990	11.530	Population	≥20	Both	1987	0.83		0
France	1996	1.670	Population	≥18	Men	1987	0.32		0
					Women		0.86		
France	1986-9	529.510	Population	20-70	Men	1987		4.7	10
					Women			12.7	
Slovakia	1970's	951		≥35	Both	1958	1.3		
Italy	1991-2	4.460	Population	≥16	Men	1987	0.13		0
					Women		0.51		
Yugo-slavia	1990-1	2.180	Cross-sectional	≥20	Men	1987	0.09		7
					Women		0.29		
Bulgaria	1965	4.320	1/10 Random Sample of population	≥15	Men	ROME	0.3		6
					Women		1.2		
Spain	2000	2.190	Poly-stage random sampling	≥20	Both	1987	0.5		7
Greece	1987-95	128.920	Population	≥16	Men	1987	0.21	15-36	7
					Women		0.48		

There is evidence from a number of sources that the incidence of RA in women fell between the 1960s and 1980s and has since stabilised. This fall is now reflected in recent prevalence figures for RA from the UK which show that, since the 1960s, there had been an approximate

25% fall in RA prevalence in women aged 16-74. The prevalence in women aged 75 and over rose slightly and that in men aged 45 and over rose by around 25% (42).

Osteoporosis and fragility fracture

Osteoporosis is defined as a systemic skeletal disease characterized by a low bone mass and a microarchitectural deterioration of bone tissue, with a consequent increase in bone fragility and susceptibility to fracture. In 1994 a WHO expert panel (43) operationalized this concept by defining diagnostic criteria for osteoporosis on the basis of measurement of bone mineral density (BMD).

Osteoporosis:	a BMD value at least 2.5 standard deviations below the mean BMD of young adult women (BMD T score ≤ –2.5)
Osteopenia: (low bone mass)	a BMD value between 1 and 2.5 standard deviations below the mean BMD of young adult women (–2.5 □BMD T score <–1)

Clinically, osteoporosis is recognized by the occurrence of characteristic low-trauma fractures, the best documented of these being hip, vertebral and distal forearm fractures.

Bone density decreases with age and the prevalence of osteoporosis therefore increases with age in all populations but it varies between populations across Europe. A study measuring bone density in 16 populations across Europe demonstrated substantial variations between these populations in mean bone density (Figure 4), and also in the variance of bone density and rates of change with age in populations (44). These variations were not explained by differences in body size and may have considerable implications for explaining variations in fracture rate already documented across Europe.

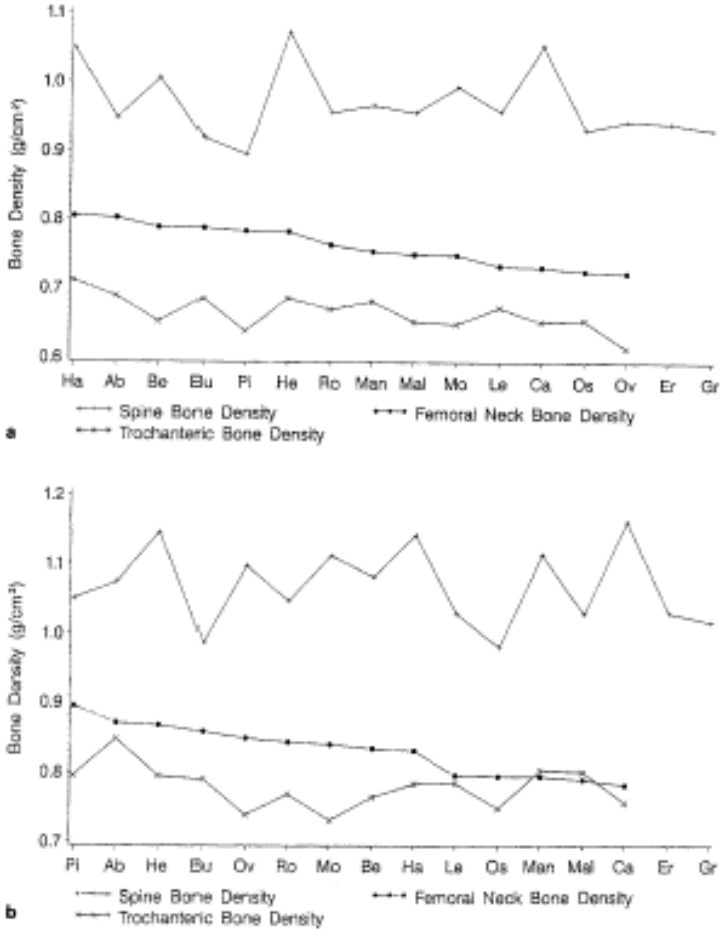


Figure 4 Mean bone density at the spine, femoral neck and trochanter in each centre, after adjusting to age 65 years, height 1.65 m and weight 70 kg in women (a) and men (b). Centres are listed in order of decreasing femoral neck bone density. Ab, Aberdeen (UK); Be, Berlin (Germany); Bu, Budapest (Hungary); Ca, Cambridge (UK); Er, Erfurt (Germany); Gr, Graz (Austria); Ha, Harrow (UK); He, Heidelberg (Germany); Le, Leuven (Belgium); Mal, Malta6 (Sweden); Man, Manchester (UK); Mo, Moscow (Russia); Os, Oslo (Norway); Ov, Oviedo (Spain); Pi, Piestany (Slovakia); Ro, Rotterdam (Netherlands). (44)

The epidemiology of fractures related to osteoporosis has been considered in the Report on Osteoporosis in the European Community in 1998 (45). In this report the incidence of hip fracture and prevalence of vertebral fracture in European Union member states was compiled from published data or information obtained by personal communication. The data have been obtained from two types of source; survey data (direct assessment of fracture rates in defined populations) and official health services administrative data. In some countries, however, no information on incidence / prevalence rates was available and, in these cases, information from other countries was substituted. This data is presented in the following tables (tables 6, 7).

Trends

The number of osteoporotic fractures is predicted to increase across Europe (45). The aging of the population is the most important factor with the most dramatic changes being seen in the oldest age group (80 years and above), in whom the incidence of osteoporotic fracture is greatest.

Using baseline incidence/prevalence data for hip and vertebral fractures and population projections for five-year periods, the expected number of hip and vertebral fractures has been estimated over the period 1990 to 2050. The number of hip fractures occurring each year is estimated to rise from 414,000 by the turn of the century to 972,000 fifty years later, representing an increase of 135%. This increase will be greatest in men and will result in a decreasing female to male ratio. From the year 2035, however, this trend will change; because of the continuous ageing of the European populations and the steeper risk-over-age slope for women, the female dominance in incidence will re-emerge. The prevalence of vertebral fractures is not expected to increase to the same magnitude as for hip fractures; thus the estimated increase is from 23.7 million in the year 2000 to 37.3 million in 2050, representing a rise of 57%. The female to male ratio is expected to decrease during the first 20 years of the next century, after which it will increase. This is again an effect of the ageing of the population and a steeper slope of risk increase in women.

Table 6 Age-specific incidence figures for hip fracture in the EU member states (/10.000population) (45)

Country	Age-group							
Women	**50-54**	**55-59**	**60-64**	**65-69**	**70-74**	**75-79**	**80-84**	**85+**
Austria	3.360	7.11	14.10	26.50	47.7	82.4	138.0	351
Belgium	2.720	5.86	11.80	22.60	41.1	72.0	122.0	317
Denmark	4.100	8.62	17.00	31.90	57.2	98.4	164.0	416
Finland	2.720	5.93	12.10	23.40	43.1	76.2	130.0	346
France	0.598	1.66	4.21	9.94	22.1	46.5	93.4	262
Germany	3.360	7.11	14.10	26.50	47.7	82.4	138.0	351
Greece	2.530	5.40	10.80	20.40	36.9	64.2	108.0	232
Ireland	1.820	4.27	9.32	19.10	37.3	69.5	125.0	362
Italy	1.600	3.49	7.16	13.90	25.6	45.4	77.6	172
Luxembourg	2.720	5.86	11.80	22.60	41.1	72.0	122.0	317
Netherlands	2.720	5.86	11.80	22.60	41.1	72.0	122.0	317
Portugal	2.630	5.18	9.64	17.10	29.0	47.7	75.8.0	151
Spain	0.613	1.72	4.42	10.50	23.7	50.3	102.0	290
Sweden	4.730	9.81	19.20	35.50	63.0	107.0	177.0	443
UK	1.820	4.27	9.32	19.10	37.3	69.5	125.0	362

Men	**50-54**	**55-59**	**60-64**	**65-69**	**70-74**	**75-79**	**80-84**	**85+**
Austria	3.220	5.69	9.57	15.50	24.2	36.6	54.0	110.0
Belgium	1.910	3.89	7.47	13.60	23.8	40.1	65.4	160.0
Denmark	2.820	5.59	10.50	18.70	32.0	52.8	84.5	199.0
Finland	2.950	5.71	10.40	18.20	30.5	49.4	77.5	177.0
France	0.477	1.19	2.73	5.90	12.0	23.5	43.8	110.0
Germany	3.220	5.69	9.57	15.50	24.2	36.6	54.0	110.0
Greece	1.400	2.96	5.88	11.10	20.0	34.6	58.0	124.0
Ireland	1.340	2.85	5.70	10.80	19.6	34.0	57.1	147.0
Italy	1.120	2.22	4.15	7.40	12.7	20.9	33.4	67.0
Luxembourg	1.910	3.89	7.47	13.60	23.8	40.1	65.4	160.0
Netherlands	1.910	3.89	7.47	13.60	23.8	40.1	65.4	160.0
Portugal	2.690	4.58	7.46	11.70	17.7	26.2	37.7	64.6
Spain	0.545	1.35	3.12	6.73	13.8	26.8	50.0	126.0
Sweden	4.510	8.76	16.10	28.20	47.4	77.1	122.0	280.0
UK	1.340	2.85	5.70	10.80	19.6	34.0	57.1	147.0

Table 7 Age-specific prevalence figures for vertebral fractures in the EU member states (/10.000 population). (45)

Country Women	Age Group 50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+
Austria	858	1 150	1 510	1 930	2 430	3 020	3 690	5 330
Belgium	1 200	1 620	2 120	2 710	3 420	4 230	5 180	7 480
Denmark	1 220	1 630	2 140	2 740	3 450	4 280	5 230	7 560
Finland	1 220	1 630	2 140	2 740	3 450	4 280	5 230	7 560
France	838	1 120	1 470	1 890	2 380	2 950	3 600	5 210
Germany	730	980	1 280	1 640	2 070	2 570	3 140	4 540
Greece	1 010	1 360	1 780	2 280	2 870	3 550	4 350	6 280
Ireland	699	938	1 230	1 570	1 980	2 460	3 000	4 340
Italy	743	996	1 300	1 670	2 110	2 610	3 190	4 610
Luxembourg	1 200	1 620	2 120	2 710	3 420	4 230	5 180	7 480
Netherlands	896	1 200	1 570	2 020	2 540	3 150	3 850	5 570
Portugal	846	1 130	1 490	1 900	2 400	2 970	3 630	5 250
Spain	846	1 130	1 490	1 900	2 400	2 970	3 630	5 250
Sweden	1 220	1 630	2 140	2 740	3 450	4 280	5 230	7 560
UK	699	938	1 230	1 570	1 980	2 460	3 000	4 340

Men	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+
Austria	1 580	1 760	1 940	2 120	2 310	2 500	2 690	3 080
Belgium	1 600	1 790	1 970	2 160	2 350	2 540	2 740	3 140
Denmark	1 760	1 960	2 160	2 370	2 580	2 790	3 000	3 440
Finland	1 760	1 960	2 160	2 370	2 580	2 790	3 000	3 440
France	1 450	1 620	1 790	1 960	2 130	2 310	2 480	2 840
Germany	1 130	1 260	1 390	1 520	1 650	1 790	1 920	2 200
Greece	1 340	1 490	1 650	1 810	1 960	2 130	2 290	2 620
Ireland	1 350	1 500	1 660	1 810	1 980	2 140	2 300	2 630
Italy	973	1 080	1 200	1 310	1 420	1 540	1 660	1 900
Luxembourg	1 600	1 790	1 970	2 160	2 350	2 540	2 740	3 140
Netherlands	1 330	1 480	1 630	1 790	1 950	2 110	2 270	2 600
Portugal	2 060	2 300	2 540	2 780	3 020	3 270	3 520	4 030
Spain	1 370	1 520	1 680	1 840	2 000	2 160	2 330	2 670
Sweden	1 760	1 960	2 160	2 370	2 580	2 790	3 000	3 440
UK	1 350	1 500	1 660	1 810	1 980	2 140	2 300	2 630

Back pain

Back pain is very common but the prevalence varies according to the definitions used and the population studied. There have been inconsistencies between studies in definitions used for duration when considering acute or chronic back pain making comparisons difficult. Epidemiological data for spinal disorders in general is often reported as low back pain regardless of the diagnosis or cause which makes it difficult to make accurate assessments of the incidence of specific or non-specific back pain. The prevalence of specific causes is estimated in most industrialised countries as ranging between 2% and 8%, the rest being labelled as non- specific back pain. This figure however depends on what conditions are considered as specific since most people as they age will develop degenerative changes but it may not be the cause of their back pain. The population based data may be subject to social, economic, genetic and environmental variables in addition to issues of study technique and back pain definition.

There are not many studies of incidence but a large study from the Netherlands reported an incidence of 28.0 episodes / 1000 persons per year and low back pain with sciatica was 11.6 / 1000 persons per year, affecting men a little more than women and is most frequent in the working population being highest between 25 and 64 years (46). New episodes are twice as common if there is a history of previous low back pain.

The prevalence of non-specific back pain has been obtained from studies performed in the USA and Europe and been reviewed by Andersson 1997 (table 8) (47) and others (48;49). It is estimated that 12-30% of adults have low back pain at any time and the lifetime prevalence in industrialised countries varies between 60% and 85%.

Table 8 Prevalence and lifetime incidence of low-back pain in cross-sectional studies

Study	**Lifetime incidence**	**Prevalence %**		Study group		
		Point	Period	Number	Age (years)	Sex (M/F)
Biering-Sorensen	62·6	12·0	–	449	30–60	M
Biering-Sorensen	61·4	15·2	–	479	30–60	F
Frymoyer et al	69·9	–	–	1221	28–55	M
Gyntelberg	–	–	25	–	40–59	M
Hirsch et al	48·8	–	–	692	15–72	F
Hult	60·0	–	–	1193	25–59	M
Magora	–	12·9	–	3316	–	M, F
Nagi et al	–	18·0	–	1135	18–64	M, F
Papageorgiou et al	59·0	–	35	1884	>18	M
Papageorgiou et al	59·0	–	42	2617	>18	F
Svensson et al	61	–	31	716	40–47	M
Svensson et al	67	–	35	1640	38–64	F
Valkenburg et al	51·4	22·2	–	3091	>20	M
Valkenburg et al	57·8	30·2	–	3493	>20	F
Walsh et al	58·3	–	36	2667	20–59	M,F

Data from Andersson(50)

Trends

There has been a reported increase in prevalence in the UK between 1980 and 2000 (51) but this is interpreted as related to a greater awareness of minor back symptoms and willingness to report them. There are various determinants (see above) that influence the occurrence of back pain and its impact. Changes in these determinants, such as obesity,

psychosocial factors and work-related factors will affect the incidence and prevalence of back pain and its impact.

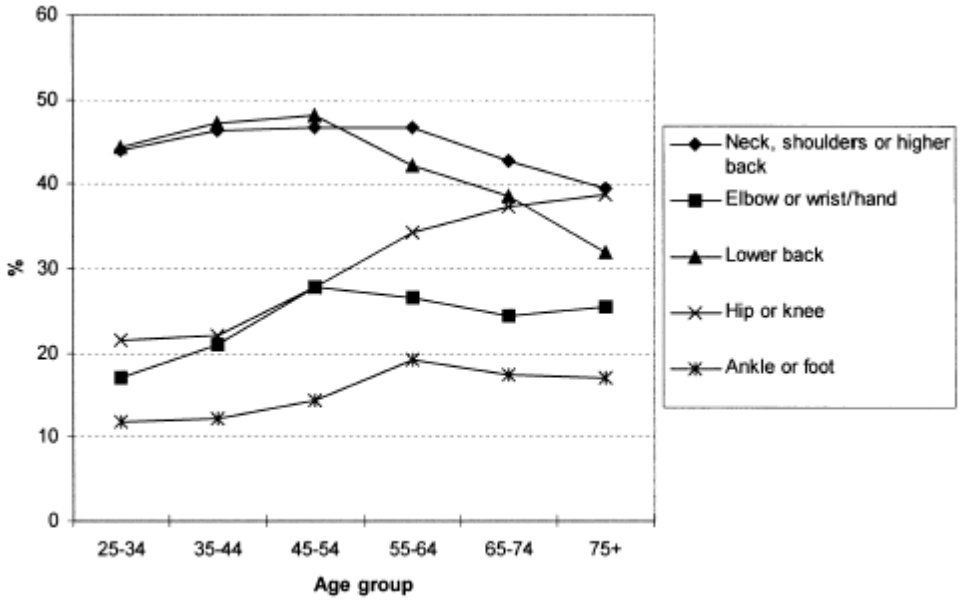
Regional pain
Regional pain is common. Various health interview surveys have investigated their prevalence, and an example from the Netherlands is given (table 9, figure 5 (52)). It is often related to activity or occupation.

Musculoskeletal problems are the most widespread occupational-related illness in the EU (http://www.eurofound.europa.eu/ewco/studies/tn0611018s/index.htm). These are being considered by the European Foundation for the Improvement of Living and Working Conditions and further information is in a detailed report (http://www.eurofound.europa.eu/docs/ewco/tn0611018s/tn0611018s.pdf). They will not be considered further here.

Table 9 Prevalence of musculoskeletal pain, by anatomical area and site (% and 95% confidence limits), in a random sample of 3664 from the Dutch population aged 25 years (DMC3-study) (52)

Pain location	**Period prevalence (during last 12 months)**	**Point prevalence**	**Prevalence of chronic pain (> 3 months)**
Neck	31.4 (±1.5)	20.6 (±1.3)	14.3 (±1.1)
Shoulders	30.3 (±1.5)	20.9 (±1.3)	15.1 (±1.2)
Higher back	18.8 (±1.3)	9.1 (±0.9)	6.2 (±0.8)
Elbow	11.2 (±1.0)	7.5 (±0.9)	5.3 (±0.7)
Wrist/hand	17.5 (±1.2)	12.5 (±1.1)	9.3 (±0.9)
Lower back	43.9 (±1.6)	26.9 (±1.4)	21.2 (±1.3)
Hip	12.8 (±1.1)	9.1 (±0.9)	7.4 (±0.8)
Knee	21.9 (±1.3)	15.2 (±1.2)	11.7 (±1.0)
Ankle	9.2 (±0.9)	4.9 (±0.7)	3.5 (±0.6)
Foot	9.4 (±0.9)	6.5 (±0.8)	5.0 (±0.7)
No pain	25.5 (±1.4)	46.1 (±1.6)	55.6 (±1.6)
One site	24.5 (±1.4)	24.1 (±1.4)	21.6 (±1.3)
2–3 sites	29.4 (±1.5)	20.3 (±1.3)	15.6 (±1.2)
4 or more	20.6 (±1.3)	9.5 (±0.9)	7.2 (±0.8)
Upper- and lower-extremities, and back or neck, left and right	13.7 (±1.1)	7.7 (±0.9)	5.3 (±0.7)
Upper- and lower-extremities, and back, left and right	10.1 (±1.0)	5.3 (±0.7)	3.8 (±0.6)
Upper- and lower-extremities, and back or neck	16.1 (±1.2)	8.8 (±0.9)	5.8 (±0.8)
Upper- and lower-extremities, and back	11.8 (±1.0)	6.0 (±0.8)	4.2 (±0.6)

Figure 5 The prevalence of musculoskeletal pain in different anatomical areas by age group (52)



4 Morbidity

A Hospital discharge data

Hospital in-patient discharge data is an ECHI indicator. Hospital discharge and average length of stay data is collected by OECD by recently extended diagnostic categories harmonised with Eurostat and WHO Europe. Relevant categories include OA hip (ICD 10 M16); OA knee (M17); other arthropathies (M00-M15, M18-M22, M24-M25) (includes RA); deforming dorsopathies and spondylopathies (M40-M49); intervertebral disc disorders (M50, M51); dorsalgia (M54); soft tissue disorders (M60-M79); other disorders of the musculoskeletal system and connective tissue (M53, M80-M99)(includes osteoporosis); fracture of forearm (S52) and fracture of femur (S72). These categories include the key musculoskeletal conditions.

Specific surgical procedures on the OECD database of relevance are hip replacement (ICD-9-CM 81.51-81.53) and knee replacement (8 ICD-9-CM 1.54-81.55) and data is available on number of in-patient cases and number of procedures per 100,000. There is a European joint replacement register (EAR) and registers of joint replacement surgery in several member states. These can be accessed via the European Federation of National Associations of Orthopaedic and Traumatology (EFORT) website (http://www.efort.org/E/05/01-50.asp). Hip replacement is usually a consequence of osteoarthritis or osteoporotic fracture. Knee replacement is usually a consequence of osteoarthritis.

However hospital discharge data is of limited relevance to most musculoskeletal problems and conditions as they are managed predominantly in primary care or as ambulatory patients. In-patient care is used variably across Europe for the management of active or complicated rheumatoid arthritis. In-patient care may also relate to arthroplasty, most commonly of hip or knee for osteoarthritis, or may relate to fragility fractures, typically of the hip as a consequence of osteoporosis and a fall. Hospital discharge data does not therefore

reflect the health resources needed or utilised related to musculoskeletal conditions. Indicators of outpatient, day case and GP care need to be used.

B Clinical management

Guidelines for the management of various musculoskeletal conditions were identified as part of the European Bone and Joint Health Strategies Project (SI2.304 598) and are tabulated in the report, European Action for Better Musculoskeletal Health (2). A survey was done, as part of that project, about implementation of guidelines which found little awareness by the authors of the guidelines as to whether their guidelines were being implemented or whether they were making a difference in clinical outcomes. A further survey has recently been performed by us to establish whether there are national guidelines for the major musculoskeletal conditions in all member states. It has also been asked who developed them, if they are implemented, whether they have influenced clinical practice and if they have altered clinical outcomes.

There are pan-European guidelines for the prevention and treatment of the full spectrum of musculoskeletal conditions developed by the European Bone and Joint Health Strategies Project (SI2.304 598) (2) (http://ec.europa.eu/health/ph_projects/2000/promotion/fp_promotion_2000_frep_15_en.pdf) There are also guidelines and recommendations for specific conditions that have been developed through EU funded projects (back pain http://www.backpaineurope.org / osteoporosis http://www.iofbonehealth.org/download/osteofound/filemanager/publications/pdf/eu-report-1998.pdf?bcsi_scan_6C001989F788A29F=epA/MX/2N9k+NIPq/bI/MUQAAABsbTQc&bcsi_scan_filename=eu-report-1998.pdf) and at a European (EULAR http://www.eular.org/ click on “recommendations”; IOF http://www.iofbonehealth.org/health-professionals/national-regional-guidelines.html) and national level by professional organisations. There is little knowledge as to whether any of these guidelines have been implemented, whether they have influenced clinical practice and whether they have altered clinical outcomes. There is clearly a need for more focused implementation with audit.

C Treatment

Treatment can be measured by health services usage including investigation, drug usage, provision of human resources and expenditure. These are included in the ECHI Shortlist (table 10). There is little readily available data on any of these that reflect the management of musculoskeletal conditions.

Table 10 Relevant ECHI Shortlist Indicators for Health interventions: health services from the ECHI Shortlist (specific recommendations for musculoskeletal conditions in brackets)

Regularly available, reasonably comparable	Partly available, sizeable comparability problems
▪ Hospital beds (orthopaedics, rheumatology, rehabilitation) ▪ Physicians employed (orthopaedics, rheumatology, rehabilitation (of musculoskeletal conditions)) ▪ Nurses employed (nurses in rheumatology and orthopaedics, physiotherapists, ergotherapists) ▪ Technologies (musculoskeletal ultrasound, MRI, CT, DXA) ▪ Hospital in-patient discharges ▪ Hospital day cases (for musculoskeletal conditions) ▪ Average length of stay (hip fracture) ▪ GP utilisation (for musculoskeletal conditions) Surgeries (hip and knee replacement, fragility fracture)	▪ Other outpatient visits (rheumatology, orthopaedics, physiotherapy, ergotherapy) ▪ Medicine use (anti-inflammatory and antirheumatic products (ATC M01), drugs for treatment of bone diseases (ATC M 05B), immunosuppressive agents (ATC L 04 A)) ▪ Waiting times elective surgeries (arthroplasty hip and knee)

Health services usage
In patient episodes do not reflect health care utilisation as most problems are managed with ambulatory care or in general practice (see above).

Most conditions are predominantly managed in the community with support from secondary care although potentially progressive conditions, such as RA, are usually managed with care shared between primary and secondary care (8).

Musculoskeletal conditions were the commonest non-infectious reason for GP consultations with 15% of the population consulting for a musculoskeletal problem in the UK in a primary care national survey in 1991 (53). They were the third most common of all reasons for GP consultation in 2003 using a GP weekly returns database and from this it has been estimated that the consultation costs are £1340 million of a total cost of £10 billion (54). Consultation rates increase with age, was higher in women than men and arthritis and back pain were the commonest reasons. In those with osteoarthritis over 45 years, each patient consulted on average twice a year. The resource implications are considerable but primary care consultation data related to reason is not routinely collected.

Secondary care for musculoskeletal conditions is largely outpatient based provided by departments of rheumatology, orthopaedics and rehabilitation. Many patients need rehabilitative interventions such as physiotherapy or ergotherapy. Many people with musculoskeletal conditions use alternative / complementary medicine (55). There are some specific studies of healthcare utilisation related to certain musculoskeletal conditions, such as rheumatoid arthritis, but there is no routinely collected data on the utilisation of these healthcare services across member states.

Pharmacological Treatments
About one-quarter of all Europeans are under long-term treatment, the major reason for which is rheumatism/arthritis (20.4%)(38). This varies across Europe from 8.6% in Finland to

27.3% in the UK. This compares to 15.5% in the EU15 for hypertension and 5.3% for depression.

The commonest treatments are for symptom control with simple analgesics (paracetamol), compound analgesics (paracetamol with codeine) and non-steroidal anti-inflammatory analgesics (eg ibuprofen, naproxen, diclofenac) (WHO Collaborating Centre for Drug Statistics Anatomical Therapeutic Chemical Classification ATC M01).

There are disease specific drugs to control rheumatoid arthritis and prevent joint damage and disability. Methotrexate is the most commonly used drug but biological therapies such anti TNF alpha are increasingly used to control the disease (WHO Collaborating Centre for Drug Statistics Anatomical Therapeutic Chemical Classification ATC L 04 A).

Bisphosphonates, strontium ranelate, raloxifene and PTH are used to increase bone density and reduce fracture risk in osteoporosis (WHO Collaborating Centre for Drug Statistics Anatomical Therapeutic Chemical Classification ATC M 05B).

There is no routine collection of data on these but some information can be found through drug intelligence agencies and other commercial sources.

Investigations
Investigations include radiology and pathology but a specific investigation for osteoporosis for which there is variable access across Europe is bone density assessment to detect osteoporosis, typically by dual energy xray absorptiometry (DXA). This is used to case find but data is not collected as part of the OECD database on screening procedures. Plain radiography, ultrasound, CT and MRI are often used to investigate musculoskeletal conditions. Data on availability, access, usage and reason is not routinely collected.

Human resources
Human resources that are most relevant and could be measured are numbers of rheumatologists and orthopaedic surgeons. In addition other health care workers may spend all or a lot of their time managing musculoskeletal conditions such as rehabilitationists, physiotherapists and ergotherapists. It is recommended that care of musculoskeletal conditions should be delivered by multiprofessional and multidisciplinary teams (55), core members of which are rheumatologists, orthopaedic surgeons, specialist nurses, specialist physiotherapists, specialist occupational (ergo)therapists, psychologists, social workers, orthotists, podiatrists, pharmacists, dietitians and patient educator and the numbers of these other team members could also be documented. Professional organisations have some of this data.

Physical resources
Physical resources that are relevant and could be measured are the number of beds for musculoskeletal conditions, separated into those for medical management, rehabilitation and surgery. Waiting times for surgery will measure whether resources meet needs.

Facilities for investigation can be measured by the availability of bone densitometry, CT and MRI. Waiting times for these investigations will measure whether resources meet needs.

D Survival

Musculoskeletal conditions are rarely fatal. Prevention of fragility fracture will reduce mortality. Rheumatoid arthritis is associated with reduced life expectancy and more effective disease suppression may improve this outcome.

E Disability and social consequences

Musculoskeletal conditions are the major cause of physical disability across Europe (56). They impact on individual by limitation of activities and restriction of participation. They impact on society socioeconomically by need for social support, work loss, disability pensions and early retirement. Questions about physical function are included in many health interview surveys, although they are not often related to condition, and there are some relevant indicators in the ECHI Shortlist (table 11). Work loss and other socio-economic costs to society can more often be related to diagnosis.

Table 11 Relevant ECHI Shortlist Indicators for Health status

Regularly available, reasonably comparable	**Partly available, sizeable comparability problems**
▪ Limitations of usual activities	▪ Limitations in physical function
Also	Also
▪ Perceived general health	▪ General musculoskeletal pain
▪ Prevalence of chronic illness	▪ Injuries: home, leisure, domestic
	▪ Related health expectancies

Activity limitation and restricted participation are the main consequences of musculoskeletal conditions. This can be measured with generic instruments e.g. SF-36, NHP and SIP. For the specific musculoskeletal conditions a series of instruments have been developed such as HAQ, WOMAC, and EFFO-QOL.

Musculoskeletal problems often restrict self care, home care, and work and leisure activities and cause loss of independence. The major reason is because of restricted mobility and dexterity. Both of these domains are not always included in health interview surveys. The Guideline for collection of data on 18 HIS items (round 2004) considers walking and lifting but not hand function.

In most welfare states, musculoskeletal conditions cause more functional limitations in the adult population than any other group of disorders. In the Ontario Health Survey (57), musculoskeletal conditions accounted for 40% of all chronic conditions, 54% of all long-term disability, and 24% of all restricted activity days. The prevalence is higher in women, and increases strongly with age. Musculoskeletal conditions are the main cause of disability in older age groups.

In a Canadian study, the prevalence of disability due to arthritis/rheumatism was 2.7%, back disorders 1.6%, trauma 0.4%, bone disorders 0.1%, and disability due to ”other musculoskeletal conditions” was 0.5% (58). Chronic widespread pain causes disability in a considerable number of individuals, but the precise magnitude remains to be identified. Disability is more severe in patients with chronic widespread pain conditions than with other localised musculoskeletal conditions (59).

Work disability is also a major consequence of musculoskeletal conditions for the individual. Social support is often needed, either by a carer or by social services, which has major economic consequences.

Despite these impacts and their costs, the availability and comparability of data across the community is limited because of different systems of workers compensation and social support as well as differences in diagnostic groups used.

Musculoskeletal conditions have a major influence on the rates of sickness absence everywhere, as shown from Scandinavia (60), the UK and The Netherlands (7). In Germany 6.7 million persons with sick leave caused by musculoskeletal conditions were reported in 2000, accounting for 18% of all sick leave cases. In regard to sick leave days 130 million were caused by musculoskeletal conditions, representing 28% of all. Injuries accounted for additional 64 million or 12,9% of all sick leave days (7).

In short term sickness absence (less than 1-2 weeks), musculoskeletal health problems are second only to respiratory disorders (61). In long-term absence, which is more important than short-term absence for the individual in terms of consequences, and for society in terms of costs, musculoskeletal conditions are the most common medical causes. Musculoskeletal injuries and disorders cause more than half of all sickness absence longer than two weeks, e.g. in Norway (62) (table 13) and Germany (7).

As for temporary benefits, musculoskeletal conditions are also common reasons for disability pensions. In Norway, among persons with disability pensions for musculoskeletal conditions in 1997, 44% were awarded for low back pain, 18% for muscle pain /fibromyalgia, 12% for OA and 9% for RA (63). These figures are similar with those of the Netherlands.

5 Mortality

Although musculoskeletal problems and conditions often result in a great and chronic problem during life, they may also affect life expectancy. Life expectancy may be reduced in people with a number of the specific musculoskeletal conditions. For example, it has been estimated that between 3 and 7 years are taken off the life of a person with RA (http://www.who.int/healthinfo/statistics/bod_rheumatoidarthritis.pdf) (64) and osteoporotic fractures, in particular hip fracture, is associated with significant mortality in the first year with age-standardised mortality ratios of 2.18 in women and 3.17 for men following hip fracture (65;66). Hence mortality, often as a consequence of co-morbidity, should not be forgotten even when monitoring consequences of musculoskeletal conditions.

The ONS short list of cause of death codes, using ICD-10 does include rheumatoid arthritis (M05-M06) and osteoporosis with (M80) or without (M81) fracture.

6 Conclusion

Musculoskeletal conditions and problems have a great burden across Europe on individuals and societies. This burden is increasing with the aging of the population and with changes in lifestyle risk factors such as obesity and reduced physical activity. There are effective interventions for prevention and management.

However, there is a lack of data reflecting their burden in member states. There are not routinely collected data that measures their occurrence and impact across Europe to enable this burden to be monitored. Recommendations have been made for monitoring musculoskeletal conditions in the European Community (7)(European Indicators for Monitoring Musculoskeletal Problems and Conditions Project (S12.297217)). These have been further considered by the Bone and Joint Monitor Project Group, an activity of the Bone and Joint Decade.

Recommendations are:

Domain	Indicator
Case definitions	Agreed case definitions need to be used according to study settings. Some case definitions can be used in HIS but others require an examination and sometimes an investigation. Lack of consistency in case definition prevents the comparison of much existing data
Incidence / prevalence of major musculoskeletal problems and conditions	Occurrence of self reported musculoskeletal pain (ECHI comprehensive indicator list 2.4.2 UW-0, UW-6): an indicator of musculoskeletal pain needs to identify only those with musculoskeletal pain that has a consequence on their activities of daily living. It is recommended to use self report in health interview survey of pain and limited function from different regions, using a standard question. This will capture all musculoskeletal problems and conditions that have a consequence on function irrespective of specific cause. Occurrence of rheumatoid arthritis (ECHI comprehensive indicator list 2.3.11 UW-6): incidence and prevalence of RA in existing and future regional registers Occurrence of hip osteoarthritis (ECHI comprehensive indicator list 2.3.11 UW-6, UW-18): prevalence of OA in research projects based on health examination surveys, including x-ray Occurrence of knee osteoarthritis (ECHI comprehensive indicator list 2.3.11 UW-6, UW-18): prevalence of OA in research projects based on health examination surveys, including x-ray Occurrence of osteoporosis (ECHI comprehensive indicator list 3.1.1 UW-6, UW-18): prevalence of low bone density monitored in health examination studies Occurrence of hip fracture (ECHI comprehensive indicator list 2.3.17 UW-6, UW-18): incidence of hip fractures from hospital statistics Occurrence of musculoskeletal problems related to injuries (ECHI Comprehensive Indicator List 2.3.17) and working environment (ECHI Comprehensive Indicator List 2.3.18) will only be identifiable if cause can be linked to the occurrence of musculoskeletal pain
Determinants	Monitor falls in older people
Hospital inpatient utilisation	Hip and knee arthroplasty: incidence and indicators for hip and knee replacement from hospital statistics Osteoporotic fracture: admissions subsequent to fracture of femur (S72) from hospital statistics
Clinical management	A depository of current clinical guidelines for the various musculoskeletal conditions that meet AGREE critieria Information on the implementation and impact of clinical guidelines (standardised audits)
Treatment	
Health services usage	Outpatient / ambulatory visits related to diagnostic code and to specialist Day cases related to diagnostic code Primary care visits related to diagnostic code Physiotherapy and occupational (ergo)therapy related to diagnostic code
Pharmacological treatments	Drugs for treatment and prevention of osteoporosis: defined daily doses of drugs (ATC M 05B – drugs for treatment of bone diseases) and actual prescription from

Domain	Indicator
	wholesale statistics and prescription registers
	Drugs for treatment of rheumatoid arthritis: defined daily doses of drugs (ATC L 04 A– immunosuppressive agents) and actual prescription from wholesale statistics and prescription registers
	Drugs for pain control (simple analgesics (paracetamol), compound analgesics (paracetamol with codeine) and non-steroidal anti-inflammatory analgesics (eg ibuprofen, naproxen, diclofenac) (WHO Collaborating Centre for Drug Statistics Anatomical Therapeutic Chemical Classification ATC M01)): defined daily doses and actual prescription from wholesale statistics and prescription registers
Investigations	Bone density assessment, typically by dual energy x-ray absorptiometry (DXA), availability and usage to detect osteoporosis,
	Musculoskeletal ultrasound, CT and MRI availability and usage to investigate musculoskeletal conditions
Human resources	Numbers of relevant health professionals: rheumatologists, orthopaedic surgeons, physiotherapists and occupational (ergo)therapists
Physical resources	Number of hospital beds for musculoskeletal conditions, separated into those for medical management, rehabilitation and surgery
	Waiting times for arthroplasty
Disability and social consequence	Reduced function: prevalence of persons with reduced function, according to diagnostic code, measured in health interview surveys as recommended by other in the health monitoring project
	Work disability: permanent or temporary work disability, according to diagnostic code, from social security statistics
General recommendation	As many of the indicators above as possible should be simultaneously collected from each target population to be able to look for linkage. Data collected on treatment and outcome should be related where possible to the reason. This may be more feasible and valid in registers than surveys. It would provide condition/problem-related data that would enable specific strategies to be developed.

Some of these recommendations are already agreed but data is not yet consistently collected across Europe for them.

There is also a need to develop and implement quality standards to ensure high standards and equity of care across Europe.

Reference list

1 Indicators for Monitoring Musculoskeletal Problems and Conditions. Musculoskeletal Problems and functional Limitation. Available at URL: http://ec.europa.eu/health/ph_projects/2000/monitoring/fp_monitoring_2000_frep_01_en.pdf, University of Oslo, 2003.

2 European Action Towards Better Musculoskeletal Health, ISBN 91-975284-0-4. Available at URL: http://europa.eu.int/comm/health/ph_projects/2000/promotion/fp_promotion_2000_exs_15_en.pdf. Bone & Joint Decade, Lund, Sweden, 2004.

3 The UK General Household Survey; National Insurance Administration. 1998.

4 Gaining Health. The European Strategy for Prevention and Control of Noncommunicable Diseases. Report of the 56th Session of the WHO Europe Regional Committee for Europe, Copenhagen, 11-14 September 2006. Available at URL: http://www.euro.who.int/Document/RC56/edoc08.pdf. 2006.
5 Global Burden of Disease and Risk Factors ISBN-10: 0-8213-6262-3. The World Bank, Washington DC: Oxford University Press and the World Bank, 2006.
6 Picavet HS, Hazes JM. Prevalence of self reported musculoskeletal diseases is high. Ann Rheum Dis 2003; 62(7):644-650.
7 Woolf AD, Breedveld F, Kvien TK. Controlling the obesity epidemic is important for maintaining musculoskeletal health. Ann Rheum Dis 2006; 65(11):1401-1402.
8 Woolf AD. Healthcare services for those with musculoskeletal conditions: a rheumatology service. Recommendations of the European Union of Medical Specialists Section of Rheumatology/European Board of Rheumatology 2006. Ann Rheum Dis 2007; 66(3):293-301.
9 Woolf AD. What healthcare services do people with musculoskeletal conditions need? The role of rheumatology. Ann Rheum Dis 2007; 66(3):281-282.
10 Davis MA, Neuhaus JM, Ettinger WH, Mueller WH. Body fat distribution and osteoarthritis. Am J Epidemiol 1990; 132(4):701-707.
11 Felson DT. Does excess weight cause osteoarthritis and, if so, why? Ann Rheum Dis 1996; 55(9):668-670.
12 Reprinted from Best Pract Res Clin Rheumatol Publication, 16(5), Petersson IF, Jacobsson LT, Osteoarthritis of the peripheral joints, 741-760, 2002, with permission from Elsevier
13 Croft P, Coggon D, Cruddas M, Cooper C. Osteoarthritis of the hip: an occupational disease in farmers. BMJ 1992; 304(6837):1269-1272.
14 Felson DT, Zhang Y, Hannan MT, Naimark A, Weissman B, Aliabadi P et al. Risk factors for incident radiographic knee osteoarthritis in the elderly: the Framingham Study. Arthritis Rheum 1997; 40(4):728-733.
15 Weyand CM, Hicok KC, Conn DL, Goronzy JJ. The influence of HLA-DRB1 genes on disease severity in rheumatoid arthritis. Ann Intern Med 1992; 117(10):801-806.
16 Symmons D, Harrison B. Early inflammatory polyarthritis: results from the norfolk arthritis register with a review of the literature. I. Risk factors for the development of inflammatory polyarthritis and rheumatoid arthritis. Rheumatology (Oxford) 2000; 39(8):835-843.
17 Ollier WE, Harrison B, Symmons D. What is the natural history of rheumatoid arthritis? Best Pract Res Clin Rheumatol 2001; 15(1):27-48.
18 Cummings SR, Nevitt MC, Browner WS, Stone K, Fox KM, Ensrud KE et al. Risk factors for hip fracture in white women. Study of Osteoporotic Fractures Research Group. N Engl J Med 1995; 332(12):767-773.
19 Kanis JA, Johnell O, Oden A, De Laet C, Jonsson B, Dawson A. Ten-year risk of osteoporotic fracture and the effect of risk factors on screening strategies. Bone 2002; 30(1):251-258.
20 Vingård E, Nachemson A. Work-related influences on neck and low back pain. In: Nachemson A, Jonsson S, editors. Neck and back pain. The scientific evidence of causes, diagnosis, and treatment. Philadelphia: Lippincott, Williams and Wilkins, 2002: 97-126. In: Nachemson A, Jonsson S, editors. Neck and back pain. The scientific evidence of causes, diagnosis, and treatment. Philadelphia: Lippincott, Williams and Wilkins, 2002: 97-126.
21 Bernard BP, Fine LJ. Musculoskeletal disorders and workplace factors. A critical review of epidemiologic evidence for work-related disorders of the neck, upper extremity, and low back. CDC/NIOSH: US Department of Health and Human Sciences. 1997. CDC/NIOSH:US Department of Health and Human Sciences.
22 Hoogendoorn WE, van Poppel MN, Bongers PM, Koes BW, Bouter LM. Physical load during work and leisure time as risk factors for back pain. Scand J Work Environ Health 1999; 25(5):387-403.

23 Hoogendoorn WE, van Poppel MN, Bongers PM, Koes BW, Bouter LM. Systematic review of psychosocial factors at work and private life as risk factors for back pain. Spine 2000; 25(16):2114-2125.
24 Bongers PM, de Winter CR, Kompier MA, Hildebrandt VH. Psychosocial factors at work and musculoskeletal disease. Scand J Work Environ Health 1993; 19(5):297-312.
25 Hartvigsen J, Leboeuf-Yde C, Lings S, Corder EH. Is sitting-while-at-work associated with low back pain? A systematic, critical literature review. Scand J Public Health 2000; 28(3):230-239.
26 Leboeuf-Yde C. Smoking and low back pain. A systematic literature review of 41 journal articles reporting 47 epidemiologic studies. Spine 1999; 24(14):1463-1470.
27 Leboeuf-Yde C. Alcohol and low-back pain: a systematic literature review. J Manipulative Physiol Ther 2000; 23(5):343-346.
28 Leboeuf-Yde C. Body weight and low back pain. A systematic literature review of 56 journal articles reporting on 65 epidemiologic studies. Spine 2000; 25(2):226-237.
29 Linton SJ. A review of psychological risk factors in back and neck pain. Spine 2000; 25(9):1148-1156.
30 This article was published in Best Pract Res Clin Rheumatol, 16(5), Tulder Maurits, Koes Bart and Bomardier Claire, Author(s), Low back pain, 761-775, Copyright Elsevier (2002).
31 van der Windt DA, Thomas E, Pope DP, de Winter AF, Macfarlane GJ, Bouter LM et al. Occupational risk factors for shoulder pain: a systematic review. Occup Environ Med 2000; 57(7):433-442.
32 Natvig B, Nessiøy I, Bruusgaard D, Rutle O. Musculoskeletal symptoms in a local community. Eur J Gen Pract 1995; 1:25-28.
33 Health in the European Union Special EUROBAROMETER 272e/ Wave 66.2 TNS Opinion & Social; European Commission 2007
34 Andersson HI, Ejlertsson G, Leden I, Rosenberg C. Chronic pain in a geographically defined general population: studies of differences in age, gender, social class, and pain localization. Clin J Pain 1993; 9(3):174-182.
35 Bergman S, Herrstrom P, Hogstrom K, Petersson IF, Svensson B, Jacobsson LT. Chronic musculoskeletal pain, prevalence rates, and sociodemographic associations in a Swedish population study. J Rheumatol 2001; 28(6):1369-1377.
36 Hagen KB, Kvien TK, Bjorndal A. Musculoskeletal pain and quality of life in patients with noninflammatory joint pain compared to rheumatoid arthritis: a population survey. J Rheumatol 1997; 24(9):1703-1709.
37 Urwin M, Symmons D, Allison T, Brammah T, Busby H, Roxby M et al. Estimating the burden of musculoskeletal disorders in the community: the comparative prevalence of symptoms at different anatomical sites, and the relation to social deprivation. Ann Rheum Dis 1998; 57(11):649-655.
38 European Opinion Research Group EEIG. Health, Food and Alcohol and Safety. Special Eurobarometer 186. Available at URL: http://ec.europa.eu/health/ph_determinants/life_style/alcohol/documents/ebs_186_en.pdf European Commission, 2003
39 Oliveria SA, Felson DT, Reed JI, Cirillo PA, Walker AM. Incidence of symptomatic hand, hip, and knee osteoarthritis among patients in a health maintenance organization. Arthritis Rheum 1995; 38(8):1134-1141.
40 Lawrence RC, Helmick CG, Arnett FC, Deyo RA, Felson DT, Giannini EH et al. Estimates of the prevalence of arthritis and selected musculoskeletal disorders in the United States. Arthritis Rheum 1998; 41(5):778-799.
41 Arnett FC, Edworthy SM, Bloch DA, McShane DJ, Fries JF, Cooper NS et al. The American Rheumatism Association 1987 revised criteria for the classification of rheumatoid arthritis. Arthritis Rheum 1988; 31(3):315-324.

42 Symmons D, Turner G, Webb R, Asten P, Barrett E, Lunt M et al. The prevalence of rheumatoid arthritis in the United Kingdom: new estimates for a new century. Rheumatology (Oxford) 2002; 41(7):793-800.
43 Assessment of fracture risk and its application to screening for postmenopausal osteoporosis: report of a World Health Organization Study Group. WHO Technical Report Series No. 843. WHO Technical Report Series No. 843. Geneva, World Health Organization, 1994.
44 Lunt M, Felsenberg D, Adams J, Benevolenskaya L, Cannata J, Dequeker J et al. Population-based geographic variations in DXA bone density in Europe: the EVOS Study. European Vertebral Osteoporosis. Osteoporos Int 1997; 7(3):175-189, figure 1 (page 180). With kind permission of Springer Science and Business Media
45 Report on Osteoporosis in the European Community: Action for prevention. Available at URL: http://www.iofbonehealth.org/publications/eu-policy-report-of-1998.html Luxembourg, European Communities, 1998.
46 Van den Velden J, De Bakker DH, Claessens AAMC, et al. Een Nationale Studie Naar Ziekten en Verrichtingen in de Huisartspraktijk. 1991. Utrecht, NIVEL. Basisrapport: Morbiditeit in de huisartspraktijk.
47 Andersson GB. Low back pain. J Rehabil Res Dev 1997; 34(4):ix.
48 Loney PL, Stratford PW. The prevalence of low back pain in adults: a methodological review of the literature. Phys Ther 1999; 79(4):384-396.
49 Walker BF. The prevalence of low back pain: a systematic review of the literature from 1966 to 1998. J Spinal Disord 2000; 13(3):205-217.
50 This article was published in Lancet, 354(9178), Andersson GB, Epidemiological features of chronic low-back pain, 581-585, Copyright Elsevier (1999).
51 Palmer KT, Walsh K, Bendall H, Cooper C, Coggon D. Back pain in Britain: comparison of two prevalence surveys at an interval of 10 years. BMJ 2000; 320(7249):1577-1578.
52 Picavet HS, Schouten JS. Musculoskeletal pain in the Netherlands: prevalences, consequences and risk groups, the DMC(3)-study. Pain 2003; 102(1-2):167-178.
53 HMSO Office of Population Censuses and Surveys Series MB5 no.3 Morbidity Statistics from General Practice Fourth national study 1991- 1992. A study carried out by the Royal College of General Practitioners, the Office of Population Censuses and Surveys, and the Department of Health. Anna McCormick, Douglas Fleming, John Charlton. 1995. London, HMSO Office of Population Censuses and Surveys, 1995.
54 Health Protection in the 21st Century. Understanding the Burden of Disease; preparing for the future. ISBN 0 901144 79 7. Available at URL: http://www.hpa.org.uk/publications/2005/burden_disease/full_doc.pdf . Health Protection Agency, UK, 2005. .
55 Woolf AD. Health care services for those with musculoskeletal conditions: A rheumatology service; Recommendations of the UEMS section of Rheumatology / European Board of Rheumatology 2006. Ann Rheum Dis 2006.
56 Sprangers MA, de Regt EB, Andries F, van Agt HM, Bijl RV, de Boer JB et al. Which chronic conditions are associated with better or poorer quality of life? J Clin Epidemiol 2000; 53(9):895-907.
57 Badley EM, Wang PP. Arthritis and the aging population: projections of arthritis prevalence in Canada 1991 to 2031. J Rheumatol 1998; 25(1):138-144.
58 Reynolds DL, Chambers LW, Badley EM, Bennett KJ, Goldsmith CH, Jamieson E et al. Physical disability among Canadians reporting musculoskeletal diseases. J Rheumatol 1992; 19(7):1020-1030.
59 White KP, Speechley M, Harth M, Ostbye T. Comparing self-reported function and work disability in 100 community cases of fibromyalgia syndrome versus controls in London, Ontario: the London Fibromyalgia Epidemiology Study. Arthritis Rheum 1999; 42(1):76-83.
60 Tellnes G, Svendsen KO, Bruusgaard D, Bjerkedal T. Incidence of sickness certification. Proposal for use as a health status indicator. Scand J Prim Health Care 1989; 7(2):111-117.

61 Stansfeld S, Feeney A, Head J, Canner R, North F, Marmot M. Sickness absence for psychiatric illness: the Whitehall II Study. Soc Sci Med 1995; 40(2):189-197.
62 Brage S, Nygard JF, Tellnes G. The gender gap in musculoskeletal-related long-term sickness absence in Norway. Scand J Soc Med 1998; 26(1):34-43.
63 National Insurance Administration, Norway. Yearbook of social insurance statistics 1997. Oslo: Rikstrygdeverket. 1998.
64 Symmons D, Mathers C, Pfleger B. The global burden of rheumatoid arthritis in the Year 2000. Available at URL: http://www.who.int/healthinfo/statistics/bod_rheumatoidarthritis.pdf http://www.who.int/healthinfo/statistics/bod_rheumatoidarthritis.pdf. 2003.
65 Center JR, Nguyen TV, Schneider D, Sambrook PN, Eisman JA. Mortality after all major types of osteoporotic fracture in men and women: an observational study. Lancet 1999; 353(9156):878-882.
66 Johnell O, Kanis JA, Oden A, Sernbo I, Redlund-Johnell I, Petterson C et al. Mortality after osteoporotic fractures. Osteoporos Int 2004; 15(1):38-42.

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13 Oral Health

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1 Introduction

Dental caries is one of the most prevalent chronic diseases of people worldwide; individuals are susceptible to this disease throughout their lifetime (Selwitz et al, 2007). The burden of oral diseases and the needs of populations over the past 20 years in Europe have changed considerably which has led to good progress with improving oral health in some parts of Europe and to extend and build on these to reduce the prevalence and severity of dental caries. Reductions in caries and other dental problems were mainly achieved through diffusion and consumption of fluoride toothpaste along with changing living conditions, disease management, improving oral hygiene and public health measures. But, despite great achievements in oral health of populations globally, problems still remain in many communities particularly among under-privileged groups. The significant role of socio-behavioural and environmental factors in oral health is evidenced in an extensive number of epidemiological surveys. The greatest burden of all oral diseases is on the disadvantaged and socially marginalized (WHO, 2003). Children are part of the most vulnerable groups affected and within this age group further difficulties arise for those affected by specific systemic conditions, those with developmental disturbances of tooth structure, the socio-economically deprived, the elderly and the handicapped. It is therefore necessary to focus preventive efforts on these special risk groups of populations from this preventable disease.
Although carious lesions affect a relatively small portion of the population in some European countries, in others prevalence is still substantial. At present, the distribution and severity of oral diseases vary among within the same country or region. At the same time the issues associated with managing the problems of contracting most appropriately with dental health care professionals and limiting treatment costs have to be taken into account. This will optimize the cost-effectiveness ratio of the health programmes implemented within the framework of a policy aiming at reducing inequalities in health.
Given the extent of the problem, oral diseases – caries, periodontal diseases, edentulousness -are major public health problems. Their impact on individuals and communities, as a result of pain and suffering, impairment of function and reduced quality of life, is considerable. Moreover, traditional treatment of oral disease is extremely costly, the fourth most expensive disease to treat in most industrialized countries.

1.1 Oral Health strategies for Europe

Oral health systems must adjust to the transition process. Member States have formulated health priority areas or targets for health policies, broadening the spectrum of oral health to objectives in terms of quality of life, reduction of health inequalities, quality of care and access to care. This evolution implies a broader concept of the role of oral health professions and their contribution to general health.
The European NCD strategy already includes oral conditions within the group of noncommunicable diseases to be tackled through an integrated approach (WHO, 2007). WHA60.17 resolution « Plan of action for the promotion of oral health and integrated prevention of diseases » adopted in May 2007 by the World Health Assembly underscores a change of course of the oral health policy (WHO, 2007). Member States are asked to use evidence-based approaches in order to incorporate oral health in integrated policies for prevention and control of noncommunicable diseases, as well as maternal and child health. The resolution also focuses specifically on preschool and schoolchildren. Without disavowing the last resolutions of discipline on fluoridation and oral health (WHA22.30, WHA28.64 and WHA31.50), on oral health as part of a strategy of health for all (WHA36.14), and on oral health (WHA42.39), it makes first and foremost reference to the intrinsic link between oral health, health in general and quality of life, while underlining the necessity to incorporate oral health and prevention for oral health diseases promotion programs in the prevention and integrated taking care of chronic diseases programs. Moreover, this resolution leans broadly on the WHO Framework Convention on Tobacco Control (WHA56.1 and WHA59.17); on cancer prevention and control (WHA 58.22); on scaling up treatment and care within a

coordinated and comprehensive response to HIV/AIDS (WHA57.14); on health promotion and healthy lifestyles (WHA57.16); on the Global Strategy on Diet, Physical Activity and Health (WHA57.17); on strengthening active and healthy ageing (WHA58.16); on prevention and control of noncommunicable diseases, and on public-health problems caused by harmful use of alcohol (WHA58.26).

Internationally, dentistry and oral health is moving towards preventive and minimally invasive care. Current strategies agree therefore towards the necessity of broadening inserted actions towards chronic diseases, while keeping in mind certain specificities in oral health care. The four most prominent noncommunicable diseases - cardiovascular diseases, diabetes, cancer and chronic obstructive pulmonary diseases - share common risk factors with oral diseases, preventable risk factors that are related to lifestyle (WHO, 2006). A major benefit of the common risk factor approach is the focus on improving health conditions for the whole population as well as for high risk groups; thereby reducing inequities. Thus, the recommendations stemming from the consultation "Health strategies for Europe» available on www.eudental.eu made important recommendations on integrating oral disease prevention and oral health promotion into an overarching EU health strategy cover the domain of the:

a Prevention:
   i/ Oral health promotion must be an integral part of chronic disease prevention,
   ii/ Oral health promotion and prevention must include focus on specific population groups according to specific life-styles – especially children or the elderly-,
   iii/ Patients and oral health care professionals must be educated to promote a healthy lifestyle.
b Health inequalities strategies
   i/ Policies on community fluoride administration must be promoted;
   ii/ Policies for disabled people are needed to ensure their access to oral health services,
   iii/ Targeted strategies for high-risk groups, deprived communities or individuals should be implemented).
c Quality assurance, - patient information and patient safety
   i/ Competent authorities must ensure the safety and quality of the oral health care system;
   ii/ Citizens need easy access to information based on high-quality and accurate oral health data
d Oral health surveillance.

1.2 Oral Health Surveillance Strategies for Europe

In Europe, although the impact on public health of oral health is, most of the time, validated in the scientific literature, decision makers are not always in a position to estimate the burden of diseases and risk factors on the morbidity rates and quality of life of the population. The major reason for this is that the description of oral health conditions is difficult, especially in adults and the elderly, owing to the scarcity of data from national studies based on a representative sample of the population of the country. In addition, the variation in methodological aspects of epidemiological studies markedly limits comparisons between countries and regions (1), and that in a deluge of indicators - 620 identified in 2004 (Bourgeois & Llodra, 2004)- overwhelming health services personnel in charge of epidemiological surveillance and evaluation of care programmes. Within a context of a profusion of health indicators, operating a selection is not an easy task.

The surveillance system in oral health for the past 40 years was globally built around the surveillance of caries in order to estimate the impact of community and individual fluoride strategies. Decay experience at early and/or later stages of severity assessed by variations of the severity of caries index is accepted globally as a standardized measure of one of the

most common oral diseases. Dental caries experience among 12 yr old children is based on the DMFT (Decayed, Missing and Filled Teeth) index that measures the lifetime experience of dental caries in permanent dentition. This indicator has reached today its limits due to its lack of reactivity, from its difficulty to give information on health inequality, and in a context where oral health strategies and objectives, as described above, have considerably evolved. And, in addition to the more well established indicators for dental caries, such as mean decay experience, which require a full dental examination, a rapid partial recording system which looks only at decay experience on the four most vulnerable permanent molars teeth in children provides an efficient alternative in some circumstances.
In Europe, the small amount of representative data on the status of oral health among populations is targeted, when it exists, on DMFT indicators and 12-year olds. Data has significantly declined the past 10 years. Only rarely is data part of a health monitoring methodology. Few countries in Western Europe have established a data collection system at the national level: only Great Britain has secular epidemiological data on the prevalence of caries in young adults. Sweden and the other Scandinavian countries used country council reports to the National Board of Health and Welfare through the public dental service.

As the focus of public health planning embraces evidence based healthcare, moves away from providing only restorative interventions and moves towards the delivery and evaluation of preventive programmes and services, indicators are needed which can be used to document the need for and the degree of success achieved in controlling early stage decay through prevention and the need for and the pattern of restorative care which is provided for decay which has progressed to the more severe stages of the disease process (Petersen et al., 2005). In a manner analogous to the WHO Stepwise approach, these indicators provide the necessary flexibility to record at different stages of the oral health process, according to the public health and clinical need.

At least, as discussed, a core group of modifiable risk factors are common to many chronic diseases and injuries. The setting up of a new information system in oral health integrated into the health surveillance of chronic diseases plans is recommended (WHO, 2007). Continuing surveillance of levels and patterns of risk factors is of fundamental importance to planning and evaluating community preventive activities and oral health promotion. It is in this sense that “DG SANCO is also giving high priority to developments in other areas covered by existing Health Monitoring Programme projects, especially Reproductive and Perinatal Health, Oral Health and issues in the 2003-2008 Programme.

The need for the necessary integration of the oral health sector within the national and European health information systems is an added challenge, considering that this should be done at all levels of the reference system. With the support from the Directorate-General Health and Consumer Protection of the European Commission, the EGOHID phase I (2002-2005) has been developed to establish priorities for a specifically European context in coordination with the existing programme and to make recommendations for improving health system information performance by the establishment of the most relevant indicators in oral public health. With the expert contribution of the ministries of health, WHO, universities, regional and national dental associations, health professionals in the European member states, the EGOHID Phase I recommended a minimal list of 40 essential indicators covering four major dimensions: i/ Oral function status; ii/ Determinants (behaviour, life habits) ; Iii/ Oral health system/promotion, prevention, access to care, quality care and system performance and iv/ Oral health quality of life (www.egohid.eu).

2 Determining factors / risk of health

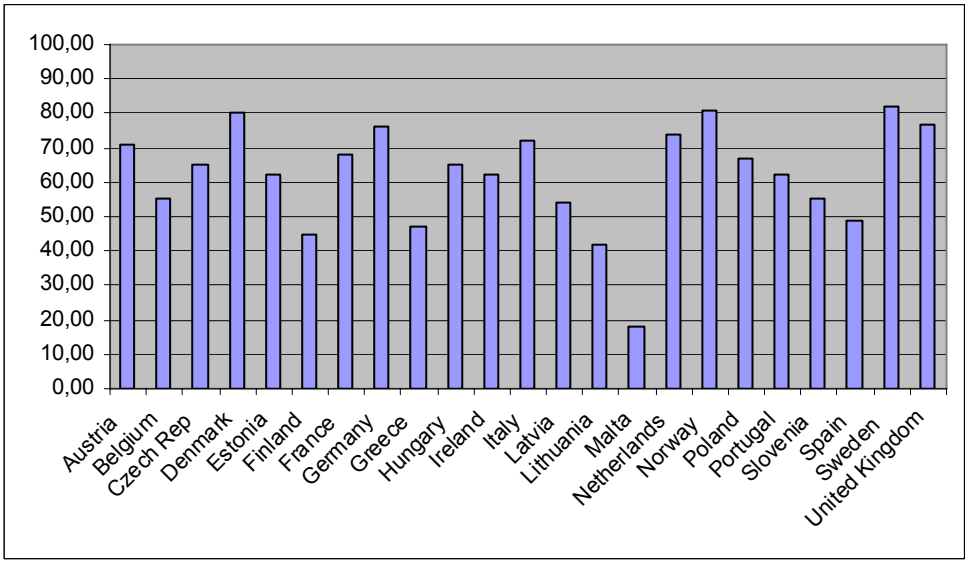
The following indicators issue from EGOHID I concern risk factors and/or risk of oral health of the children, the adolescent, and adult in Europe. Their availibilities declared by the 20

countries, members of EGOHID II during the 2006 European consultation are introduced in this chapter for every chosen indicator.

Indicators for monitoring the oral health of children and adolescents

1. Proportion of daily toothbrushing with fluoride toothpaste in children 3-6 and 6-12 years, adolescents aged 13-17 years.
Source: 50 % of country members declare to collect in a regular way through oral health surveys this indicator; even so only 2 Ministries of Health (Latvia, Portugal) are involved (Table I). No statistics are globally produced by taking into account socio-economic factors, age and gender. Moreover no temporal data are available in the literature or data banks.

Figure 1 The percentage of 15 years old adolescent who declares brushing their teeth more than once a day (Source: www.data.eur.who)



Variations from 20% are observed between some countries as Austria, Denmark, Germany, Italy, Netherlands, Norway, Sweden and United Kingdom (Prevalence >70%) and Finland, Greece, Lithuania, Spain (Prevalence between 40 and 50%), Malta declaring a score of 19%.

Other risk indicators

2. Proportion of women aged 15-39 years who had a preventive dental visit during their last pregnancy
3. Proportion of mothers with children under 7 years age old who know the role that the usage of fluoride containing toothpaste twice a day is in preventing tooth decay in children.
4. Fluoridation Exposure Rates: The number and rates (per 1,000 populations) of the population – preferably 0-13 years – daily exposed to water or alternative fluoride sources.

Table I Periodicity of collection - regular (a), episodic (b), never (c) - of indicators for monitoring the oral health of children and adolescents concerning risk factors / risk of oral health (Source: EGOHID II, 2006)

Country	*1. Daily toothbrushing with fluoride toothpaste*	*2. Proportion of women aged 15-39 years who had a preventive dental visit during their last pregnancy*	*3. Proportion of mothers with children under 7 years age old who know the role that the usage of fluoride containing toothpaste twice a day is in preventing tooth decay in children.*	*4. Fluoridation Exposure Rates: The number and rates (per 1,000 populations) of the population – preferably 0-13 years – daily exposed to water or alternative fluoride sources.*
Austria				
Belgium				
Cyprus				
Czech Republic				
Denmark				
Estonia				
Finland				
France				
Germany				
Greece				
Hungary				
Italy				
Latvia				
Lithuania				
Netherlands				
Portugal				
Romania				
Slovakia				
Spain				
United Kingdom				

Source: These indicators are absent from the 20 country EGOHID II members' oral health surveillance systems in respectively 82 %, 72 % and 53 % of cases.

3 Impact / predominance

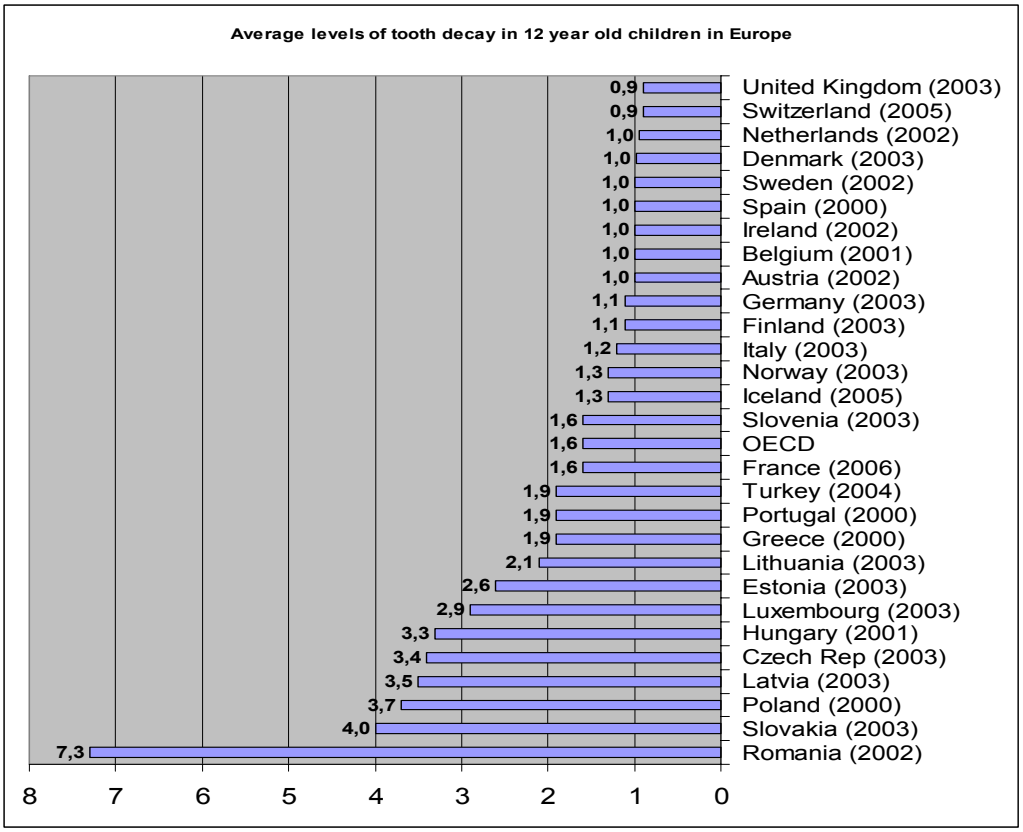
EGOHID I recommended the main following indicators to give information on the oral health prevalence of children, adolescents and adults oral health in Europe. Sources concerning every indicator, available by country members, are given, which have been declared during experimental consultation of EGOHID Phase II and, when possible, data identified in the literature (OECD, WHO GODB - a total of 1,890 scientifically validated studies are contained in the WHO data base but the fact that these surveys have more local or regional rather than national representativeness somewhat limits their impact-, WHO Euro databases, Pub Med, CECDO Databases).

5. Proportion of early childhood caries in the age group 1-5 years.
Early childhood caries is an aggressive presentation of dental caries that affects the primary teeth of infants and toddlers,
Source: 25 % of EGOHID II (Finland, Czech, Netherlands, Denmark, and UK) country members declare regularly listing this indicator, 20 % occasionally and 55 % never. No significant database includes this indicator.

6. Mean number of decayed, missing and filled primary or permanent teeth present per person in age group 5 to 74 years.
Source: Historically, this indicator is broadly and occasionally used at the age of 12 years old to assess populations' dental health. Its European coverage is of 95 %, 22 % of that information comes from Ministries of Health (UK, Portugal, Netherlands, Latvia, Denmark, and Cyprus). It is rarely explained by taking into account risk factors that are socio-economic factors and age. This restricts considerably its interest, taking into account the existence of groups and individuals with a high risk of caries which characterizes the main part of European countries. Sources are issue from WHO database (www.whocollab.od.mah.se),

OECD references (www.sourceoecd.org), the database of the Council of European Chief Dental Officers (www.cecdo.org/) and Pub Med.

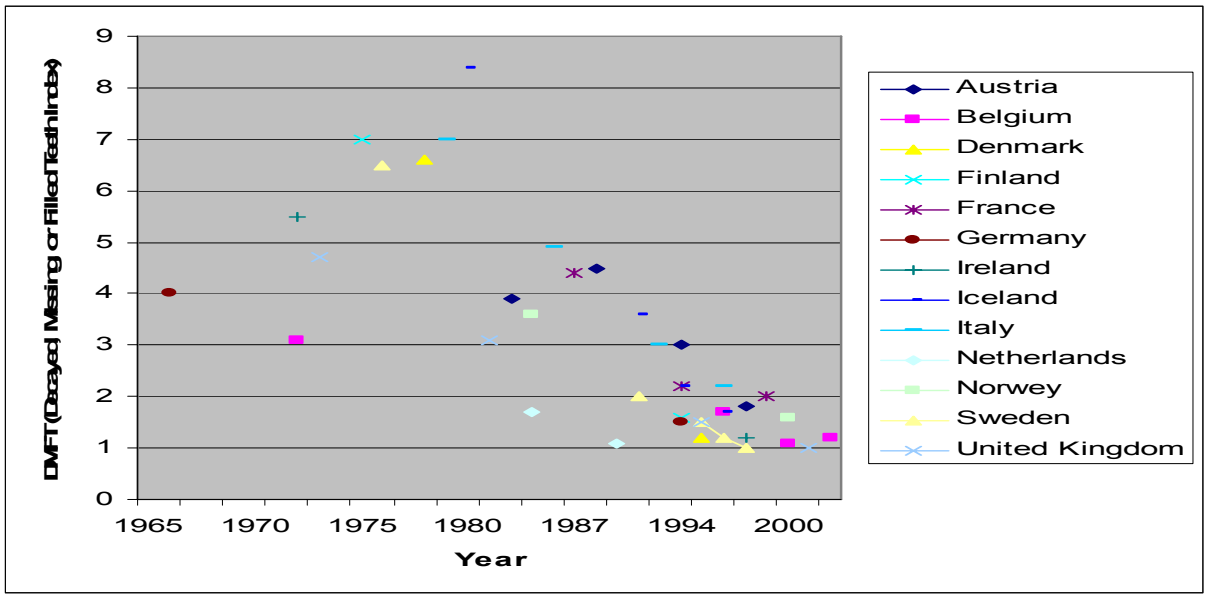
Figure 2 Average levels of tooth decay in 12 year old children in Europe



In 2003, or the closest available year, 12-year-old children in Austria, Finland, Germany, Ireland, Spain, Sweden, the United Kingdom, the Netherlands, and Denmark had an average of less or equal than one decayed, missing or filled permanent tooth (DMFT). In contrast, children in Latvia, Poland, Romania, Hungary, the Czech Republic and Slovakia had three DMFT or more. Most OECD countries had between one and three DMFT for 12-year-old children. 92 % of member countries have children who are situated in a low or very low category of risk of severity of teeth decay (Source: OECD, 2007). Caries in Europe would concern 10 to 20 % of the children who do not have or hardly benefited from the improvement of dental health of populations observed for the past 30 years. In France, 1/3 of children represent 80% of tooth decay, ¼ of children represent 65% of tooth decay and 38% are caries free. The children at high risk of caries are major elements for the development of health policies turned to the reduction of the disparities, the prevention and the promotion of health integrated into chronic diseases

The past 25 years have seen substantial falls in the DMFT index across OECD countries, declining from an average 4.5 in 1980, to 2.6 in 1990, and 1.4 in 2003 for a consistent group of countries with long time series. During that period, 16 of the 19 OECD countries for which data are available saw declines in DMFT of 50% or more. Trends of tooth decay in the last 30 years underlines convergence of caries towards a DMFT=1 score, whatever the organization of the oral health system, its financing and prevention mode (fig.3). This is a substantial public health achievement.

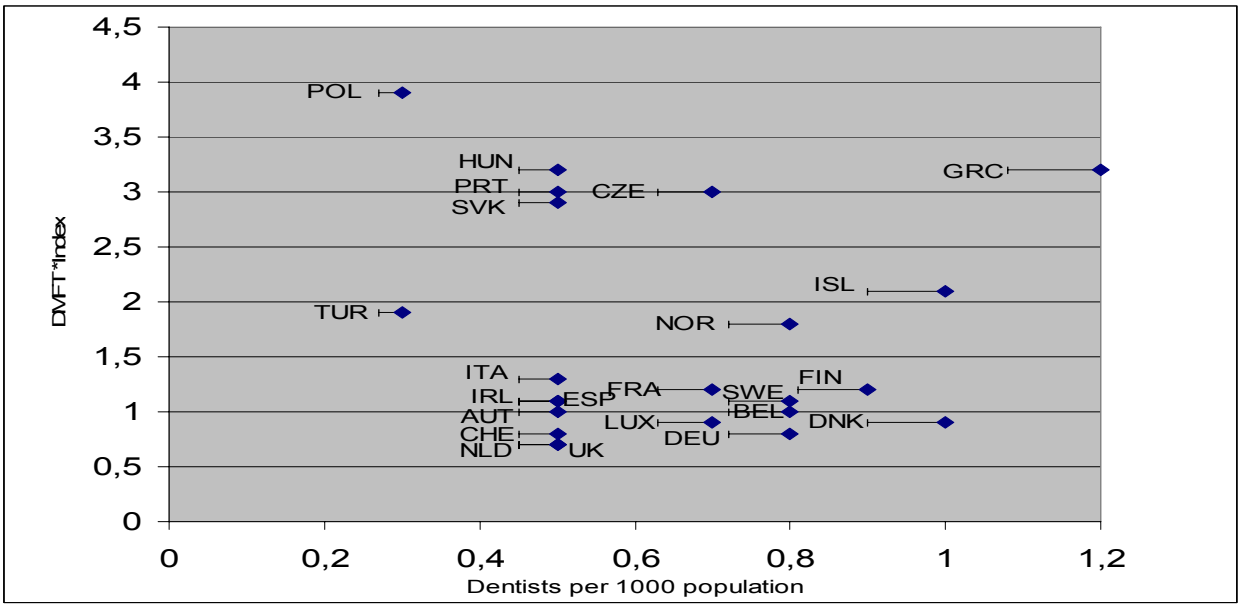
Figure 3 Tooth Decay Trends -Data from the World Health Organization – http://www.euro.who.int -



The common metrics, responsible for this improvement between member countries, validated by the scientific community, mainly is the rise of the standard of living of the populations since the 1970s, associated with the generalization of the use and the consumption of fluoride toothpastes by children. Logically, the new member countries should quickly join with this tendency.

Chart 1. issue from the OECD report shows little association between the number of DMFT among children and the number of dentists per capita. There are substantial differences in DMFT index scores among countries that have the same number of dentists per capita, indicating that many other factors affect dental health beyond the availability of dentists. (OECD, 2007).

Chart1 Association between the number of DMFT among children and the number of dentists per capita



Source: OECD, 2007

7. Proportion of 12-year-old children according to fluorosis Dean's index score.

Dental fluorosis is a condition that results from the intake of too much fluoride during the period of tooth development, usually from birth to approximately 6-8 years of age. Dental fluorosis is a specific disturbance of tooth formation caused by excessive fluoride intake during the development of teeth

Source: No significant data exists at European level except in Denmark, Ireland, France and UK.

8. Proportion of adults aged 35-74 years with periodontal diseases cases of any grade

Source: 65 % of the members declare not collecting information about this indicator, 20 % do it in a regular way (Czech, Germany, Spain, UK) among which 14 % of the total are national type studies. New national studies in France, Germany, and UK are taking into account the linked risk factors (Age, gender, SES, tobacco, alcohol, etc...). In France, 85.4 % of the adults aged 35-64 yrs, that is 19 388 000 subjects, present a periodontal disease in a context where the severe form affects only a small proportion of the population (less than 3%).

9. Annual incidence of oral cancer for adults aged 35-64 years per 100,000 populations.

Source: Available data of lip, tongue and mouth cancers in Europe are on the WHO website and dates from 1988-1992.- no more recent data are presented- Denmark *, France *, Germany, Hungary, Italy, Latvia *, Portugal *, Spain *, UK* declares collecting this information regularly via mainly ministerial sources (*).

10. Proportion of subjects aged 8-65 years or older who has experienced difficulties in eating and/or chewing because of problems with mouth, teeth or dentures of any grade in the past 12 months.

Source: Predominantly (80 %), member countries did not insert on a regular basis oral health quality of life indicators into their surveillance systems (except: Austria, Belgium, Germany, and Spain). EGOHID II Pre-test 2007 Collaborative Study indicates preliminary and no-published results (Table II).

Table II How often have you experienced difficulties with eating food due to mouth and teeth problems?

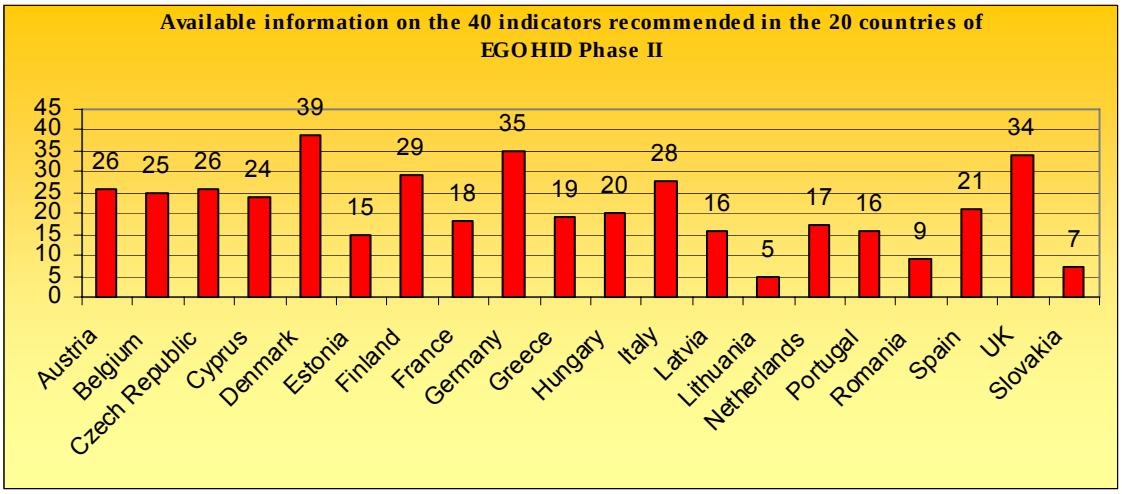
	Germany	Poland	UK	Italy	France	Finland	Denmark	Spain	Total
Never	68%	75%	59%	71%	71%	80%	82%	49%	69%
Hardly never	27%	12%	21%	10%	6%	15%	16%	25%	17%
Occasionally	4%	7%	17%	12%	8%	4%	1%	19%	9%
Fairly often	1%	5%	2%	3%	7%	1%	1%	4%	3%
Very often	0%	0%	1%	4%	8%	0%	0%	0%	2%
Don't know	0%	1%	0%	0%	0%	0%	0%	0%	0%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%

Source: Egohid II, 2007, Methods of quota – age, gender, CSP- , Interview by phone, 100 subjects per country aged 18-64 yrs

4 Improving data availability for European oral health indicators

Within the European Global Oral Health Indicators Development Project Phase I valuable core indicators based on agreed and uniform definitions were identified. These indicators are essential for comparisons to be made over time not only between regions and care units but also at national level. These comparisons can then be used as a basis in development and quality work at all levels of dental care and dental services. The prerequisites for monitoring the quality of care in Europe are good, despite major disparities between Members States.

Figure 4 Available information on the 40 indicators recommended in the 20 countries of EGOHID Phase II



The rate of use of recommended indicators fluctuates considerably between countries and the burden of the ministries of health in the development and management of oral health surveillance is minor (2.5 %). The organization of the surveillance mainly depends on the effort of diverse partners such as universities, national and other dental associations without real concertation. Actions taken together at a European level do not exist.

Then, there is at present no permanent surveillance action developed at a national level. The indicators of morbidity – caries, missing teeth, edentulousness- are in this context privileged, but they rest on standard, irregular and cross sectional epidemiological studies, little adapted to the ability to react to information needs. Proposing alternative methods is required.

However, further development and promotion of models and methods for performance assessment is needed in order to be able to deliver policy-relevant information to each nation's health policy makers. Without denying the traditional indicators used in the oral health, the present condition of oral health surveillance needs to bring a pragmatic alternative to the surveillance of the populations by recommending a series of operational indicators and methods which can supply a concrete help to the decision-makers of European health policy. The 40 selected indicators in EGOHID I do not require particular conceptual development. They cover all domains of applications of the oral health system (outcome, process, determinants). The presence in the list of reference of indicators like i/ Frequency of daily intake of food and drink of people, ii/ Proportion of dentists providing advice on tobacco use cessation to their patients, iii/ Incidence annual of oral cancer in adults contribute of laying common foundations for an integrated approach of health surveillance.. It also integrates into European concepts and foundation of ECHI data and Compendium of Health Indicators (ICHI2).

A critical analysis of the methodological criteria used in international scientific literature has underlined that new and complementary trends should be recommended to improve the production of higher quality information in oral health epidemiology. Standardized procedures including health interview and health clinical surveys in relation with core indicators should be developed and used. Similarly, thought should be given to the design and implementation of an Oral Health Surveillance System, based on oral health primary care providers which would support national health surveillance systems such as Health National Interview Survey and Health National Clinical Survey. The analysis of the scientific literature showed weaknesses in the evaluation of oral health trends in terms of methodology, quality control, and presentation of results. The ability to interpret and make conclusions in public oral health are therefore limited. New or complementary measures should be put in place in order to improve the quality of medical information in oral health epidemiology.

The range of potential quality methods is vast, making a full review impracticable. Supporting evidence might be absent or inadequately documented. Existing data sources might not permit the construction of the desired indicators, because the required variables are missing or recorded differently. Dedicated data collection that would yield comparable information on a national level might be prohibively expensive. Thus, to tackle the problem in a way that respects time and resource constraints, an opportunistic rather than idealistic approach seems warranted. The main disadvantage of relying on existing data sources is that the data systems have usually been designed for purposes other than quality measurement and may therefore not always provide exactly the desired information. The following limitations are commonly observed:

- Limited geographic coverage – in several countries, data are only available for selected regions.
- Limited coverage of populations –collection of administrative data is sometimes linked to individual characteristics, such as insurance status.
- Data access limitations – data collected by institutions other than national government or national institutes may sometimes not be readily accessible due to confidentiality issues or property rights issues which prevent any release.

5 Conclusion

The progress of oral health in the region are significant with a majority of children free of caries. But the burden of oral diseases in 2008 remains important, so much the problems bound to the disparities of access to care of the populations, to the disparities in view of the based disease bound among others to socio-economic factors, to the economic impact of disease on society and the impact on the quality of life which remains not solved (WHO,

2003). However, the distribution of caries is very skewed and although risk groups are increasingly targeted for prevention, appropriate and prudent surveillance and care should be provided for all patients since caries can occur and can progress in all risk groups.

The population presenting oral disorders need care adopting a longitudinal perspective, with an emphasis on prevention and health promotion.. In dental caries management, the focus has been around preventive caries management for children, but caries is a disease process that needs to be managed over a person's lifetime. The evidence is leading to an international trend in clinical practice, to move away from operative intervention towards prevention of caries. This approach relies on accurate diagnosis of disease and lesions, disease prevention, just-in-time restoration, minimally invasive operative procedures, and prevention of recurrence (Pitts, 2004).
The dentist in the particular scope of their exercises, indeed have to make pay their attention focus on two types of approaches. They have to attempt in the first place to prevent the occurrence of chronic oral health diseases - caregivers of children could play a major part in keeping children free of obvious dental caries. (Selwitz et al, 2007)- and, secondly, to intercept these by taking charge of the prevention of the major complications of these disease. This by setting up an optimal treatment and by providing best practices for managing oral diseases once they have been diagnosed. Responsibility and the collaboration of the patient are essential elements.

An indispensable condition of the political changes is to reform the surveillance system to provide adequate information from a public health surveillance point of view, which concern more particularly public health in the European scale, that is:

- incorporate an oral health information system into the health surveillance plans, so that the objectives of oral health would be in accordance with European norms, and to assess progress in promotion of health;
- take measures so that oral health would be incorporated in policies relating to prevention and taking care of chronic diseases, as well as in policies relating to the health of the mother and the child;

The European Commission introduced within the framework of its program Public Health of the Directorate General Health and Consumer Protection a global reflection on the development of an information system adapted to the challenges of the policies of health promotion and prevention of chronic diseases, which has to supply the necessary elements in order to help to make decisions within the Ministries of Health of Member States. EGOHID, on one hand underlines the need to rationalize the research of information by the use of reactive and useful indicators, taking into account health problems linked to health inequality of and access to care. On the other hand, EGOHID identifies the most promising methods in the respective area - clinical survey, health interviews surveys for population and providers- ; discusses their policy relevance and scientific soundness. It focuses on a set of recommendations for development of the use of common methods in the field of the surveillance for which there is agreement on validity, importance and for which comparable data are available in most EU-countries. At least, EGOHID presents an original argument of integration of oral health in the actions of health promotion, and contributes to give to the people in charge a help in the very useful decision.

Reference list

Bourgeois DM, Llodra JC. (editors). Health Surveillance in Europe. European Global Oral Health Indicators Development Project. Paris: Quintessence International; 2004.

Council of European Dentists. Health Strategies in Europe, Recommendations of Oral Health Workshop. In: www.eudental.eu/index.php?ID=27888.

Marthaler TM. Changes in dental caries 1953–2003. Caries Res 2004; 38: 173–81.

Organisation for Economic Co-operation and development. Health at a Glance 2007: OECD Indicators. (In sourceoecd.org/), OECD, 2007.

Ottolenghi L, Muller-Bolla M, Strohmenger L, Bourgeois D. Oral Health Indicators for Children and Adolescents. European perspectives. Eur J Paediatr Dent. 2007 Dec; 8(4):205-10.

Petersen PE, Bourgeois D, Bratthall D, Ogawa H. Oral health information systems--towards measuring progress in oral health promotion and disease prevention. Bull World Health Organ. 2005 Sep; 83(9):686-93.

Petersen PE, Bourgeois D, Ogawa H, Estupinan-Day S, Ndiaye C. The global burden of oral diseases and risks to oral health. Bull World Health Organ. 2005 Sep; 83(9):661-9.
Pitts NB. Are we ready to move from operative to non-operative/preventive treatment of dental caries in clinical practice? Caries Res 2004; 38: 294–304.

Selwitz RH, Ismail AI, Pitts NB. Dental caries. Lancet 2007; 369: 51–59

World Health Organization, Regional Committee for Europe. Resolutions adopted by the Sixtieth World Health Assembly of particular interest to the European Region of WHO: Policy and technical matters. WHO Euro, pp1-19, 2007. (In: www.euro.who.int/document/rc57/edoc05.pdf). Copenhagen: WHO, 2007.

World Health Organization. Sixtieth World Health Assembly: Oral health: action plan for promotion and integrated disease prevention, WHA60.17 .Eleventh plenary meeting, 23 May 2007. A60/VR/11, Geneva: WHO, 2007.

World Health Organization. The World Oral Health Report 2003: continuous improvement of oral health in the 21st century – the approach of the WHO Global Oral Health Programme. Geneva: WHO, 2003.

14 Sexual and Reproductive Health

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On behalf of the REPOSTAT 2 project

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1 Introduction

This chapter was written by Miguel Oliveira da Silva, project co-ordinator of REPROSTAT 2, a EC Public Health project: *Assessing the usefulness of a comprehensive set of reproductive health indicators designed for the enlarged European Union, with a particular emphasis on the reproductive health of adolescents and young adult.*
Several contributions from previous REPROSTAT 2 documents and papers (already published or submitted for publication) were taken into consideration, mainly those from Temmerman (2006) and Gissler (2008, in publication).
Indirectly all REPROSTAT 2 participants[*] contributed to this chapter, with particular importance of those integrating the Steering Committee: Albrecht Jahn (Germany), Jorn Olsen (Denmark), Marleen Temmerman (Belgium), Kitty Bloemenkamp (The Netherlands), Phillip Hannaford (United Kingdom) and Helle Karro (Estonia).
Sexual and Reproductive Health (SRH) outcomes are important measures of the general health and social well being of a population. The scope of SRH extends across the lifespan and across several Public Health domains. Assessing the most relevant aspects of SRH[†] requires the measurement of a wide range of medical, social, and demographic trends within a population, in addition to assessing the quality and effectiveness of associated health cares services (Jahn, 2006).

Although useful and even essential, comparisons between countries have many caveats (Kosonen 1994, Kautto & Moisio 2004, Gissler et al. 2005). Actually, we are aware and have faced serious difficulties.
An important condition is comparable units of measurements, and therefore creation and development of indicators is essential (Kosonen 1994). Without reliable indicators a picture of a situation or developments may remain ambiguous. The lack of standardisation both in indicator definitions and methods of measurement has hindered international comparisons (Koponen & Aromaa 2006). As a first step for a more complete health monitoring system in EU, a list of main health indicators has been developed (McKee and Ryan 2003, Robine and Jagger 2003).
Under an historical point of view, in several, if not most Member States SRH indicators have been characterized by different data collection methods, such as sampling and questioning, varying inclusion criteria and different age categories in data collection; the lack of standardization both in the indicators definitions and methods of measurement has hindered international comparisons and is recognized as an urgent need.
REPROSTAT (Temmerman 2006) aimed to create a common core set of indicators which would allow health professionals, policy makers and researchers to effectively monitor and evaluate SRH and associated health care in the EU.
While the development group wished to include elements from the full spectrum of SRH, it recognized that not all aspects could be covered in a single set of indicators. Moreover, in the field of reproduction and perinatal health, two European groups have proposed indicators to help health professionals, policy makers and researchers to effectively monitor and

[*] Besides those already mentioned: Agustin Montés (Spain), Caroline Moreau (France), Serena Donati (Italy), Mary Short (Ireland), Helen Wennborg (Sweden), Medard Lech (Poland), Vit Unzeitig (Czech Republic), Valentina Mihaila (Romania), Todor Chernev (Bulgaria), Irena Kirar Fazarinc (Slovenia), Bartfái György (Hungary), Mika Gissler and Elina Hemminki (Finland), Gunta Lazdane (WHO/Europe) and Inese Birzule (Latvia).
Also contributed to this project Mari Imamura Aberdeen) as research assistant that coordinated the Systematic review of factors related to teenage pregnancy in Europe; Janet Tucker (Aberdeen) also supervised this task
Inês Fronteira, as research assistant epidemiologist, coordinated the Youth Sexual Pilot Survey in four European Union Member States (Portugal, Belgium, Estonia and Czech Republic)

[†] According with the International Conference on population and development (Cairo, 1994, paragraph 7.2) Reproductive health "implies that people are able to have a satisfying and safe sex life and that they have the capacity to reproduce and freedom to decide if, when and how often to do so. It also includes sexual health, the purpose of which is the enhancement of life and personal relationships, and not merely counseling and care related to reproductive and sexually transmitted diseases".

evaluate reproductive health and associated health care (Temmermann et al., 2006, Zeitlin et al. 2003a and 2003b).
Sexual and Reproductive health indicators were created within REPROSTAT project, modifying and completing the pre-existing WHO recommendations (WHO/RHT97.27 Reproductive Health indicators for global monitoring: report of an interagency technical meeting). These were described in a previous article (Temmerman et al. 2006) together with their availability in two old EU member states, Italy and Germany.
REPROSTAT, in the previous UE (2003) and REPROSTAT 2 (in the now enlarged EU with 27 Member States) agreed in a final recommendation minimum list to monitor SRH.
For each indicator there is an operational definition, justification for selection, criteria for selection, data sources and (when appropriated) references.
Our list of indicators consists of 13 core indicators, 1 recommended indicator and 4 others that need further development:

Areas	Core	Recommended	Future development
STI/ Sexual behaviour	1- HIV 2- Chlamydia prevalence 3- Condom use		
Youth	4 – Median age at 1st intercourse 5- Contraceptive use at 1st intercourse 6- Teenage birth rate		
Contraception, Fertility & Reproduction	7- Contraceptive prevalence 8- Maternal age at 1st childbirth 9- Total fertility rate 10- % trying to get pregnant 11-% deliveries after ART		
Abortion	12 - Induced abortions		
Emerging areas	13-Hysterectomy rate	14- Urinary incontinence	15- Menopause Hormone therapy 16- Erectile dysfunction 17 Sexual health and wellbeing 18- Violence during pregnancy

For definitions and important details please please consult in detail http://www.fm.ul.pt/reprostat , see Annex 5.

2 Health determinants / risk factors

After having agreed on the minimum list of the mentioned SRH indicators, REPROSTAT 2 project had as main goals:

1. A systematic review of factors associated with teenage pregnancy in European Union (Imamura, 2007).
2. To conduct an *ad hoc* youth sexual health pilot survey in four Member States.
3. To build a critical study about the actual feasibility of comparing the existing European SRH indicators (Gissler 2008, in publication).

As far as the **systematic review** was concerned, our method consisted of a search strategy including electronic bibliographic databases (1995 to May 2005) bibliographies of selected articles and requests to all country representatives of REPROSTAT 2 for relevant reports and publications.
Primary outcome measure was conception. Inclusion criteria were quantitative studies of individual-level factors associated with teenage (13-19 years) pregnancy in EU countries.
Results came from 4444 studies identified and screened, 20 met the inclusion criteria. Most of the included studies took place in UK and Nordic countries.
The well-recognized factors of socioeconomic disadvantage disrupted family structure and low educational level and aspiration appear consistently associated with teenage pregnancy.
However, surprisingly for some of us, evidence that access to services in itself is a protective factor remains inconsistent.
Although further association with diverse risk-taking behaviours and lifestyle, sexual health knowledge, attitudes and behaviour are reported, the independent effects of these factors too remain unclear.
Another conclusion resulting from the systematic review was that included studies varied widely in terms of methods and definitions used.
This heterogeneity within the studies left us two outstanding issues. First, we cannot synthesize or generalize key findings as to how all these factors interact with one another and which factors are the most significant. Second, it is not possible to examine potential variation between countries.
Future research ensuring comparability and generalizability of results related to teenage sexual health outcomes will help gain insight into the international variation in observed pregnancy rates and better inform interventions (Imamura, 2007).
Taking in account the data provided by this *systematic review*, REPROSTAT 2 designed, conducted and piloted a **sexual youth pilot survey** in 2006 in four EU Member States.
This study was aimed at characterizing some of the SRH behaviours of young people aged between 16 and 19 years old from Belgium, Czech Republic, Estonia and Portugal.

Table I Total number of interviewed basic sample units (BSU) per country

	Czech Republic	**Belgium**	**Estonia**	**Portugal**
BSU	392	369	435	361

An observational, descriptive cross sectional study having as sample unit young people (between 361 and 435 per country- see Table I), either male or female, who went to 10^{th}, 11^{th} or 12^{th} grade school, or legal equivalent, in 2005/2006 scholar year and who were 16 to 19 years old was carried out. A self-reporting, structured questionnaire was used. Only descriptive analysis of the results was made.
Friends, books and magazines were the most important source of information on puberty for every country. School teachers appeared as one of he most important sources of information of sexual and reproductive systems of men and women.
In every country the large majority of respondents had already had a boy or girl friend: 76.6% in Estonia, 87% in Czech Republic, 91.5% in Belgium and 95.8% in Portugal.
More than 47% (between 47% in Estonia and 58% in Belgium) respondents had already had heterosexual intercourse.
Mean age at first sexual intercourse ranged between 15.2 in Belgium and 16.4 in Czech Republic.

Table II Heterosexual intercourse, age and use of method to avoid pregnancy

Country	% already had heterosexual intercourse	Mean age at first heterosexual intercourse (FHI)	% who used method to avoid pregnancy at FHI	Method mostly used at FIH	% Always used a method to avoid pregnancy	Method mostly used
Belgium	58.5	15.2	91.5	Condom (75.9)	71.1	Pill (55.0)
Czech Republic	48.7	16.4	95.3	Condom (68.9)	92.9	Pill (49.7)
Estonia	47.6	15.3	85.5	Condom (90.1)	76.2	Condom (72.0)
Portugal	52.3	15.6	91.4	Condom (95.6)	82.1	Condom (61.4)

The large majority of respondents used a method to avoid pregnancy at first sexual intercourse (see Table II). Portugal was the country with the smallest percentage of respondents answering that they had heard about Chlamydia (see Table III). In this same country, another sexual transmitted disease, cervical cancer, has a high prevalence, incidence and mortality.

Table III - Knowledge about Chlamydia and willingness to test for Chlamydia

Country	% respondents who had heard about Chlamydia	% respondents willingly to test for Chlamydia
Belgium	30.9	58.6
Czech Republic	29.3	73.2
Estonia	51.3	75.3
Portugal	11.8	64.7

Although this survey did not covered any question concerning this issue, it should probably be considered in a future one, and not only because of the on going ethical polemic concerning the human papiloma virus (HPV) vaccination (Golgrove, 2006 and Lo, 2006).
On the overall, the respondents in the four countries seem to behave very similarly as far as SRH is concerned.
However, some outcomes of this apparently similar sexual and reproductive behaviour of young people is obviously different when considering the same four Member States.
Teenage pregnancy is a good example, with rates, 1n 2005, varying between 6% in Portugal and 2 % in Belgium (Estonia with 4 % and Czech Republic 1 %).
This seems to be due to either one of the following reason: contraceptive failure (Portugal, for instance, having a huge use of emergency contraception, with sales increasing enormously from 80.000 in 2001 to 220.000 in 2006); sample of students not representative of the whole population (either because of the selected schools, either because, for instance, in Portugal, again, more than 20% of the population left the school at the 9th year).
This is, of course, a pilot study conducted at high-school, needed to be followed by further and larger studies with a core module of sexual and reproductive health (e.g HBSC and/or EHIS). Ideally, the population that, in some countries, already drop-out from school at this age – one of the high-risk groups – should be included.

Age differences

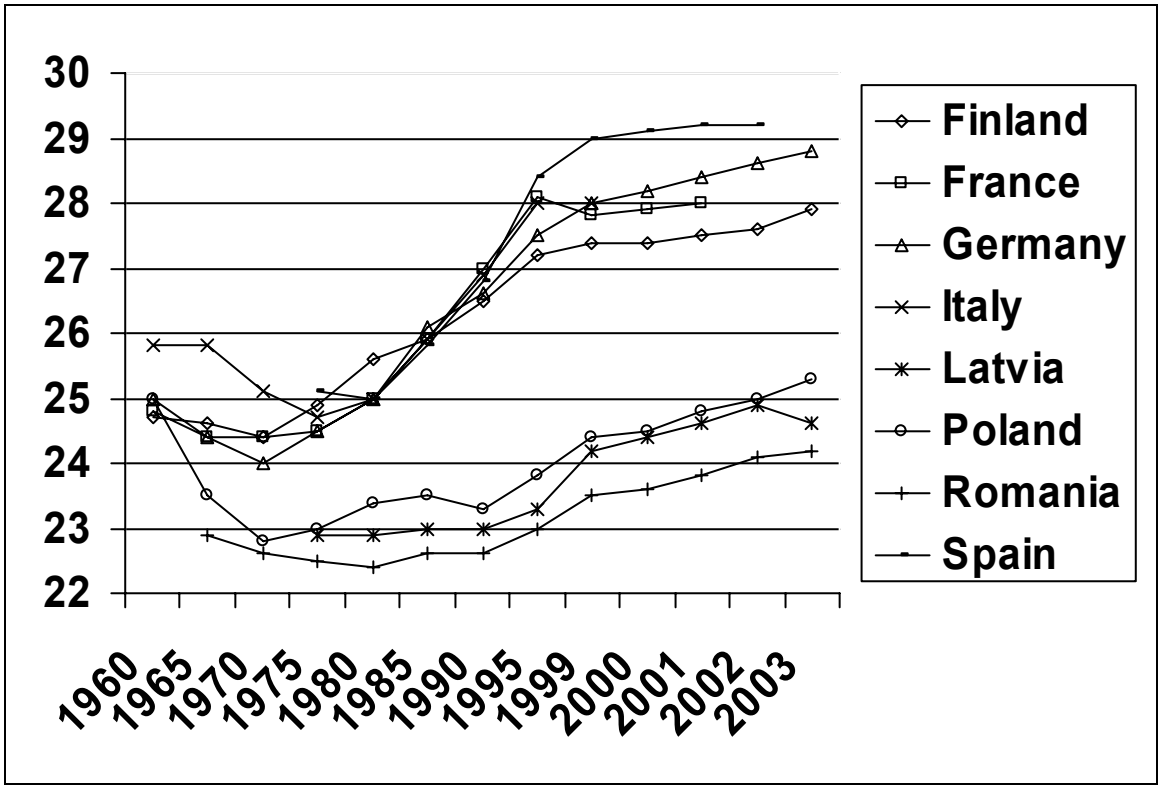
Age differences discrimination is extremely important when considering several SRH indicators.
If we consider teenage birth rate, it is totally different, under a both maternal-fetal and social perspective, to consider either the whole group 15-19 years old or, for instance splitting it into < 17 years old and 17 or more years old.
Although both REPROSTAT and REPROSTAT 2 projects have agreed on the need to have available data about age-specific birth rate in teenagers (number of births in women aged less than 20 years (at delivery) per 1000 women of the same age by one-year interval) – this is not frequently the case, some countries (Italy, for instance) using 18 years old as a cut-off. This makes comparisons much more difficult. It is also more difficult to identify evidence based knowledge of eventual different risk factors associated to different age groups.

Health inequalities

Socio-economic and ethnical differences most certainly exist among REPROSTAT 2 SRH indicators, but the currently existing statistics and data are usually not disaggregated by SES and ethnics.
Two good examples are teenage birth rates and total fertility rate.
For instance, in Portugal teenage birth (do not confuse with teenage pregnancy) rate is one of the highest in EU. There is a consensual clinical impression that most teenage mothers, specially the youngest ones (less than 17 years old) come from the lower SES and/or from ethnical minorities (namely African, gypsies).
An important issue concerns teenage pregnancy when it results from a wanted decision and not from contraceptive failure. This happens sometimes mostly among ethic minorities and lower class populations and creates a need for specific approach to prevent it, if possible. It should here be understood that for a considerable number of health professionals the huge majority of young teenage pregnancies should be prevented, for health, social and emotional reasons.
However, in some Member States (e.g. Portugal and Belgium) the law specifically forbids that national health data can be disaggregated by their ethnical provenance. One understands that this was done in order to prevent eventual racist or chauvinist politics. But under a Public Health point of view this becomes a serious difficulty to document the need for a specific intervention targeted at those groups.
Also, in the youth pilot survey about sexual health, some socio-economic and ethnical inequalities were probably not detected. First, because of the sampling itself: students attending the high-school answering a questionnaire during the classes.
Young people (probably, mostly from ethical minorities) that already drop out from the school (in certain cases those with high risk sexual behaviours) were missed.
As far as total fertility rate is considered, again the consensual clinical and health policy-makers feeling is that the rate is higher for several ethical minorities and among some of the lowest socio-economic levels. Indeed, it is accepted that fertility rate is often higher among these sub-groups.

Time trends

Figure 1 The mean age of women at first childbearing in 1960–2003



i) Several positive trends have been seen in the European Union: induced abortion rates are decreasing; contraceptive reliable methods are relatively highly used; acceptability of HIV testing during pregnancy is very high; teenage birth rate is decreasing, with low rates in most EU countries.
ii) But there also negative tends: fertility rates have been and persist below replacement level; postponement of childbearing is continuing (Figure 1) ; caesarean sections are increasing.

3 Incidence / prevalence of SRH indicators

A previous article (Temmerman et al. 2006) presented SRH indicators and described their availability in two EU Member States, Germany and Italy. These SRH indicators were created within REPROSTAT project, modifying and completing the pre-existing WHO global indicators for world purposes.

More recently (Gissler 2008, in publication), it was studied whether the SRH indicators are available and comparable, also in order to illustrate whether cross-country comparisons are feasible to pinpoint areas of concern and give ideas for future research.

Besides the 15 REPROSTAT SRH indicators, caesarean section was included. Indicators on HIV and induced abortions were divided into two parts. This resulted in a total of 18 indicators.

Information from eight countries was gathered through REPROSTAT 2 local participants. The requested data were obtained from various data sources, mainly from routine health statistics and health surveys; these data were completed by existing health information available in Eurostat New Cronos database (Eurostat 2007), Health for all-statistical data base (WHO 2007) and OECD Health Data (2007).

We will concentrate our attention in three essential SRH indicators, which represent three of the SRH main areas where, with all the limitations, there are reliable data:

- Total fertility rate;
- Mean maternal age at first childbearing (figure 1);
- Birth per 1000 women among 15-19 years old.

The *fertility rates* have long been below the replacement level of 2.1. The postponement of childbearing is continuing, even though it seems that the mean age at first childbearing seems to be diverging in the old EU Member States.

This indicator should be considered together with the *mean maternal age at first childbirth*, because usually it is accepted that the first one is one of the consequences of the second one: if a woman has her first childbirth at the end of her twenties, most probably she will not have many children.

However, in Poland, an extremely low fertility rate coexists with a relatively young maternal age at the first childbirth (24.7 years).

Whatever the relationship between these two indicators is, the total fertility rate in the eight countries considered in this study ranged from 1.2 in Poland (surprinsigly for some people, due to the huge catholic influence existing in this country) to 1.9 in France.

Maternal age at the first child birth ranged from 24.6 years in Romania to 29.2 years in Spain (see Figure 1).

Under an epidemiologic and Public Health perspective, having the first term pregnancy after 30 years old is a recognized increased risk factor for breast cancer.

As far as birth per 1000 women between 15-19 years is considered (i.e., most of the usually called teenage mothers, since those aged less than 15 a very few) it ranges from 9.3 in France to 33.8 in Romania, in 2005.

This indicator by no way necessarily reflects direct contraceptive failure – due to both induced abortion and intended pregnancy among some adolescents.

But, anyway, the reasons for such a huge discrepancy among different Member States have to carefully be analyzed and critically understood in the context of specific health and cultural contexts and environments of each region, community and country.

4 Morbidity

Although we do not have available data about sexual and reproductive health morbidity, it is obvious that it exists.
In certain cases the same disease can affect more than one single recommended indicator. This is the case, for instance with Chlamydia or HIV infection; both of these infections can be

one of the causes of infertility (trying to get pregnant for one year or more and deliveries associated to ART).

Also, mean age at first intercourse and contraceptive use at first intercourse can be linked with age-specific birth rate in teenagers. It would be important to consider here young maternal (i.e. pre-eclampsia and social and emotional issues) and fetal morbidity (i.e. preterm deliveries and intra uterine growth retardation fetus), specially associated to young teenage (less than 17 years) pregnancy. We are not aware of existing European data about this recognized problem.

Contraceptive failure is obviously related to induced abortion, two important indicators of sexual morbidity, even when the induced abortion is safe, legal and rare.

As already mentioned, mothers are increasingly delivering their first child at older ages. Maternal and fetal problems are well known: increased incidence of dystocic deliveries (e.g. cesarean section), maternal diabetes, hypertension, fetal chromosomal anomalies and increased spontaneous abortions. Sub fertility or infertility, with increased deliveries associated with ART (not to speak about its costs) are well recognized morbidity issues (Williams Obstetrics, 2005).

More difficult to evaluate in all its extension is the morbidity linked to an unpleasant sexual life. Indeed, several unpleasant health outcomes can be seen as a result of a poor sexual health: depression, mood instability, anxiety, poor self, insomnia, psycho-somatic complains. Sexual well being is a recommended SRH indicator that needs further development.

5 Conclusion

Most Member States gather SRH data from population, birth and health statistics and registers, but health interview and examination surveys, common in most EU Member States, very seldom include data on SRH.

For this reason, (and also because usually there is no consensus on questioning and data collection methods which may lead to variation in inclusion criteria, age groups and recall time), the availability and comparability has been significantly worse for SRH indicators taken from surveys, compared to the indicators taken from routine statistical systems.

In order to overcome all these difficulties and discrepancies, it seems essential to conduct a common survey for all EU countries, including a core module containing questions about SRH.

Sexual and reproductive health is an important measure of the general health and social well being of a population. Moreover, the scope of sexual and reproductive health extends across the life span (from adolescence to the ageing) and across several Public Health domains.

Collecting reliable sexual and reproductive health data, even if only considered through the minimum list of indicators that REPROSTAT has recommended, should be an urgent priority on the health policy agenda.

In order that sound evidence based politics can be taken on these issues, some more evidence based knowledge and wisdom is needed, overcoming existing ignorance and misconceptions.

Several alternatives (not necessarily ant agonic) have been suggested. It is important that:

i) Additional core questions on SRH are included (also covering men health) in the next European Health Interview Survey (EHIS);
ii) European Union Member States, through their statistics and health authorities, agree on the suggested SRH indicators definitions, in order to make comparisons more evidence based;
iii) Attention is given to areas such as sexual well being and gender issues (violence included);
iv) Specific larger an anonymous pan-European youth SRH surveys will be conducted, taking in consideration some of the questions already raised by the REPROSTAT 2 pilot survey. This can be done extending the current WHO HBSC (Health Behaviour of School-Children Survey), to the age group 15-19.
This can be done with small adaptations and will be a reliable approach to teenagers' specific needs and autonomy.

Reference list

Colgrove J. The Ethics and politics of Compulsory HPV Vaccination. NEJM 2006; 355:2389-2391

Lo B. HPV vaccine and adolescents' sexual activity. BMJ 2006; 332:110-1107

Williams Obstetrics. Cunningham FG, Leveno KJ, Bloom AL, Hauth JC, Gilstrap III LC and Wenstrom KD (eds). McGrawHill, 22nd edition, 2005, pp 194-195

Jahn A, Bloemenkam KWM, Hannaford P, Olsen J, Oliveira da Silva M, Temmerman M on behalf of the REPROSTAT Steering Committee. Monitoring reproductive health in Europe – what are the best indicators of reproductive health ? Human reproduction 2006; 21(9):2199-2200

Gissler M, Hannikainen-Ingamn K, Hemminki E, Oliveira da Silva M, Donati S, Jahn A. The feasibility of European reproductive health indicators
(2008, in publication)

Imamaura m, Tucker J, Hannaford P, Oliveira da silva M, Astin M, Wyness L, Bloemenkamp KWM, Jahn A, Karro H, Olsen J, Temmerman M, on behalf of the REPROSTAT 2 group. Factors associated with teenage pregnancy in the European Union countries: a systematic review. European Journal of Public Health 2007; March 25:1-7

Zeitlin J, Wildman K, Breart G, Alexander S, Barros H, Blondel B, Buitendijk S, Gissler M, Macfarlane A and PERISTAT Scientific Advisory Committee: PERISTAT: indicators for monitoring and evaluating perinatal health in Europe. European Journal of Public Health.13 (3 Suppl): 29-37, 2003.

Zeitlin J, Wildman K, Bréart G, Alexander S, Barros H, Blondel B, Buitendijk S, Gissler M, Macfarlane A: Selecting an indicator set for monitoring and evaluating perinatal health in Europe: criteria, methods and results from the PERISTAT project. Indicators to Monitor and Evaluate Perinatal Health in Europe. Results from the PERISTAT project. Special issue of European Journal of Obstetrics & Gynecology and Reproductive Biology 111 Suppl 1:S5-S14, 2003.

Kosonen P: European integration: a Welfare State Perspectiove. Helsingin yliopiston oikeussosiologian laitoksen julkaisuja No 8. Helsinki 1994.

Kautto M, Moisio P: Poverty in Finland – A comparative perspective approach. In Heikkilä M, Kautto M, (eds): Welfare in Finland. National Research and Development Centre for welfare and Health. Saarijärvi 2004.

Kramers P: The ECHI project . Health indicators for the European community. European Journal of Public Health 2003; 13 (3 supplement): 101–106.

Kautto M: Diversity among Welfare States. Comparative Studies on welfare State Adjustment in Nordic Countries. National Research and Development Centre for Welfare and Health. Research Report 118. Saarijärvi, Finland 2001.

Gissler M, Dumitrescu A, Addor V: Improving the performance of National Health Information Systems: the 2002-2003 reform in Finland from an international perspective. World Health Organization 2005. EUR/05/5046412. Available at:
http://www.euro.who.int/Document/E88075.pdf .

Eurostat: Europe in Figures – Eurostat yearbook 2006–2007.

Council of Europe: Recent demographic developments in Europe 2002. Strasbourg, Council of Europe Publishing. 2003. To be checked.
http://www.coe.int/t/e/social_cohesion/population/demographic_year_book/ (12.6.2006)

McKee M., Ryan J. Monitoring health in Europe: opportunities, challenges, and progress
Eur J Public Health 13 (supplement 3): 1-4, 2003.

Robine J-M., Jagger C.: Creating a coherent set of indicators to monitor health across Europe
Eur J Public Health 13 (supplement 3): 6-14, 2003.

ECDC: European Centre for Disease Prevention and Control.
http://www.ecdc.eu.int/index.html (12 June 2007).

Eurostat: New Cronos database (June 2007).

WHO: Health for all -statistical database (June 2007).

OECD: OECD Health Data 2006 (June 2007)

Statistics Finland: Global statistics: Main religion by country:
http://www.tilastokeskus.fi/tup/maanum/10_uskonnot.xls (June 2007)

HIS/HES database

15 Life Expectancy with Chronic Morbidity

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1 Introduction

This chapter is not about one specific chronic disease but rather brings together all chronic diseases through assessment of life expectancy with and without chronic morbidity in Europe. The generic term for such indicators is health expectancies and they are summary measures of population health combining information on survival with the prevalence of a health measure (Robine 2006). The most common health measure used is disability, producing disability-free life expectancy. Within Europe the Healthy Life Years (HLY) indicator based on a global activity limitation question has been developed by the European Commission in the framework of the European Union Lisbon Strategy* to monitor whether the steady increase in life expectancy observed in Europe is accompanied by an equivalent increase in the expected number of years to be lived in good health and whether the individual lengthening of life can be accompanied by increase in the labour force participation of the older workers. Comparison of HLY across Europe based on data from the Statistics of Income and Living Conditions (SILC) survey 2005 will be available in the EUROGLOREH (Global Health Status Report of the European Union) under preparation.

Background to health expectancies

Research on health expectancies dates back to the 1960s. Being independent of the size of populations and of their age structure, health expectancies allow direct comparison of the different groups that make up populations: e.g. sexes, socio-professional categories, regions. The first method of calculation was proposed by Sullivan in 1971 (Sullivan 1971). Since that time health expectancies have been increasingly used in developed countries to assess the evolution of a population's health status, in particular that of older people (Robine et al. 1999). From 1989, an international research network, REVES (Réseau Espérance de Vie en Santé/Network on Health Expectancy), has coordinated research on summary measures. However comparison between countries remained almost impossible due to national differences in the morbidity data collected, particularly in the study design, the health concepts used and the wording of questions.

The Euro-REVES project

The Euro-REVES project began in 1995 as a concerted action of BIOMED 2 (1995-1997), aiming to identify the reasons for the incomparability of health expectancy calculations in Europe. After three years, Euro-REVES provided recommendations to improve the comparability of health expectancies in Europe and harmonization of health data collections. Today, these recommendations still summarize the spirit of the Euro-REVES approach.

This first concerted action was followed by a second step aiming to propose a coherent set of health indicators for the EU Health Monitoring Program (Euro-REVES 2, 1997-2002), covering the various dimensions of health at the population level. In total 10 instruments were proposed with their exact wording in English (Box 1). The set allows in theory the computation of many health expectancies covering the totality of the conceptual framework of the measurement of population health. This number appeared to be a good compromise between too little and too many, making it possible at the same time to measure the extent of the differences in health between the European Union Member States (MS), to appreciate the causes, to specify the profile of each country and the differences between the various concepts of health: chronic disease, functional limitations, activity restrictions, mental health and health perceptions (Robine et al. 2004). Moreover the instruments aimed to address a major drawback with the then current European study, the European Community Household Panel (ECHP) which was that the questions did not fully distinguish the different facets of

* http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/ec/00100-r1.en0.htm

health according to current views on the disablement process and health measurement (Verbrugge and Jette 1994; Robine, Jagger and Euro-REVES 2003a).

Box 1 Health indicators for the EU Health Monitoring Program, proposed by Euro-REVES, 2002

(1)	a general question about chronic morbidity,
(2)	a set of specific questions on chronic morbidity,
(3)	a set of specific questions on physical and sensory functional limitations,
(4)	a set of specific questions on cognitive functional limitations,
(5)	a general question about activity restrictions,
(6)	a set of specific questions on personal care activities,
(7)	a set of specific questions on household activities,
(8)	a set of specific questions on other activities of daily living,
(9)	a general question about perceived health,
(10)	a set of specific questions on mental health.

Similar methodology was used in the development of the 10 health indicators: a systematic review of the literature on the concept and wording of questions and their previous use in surveys. In addition Euro-REVES harnessed the expertise of other European groups who were working on specific indicators and utilised their recommendations rather than producing contradictory ones. To this end the global and specific questions on chronic morbidity were developed by the EuroHIS Chronic Physical Conditions Network .

The three global instruments (chronic morbidity, activity limitation and perceived health) included in the list of 10 indicators were later defined as the Minimum European Health Module (MEHM) (Box 2). The MEHM has been included in a number of national surveys, in the Eurobarometer since 2002 and in the SILC since its inception in 2003. Most of the indicators proposed by Euro-REVES including the three indicators based on the MEHM and their related health expectancies were selected for the European Community Health Indicators (ECHI) short list, (Sicard and Montserrat, 2004 ; ECHIM, 2007).

Box 2 The Minimum European Health Module (Version 2002)

1.	How is your health in general? Very good / good / fair/ bad / very bad.
2.	Do you suffer from (have) any chronic (long-standing) illness or condition (health problem)? Yes/ No.
3.	For the past 6 months or more have you been limited in activities people usually do because of a health problem? Yes, strongly limited / Yes, limited / No, not limited.

In 2002-2003 Euro-REVES developed the draft of the European Health Status Module (EHSM) for Eurostat that would be one of the core modules of the European Core Health Interview Survey (ECHIS). This module was mainly built from the 10 instruments selected during the second stage of Euro-REVES. Ultimately 9 indicators were chosen: chronic morbidity (global and detailed); activity limitation (global); perceived health (global); physical and sensory functional limitations; personal care activities; household care activities; other activities; and mental health. The major importance of this development was the formation of a strict protocol for the translation process, hitherto the few European surveys that had taken place, for instance the European Community Household Panel (ECHP) had paid less attention to this key aspect for true harmonisation. Indeed it is crucial that even if existing

items are taken from current European Surveys, existing translations are not automatically taken but that new translations following a standard scientific protocol are undertaken. Initially the translation process involved 6 countries but after a series of validation pilots, translations in the remaining languages of the EU27 were undertaken by Eurostat. The systematic, protocol-driven approach taken in the development and translation of the EHSM provided a template for the remaining three core modules of the ECHIS (health determinants, health care and background variables) and has been utilised for the MEHM in the EU-SILC.

The Statistics on Income and Living Conditions (EU-SILC)

Following the decision of the Board of directors, In 2003 Eurostat began to develop the wider European Health Survey System (EHSS) of which the new annual survey called Statistics on Income and Living Condition (SILC) was an integral part. It had already been decided that the EU-SILC would contain the Minimum European Health Module (MEHM). This was the fourth step in the development of common health interview surveys in the European Statistical System (ESS). The first was the introduction of a small module on health in the ECHP (1994-2001) as a first trial of harmonized data collection on an annual periodicity. The second step was the systematic data collection at the National Statistical Institutes (NSI) of 12, then 18, health or health-related items, such as perceived health. The third step was the introduction in 2002 of a disability module in the European Community Labor Force survey (LFS) (Bonte et al, 2003).

The EU-SILC (Community Statistics on Income and Living Conditions) was first launched in 2003 as a replacement to the ECHP which had ended in 2001. However 2003-2004 was a transitional period, during which data were provided by national sources with post-harmonisation giving a break in series. EU-SILC was launched under a gentleman's agreement with six EU15 countries plus Norway in 2003 and re-launched under a Regulation with twelve EU15 countries plus Iceland in 2004 and the remaining three EU15 countries in 2005. In Estonia it was launched in 2004 and in the remaining EU10 new member states in 2005. Bulgaria, Romania, Turkey and Switzerland launched SILC in 2006 (SILC, 2007).

This chapter is written by the European Health Expectancy Monitoring Unit (EHEMU) which provides scientific support to the European Commission for the Healthy Life Years (HLY) indicator through successive projects of the Community action programmes for public health (DG Health and Consumer Protection). With its first grant (EHEMU, 2004-2007), EHEMU developed a comprehensive website (www.ehemu.eu) including an Information System, several scientific reports on health expectancy in Europe, training material including a step-by-step calculation guide with accompanying software (Jagger et al 2006), a glossary of key definitions and an Interpreting guide aimed at non-technical audiences as well as bibliographic tools. Moreover, EHEMU performed the feasibility study for the adoption of HLY as a Structural Indicator. With its second grant (EHLEIS, 2007-2010), EHEMU will develop further the European Health and Life Expectancy Information System (EHLEIS), provide new insights into gender gaps in health expectancies (HE) and trade-offs between health dimensions through scientific reports, organize a training workshop in HE and a European Health Expectancy conference and provide scientific resources to the European Union Task Force on Health Expectancies (TF-HE).[*] Calculations provided by EHEMU are made on line through the EHEMU Information System and are available on the EHEMU website.[†] Members of EHEMU were also major contributors to the earlier Euro-REVES projects which developed the MEHM.

In this chapter we report comparisons across Europe of life expectancy with chronic morbidity (LEwCM) at age 65 based on the global chronic morbidity question of the MEHM in

[*] http://ec.europa.eu/health/ph_information/implement/wp/indicators/taskforce_expectancies_en.htm
[†] www.ehemu.eu

SILC 2005. Data is therefore available for 25 countries (Austria, Belgium, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, United Kingdom). Although comparable trend data on global chronic morbidity is unavailable, we report trends in life expectancy at age 65 since these form an integral part of LEwCM.

2 Health determinants/risk factors

Other than age and gender, these are not available for global chronic morbidity in the same way as other chapters since life expectancy (and therefore the life table) is generally only available by these subgroups.

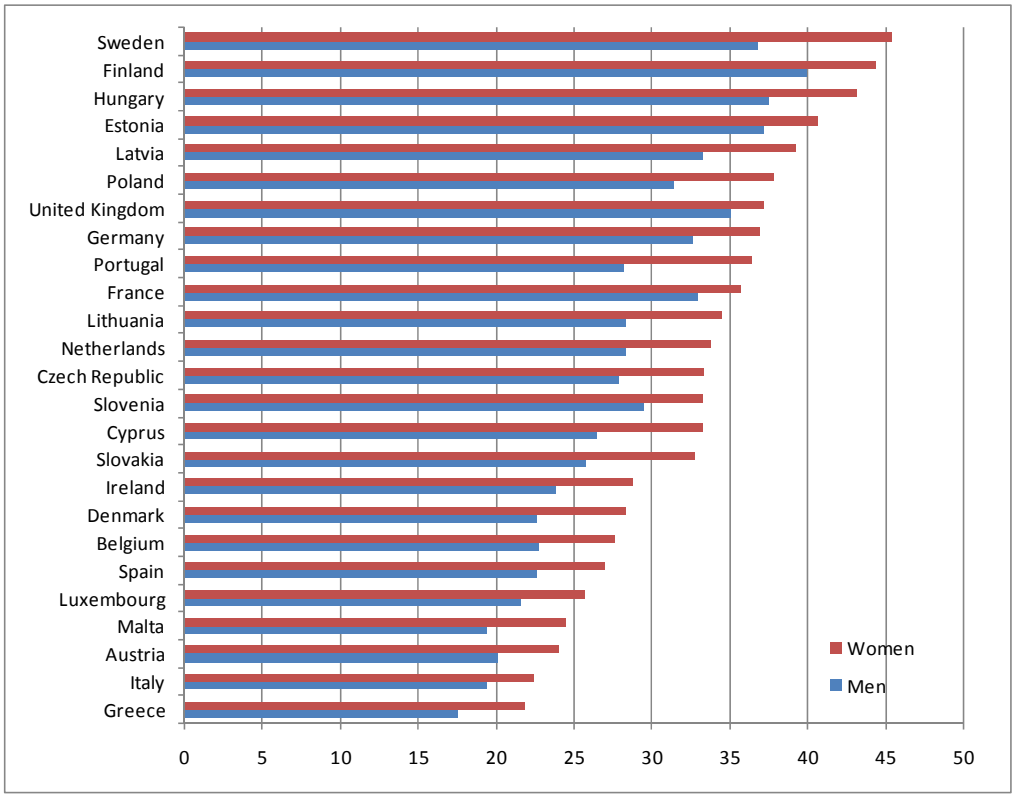
3 Prevalence of global chronic morbidity

Global chronic morbidity is measured by the MEHM question “Do you suffer from (have) any chronic (long-standing) illness or condition (health problem)? Yes/ No”.

The data were collected from SILC to ensure maximum harmonization for all Member States and are available for EU25 for 2005 and EU27 from 2006. For this chapter only 2005 data are available.

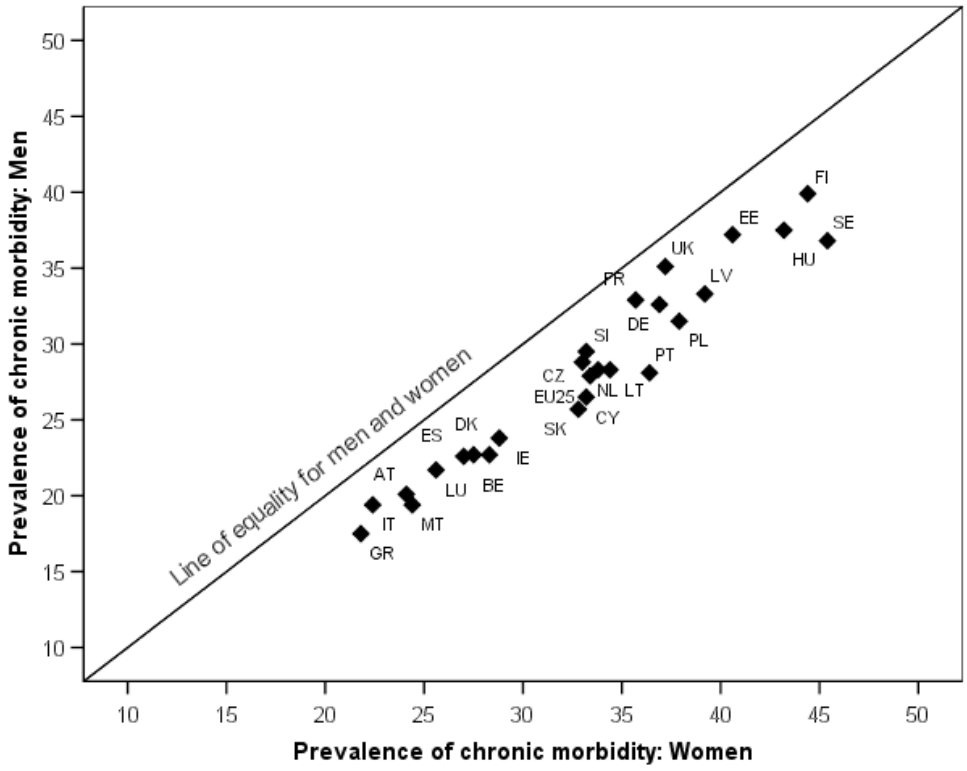
Figure 1 summarizes for the 25 Member States the prevalence of chronic morbidity in 2005, standardised to the age structure of the EU25 in 2005. Considerable disparities are evident between the European Member States in the level of chronic morbidity reported by the population. For men the prevalence ranges from 17.5% (Greece) to 39.9% (Finland) and for women from 21.8% (Greece) to 45.4% (Sweden). The reported prevalence in women is higher than that for men within every Member State though the gender gap varies from 2.1% in the United Kingdom to 8.4% in Sweden (Figure 2). However men and women give the same picture of the diversity of chronic health problems reported in Europe.

Figure 1 Prevalence of chronic morbidity at age 16 and over* for the EU25, by Member State and gender, ranked by female prevalence (Source: EU-SILC 2005)



*Proportion standardized by age with the EU25 2005 age structure

Figure 2 Standardised prevalence of chronic morbidity in EU25 for men and women (Source: EU-SILC 2005)



4 Life expectancy with chronic morbidity (LEwCM)

Life expectancy with chronic morbidity (LEwCM) is calculated by the Sullivan method (Sullivan, 1971) and using an algorithm developed by Eurostat in collaboration with EHEMU.[*] Briefly this entails applying the age and gender specific prevalence of chronic morbidity, presented in the previous section, to the life table for the corresponding years of the survey from which the prevalence data were obtained. Further methodological reports on health expectancies can be found on the EHEMU and Europa websites. As it forms the basis of LEwCM we first report life expectancy at age 65 by gender and trends over the period 1995-2005. Life expectancy estimates since 1995 are computed using the current Eurostat algorithm, and MS death counts and population estimates from the Eurostat database.[†] EHEMU may have more recent data directly collected at National Institutes of Statistics (NSI). Calculations made from such data are flagged as provisional.

Life expectancy at age 65

Life expectancy at age 65 is one measure of the ageing of the population and for the EU25 in 2005 was 16.7 years for men and 20.3 years for women.

Table 1 Life expectancy and life expectancy with chronic morbidity at age 65 in 2005 in EU25 (Source: EU SILC 2005 and EHEMU Information System)

	Life expectancy (years)		**Life expectancy with chronic morbidity (years)**	
Country	**Men**	**Women**	**Men**	**Women**
Austria	17.0	20.4	7.0	9.5
Belgium	16.6	20.2	7.1	10.1
Cyprus	16.8	19.1	10.3	13.6
Czech Republic	14.4	17.7	8.5	11.6
Denmark	16.1	19.1	5.6	7.7
Estonia	13.1	18.0	9.3	14.5
Finland	16.8	21.0	13.0	16.7
France	17.7	22.0	11.3	14.3
Germany	16.9	20.1	10.6	13.2
Greece	17.1	19.2	8.5	10.5
Hungary	13.3	17.2	9.4	13.3
Ireland	16.8	20.0	8.4	10.5
Italy	17.7	21.7	8.5	11.1
Latvia	12.5	17.2	7.7	12.0
Lithuania	13.0	17.6	7.1	11.8
Luxembourg	16.7	20.4	6.7	9.5
Malta	16.2	19.4	7.9	10.9
Netherlands	16.4	20.1	7.8	10.8
Poland	14.3	18.5	9.4	13.8
Portugal	16.1	19.4	9.3	13.8
Slovakia	13.3	17.1	7.1	10.5
Slovenia	15.2	19.3	8.4	11.5
Spain	17.3	21.3	8.6	11.7
Sweden	17.4	20.7	11.1	14.8
United Kingdom	17.0	19.5	10.3	12.2
EU25	16.7	20.3	9.6	12.4

[*] http://ec.europa.eu/health/ph_information/indicators/lifeyears_en.htm
[†] http://epp.eurostat.ec.europa.eu

These average values hide considerable differences between the Member States with a gap between the highest and lowest values in men of 5.2 years from 12.5 years (Latvia) to 17.7 years (France); in women a slightly smaller gap of 4.9 years from 17.1 years (Slovak Republic) to 22.0 years (France) (Table 1) though correlation between male and female life expectancies at age 65 were high (ρ=0.84, p<0.001). The gender gap in life expectancy at age 65 within Member States in 2005 was only 2.1 years for Greece compared to 4.9 years for Estonia.

Over the period 1995 to 2005, life expectancy at age 65 increased in the EU25 from 15 years to 16.7 years for men and from 19.1 years to 20.3 years for women. The average increase in life expectancy at age 65 across all Member States was 1.5 years for men and 1.4 years for women however patterns varied between Member States over this time period. For both men and women Ireland showed the largest increase with a gain of 3.3 years over the decade. Lithuania had the smallest increase for men (0.1 years) and Cyprus for women (0.6 years). There appeared to be little relationship between the increase over the period 1995 -2005 and life expectancy at age 65 in 1995 for either men or women. Thus there was no evidence that Member States with the highest life expectancies at the beginning of the period were showing signs of reaching a maximum value.

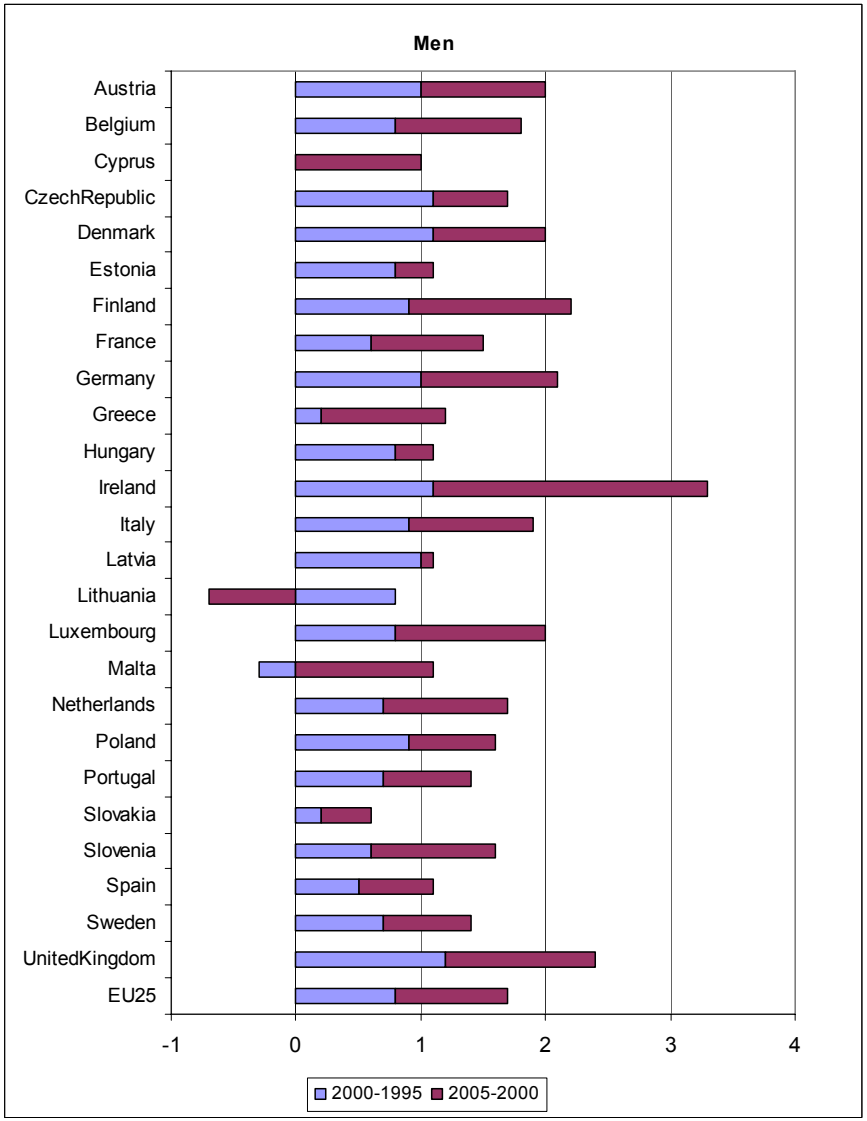
When increases over the decade were separated into early (1995-2000) and later (2000-2005) changes (Figure 3) further diversity between Members States is apparent. On average increases in the later period were marginally greater than those in the early period. Increases in the two periods remained constant in Austria, Portugal, Sweden and United Kingdom in men and Austria in women. Increases in the first period were greater than those in the second period, suggesting a slowing down of the life expectancy increase at age 65 for the Czech Republic, Denmark, Estonia, Hungary, Latvia, Lithuania, Poland in men and Czech Republic, Germany, Hungary, Latvia, Lithuania, Luxembourg, Poland, Portugal, Slovak Republic, Slovenia, Spain, United Kingdom in women. In Lithuania for both men and women life expectancy at age 65 declined in the period 2000-2005.

Years with chronic morbidity at age 65

Applying the prevalence of chronic morbidity within age groups to the life tables gives the expected years spent with chronic morbidity. Table 1 shows these life expectancies with chronic morbidity at age 65 by Member State and gender with values for the EU25 of 9.6 years for men and 12.4 years for women. The gap in LEwCM between Member States is greater than those for life expectancy being 7.3 years for men (from 5.6 years with chronic morbidity in Denmark to 13.0 years in Finland) and 8.9 years for women (from 7.7 years in Denmark to 16.7 years in Finland). When taken together with the total life expectancies in Table 1, we can see the proportion of remaining life at age 65 spent with chronic morbidity (Figure 4). As with most health measures women spend a greater number of years but also a greater proportion of their remaining longer life with chronic morbidity. At age 65 this ranges for men from 34.8% of remaining life spent with chronic morbidity in Denmark to 77.0% in Finland and for women from 40.5% in Denmark to 79.6% in Finland.

The evidence from Europe does not appear to support that Member States with longer life expectancy have longer healthier life expectancy or rather that they have less life expectancy with chronic morbidity. In Figure 5 for men particularly there appears to be two distinct clusters: the eastern European countries of Estonia, Poland, Latvia, Lithuania, Slovak Republic, Hungary, the Czech Republic and the remaining Member States. However there appears little evidence that Member States with the lowest proportion of unhealthy life (spent with chronic morbidity) are also those with the longest overall life expectancy at age 65.

Figure 3 Changes in life expectancy at age 65 in period 1995-2000 and 2000-2005 by Member State and gender (Source: Eurostat and EHEMU Information System)



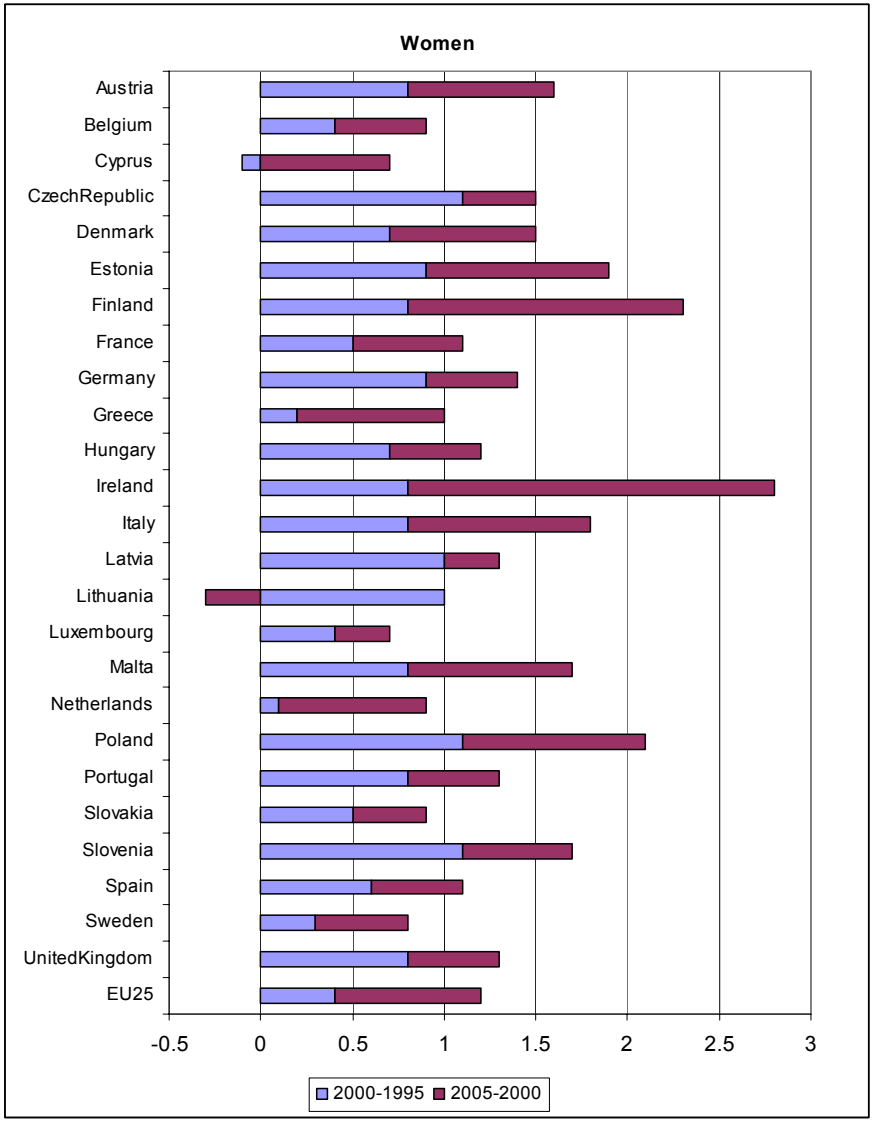
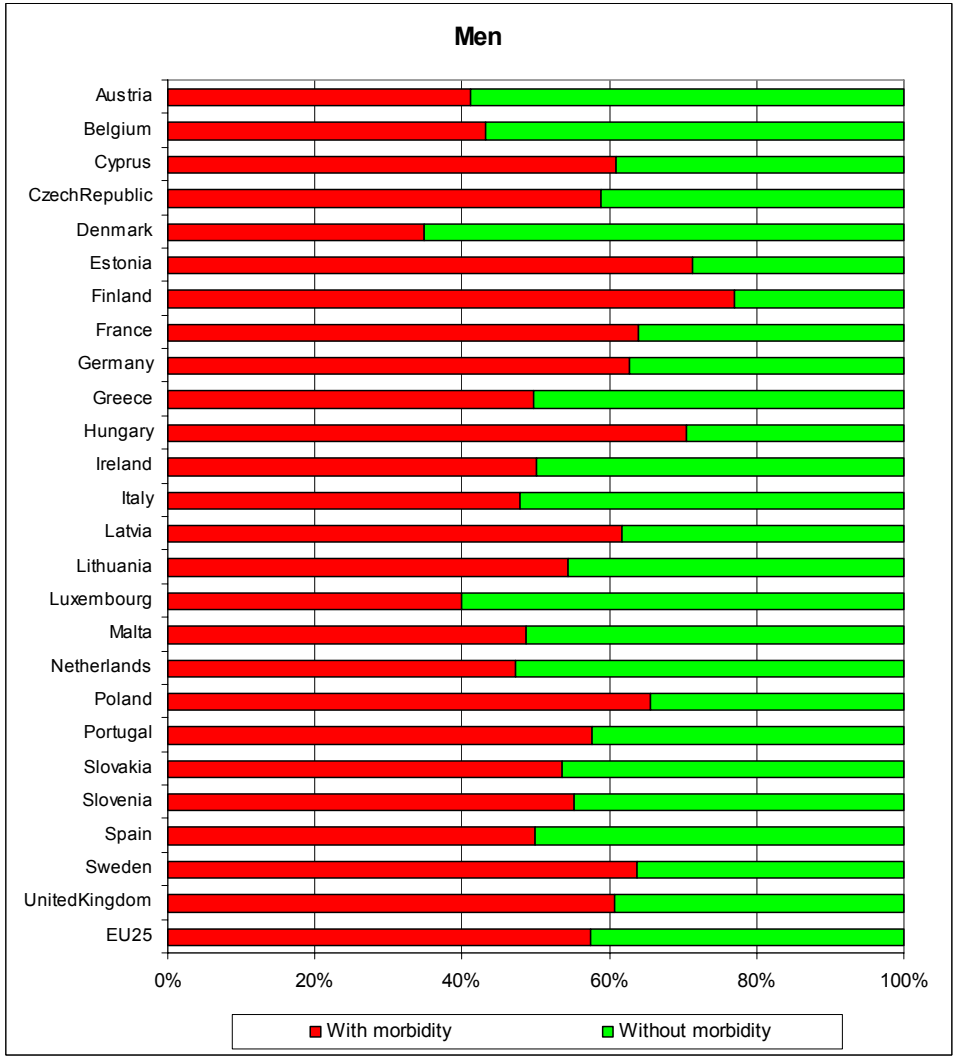


Figure 4 Proportion of remaining life at age 65 spent with and without chronic morbidity, by Member State and gender (Source: EU-SILC 2005 and EHEMU Information System)



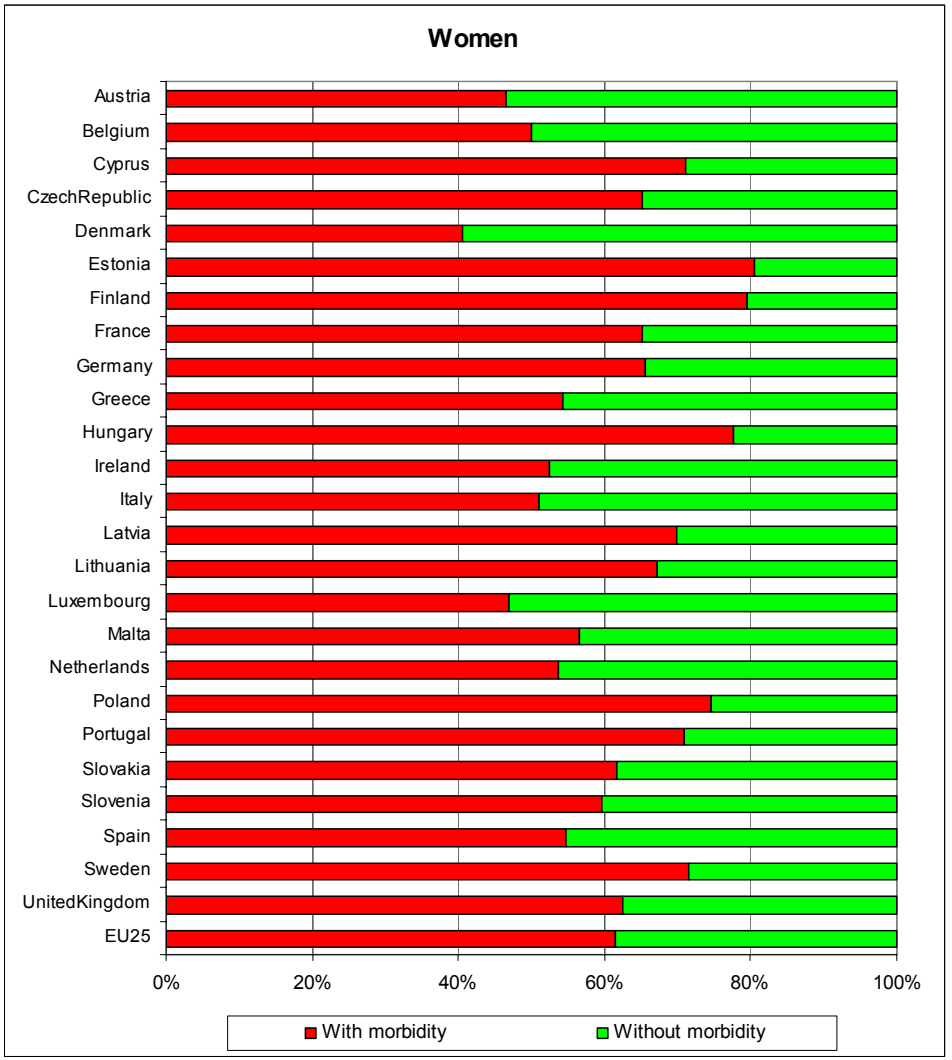
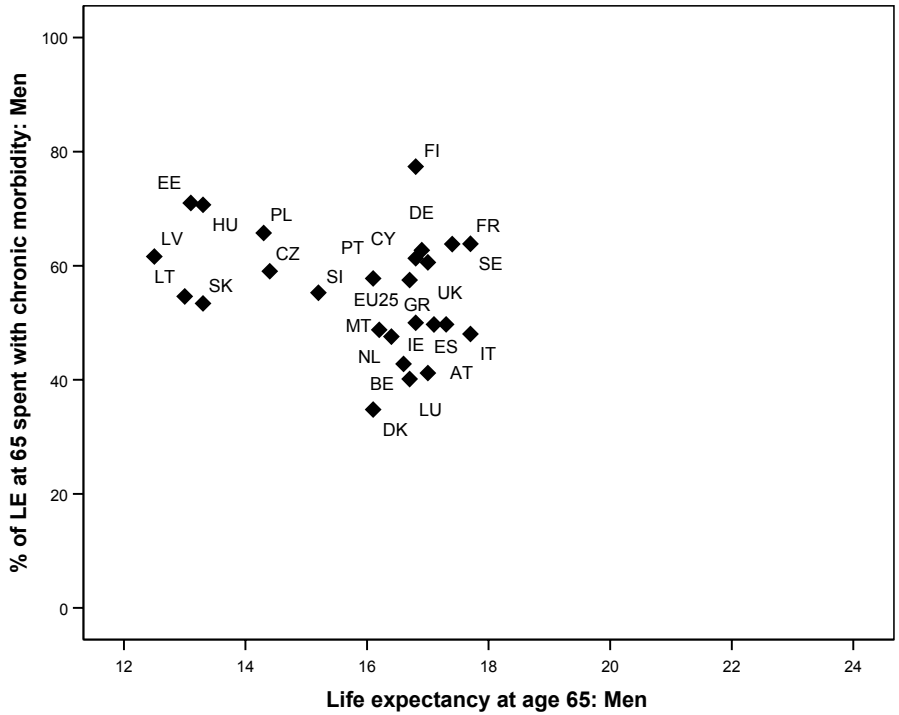
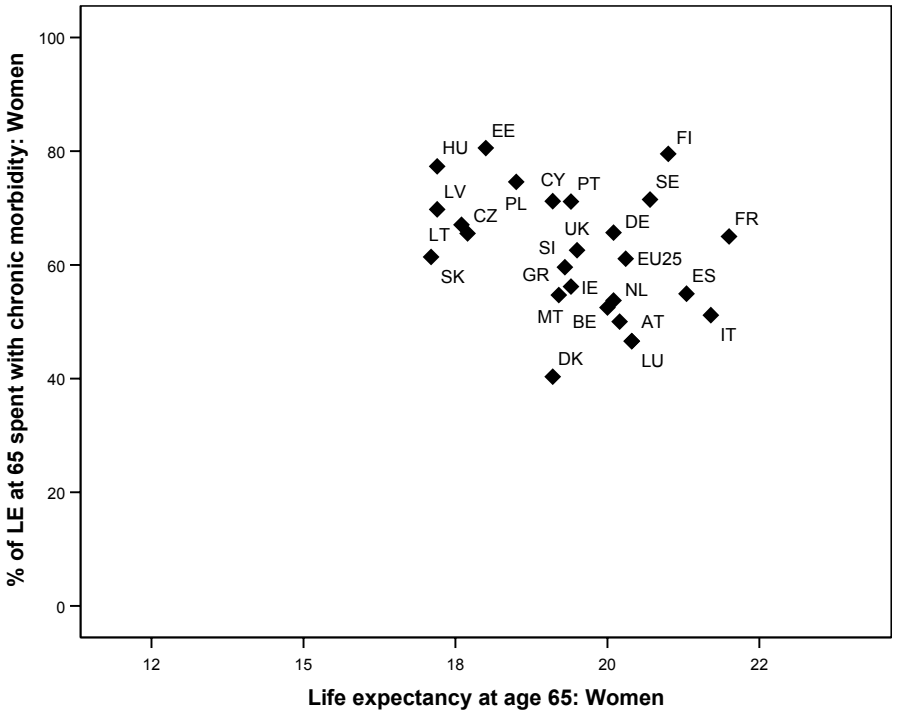


Figure 5 Proportion of remaining life at age 65 spent with chronic morbidity and life expectancy at age 65, by Member State and gender
(Source: EU-SILC 2005 and EHEMU Information System)





5 Conclusion

A decade ago, the World Health Organization (WHO) underlined that increased longevity has no value per se if it is not is accompanied by a healthy and active life, allowing a true economic and social participation of the older citizens (World Health Organization, 1997). Health expectancies such as life expectancy with chronic morbidity offer the means to monitor that reducing the longevity gaps in Europe and increasing life expectancy will be accompanied by better health and quality of life. Our findings from SILC 2005 suggest that longevity gaps are still evident in Europe with gaps of around 5 years for both men and women between countries with the highest and lowest life expectancies at age 65. Given that the average life expectancy at age 65 in the EU25 is 16.7 years for men and 20.3 years for women, this gap of 5 years is substantial. Gaps in life expectancy with chronic morbidity at age 65 are even greater than for life expectancy – over 7 years for men and almost 9 years for women.

Significant progress has been made during the last few years in developing sustainable summary measures of population health to meet the EU political agenda alongside similar efforts in North America. Indeed after almost 20 years of research on health expectancies (Robine et al 2003b), on both sides of the North Atlantic governmental authorities request these simple and robust indicators to monitor the quality of life and support active ageing and employment in the context of lengthening of life. International comparability needs further improvement as the US and the EU are still not using the same survey design or instruments and comparability with Japan has still to be developed. However the development of the Minimum European Health Module (MEHM) included in the SILC has vastly improved comparability within Europe. The MEHM includes measures of chronic morbidity, perceived health and disability, the latter by means of the Global Activity Limitation Indicator (GALI) (Van Oyen et al 2006), addressing previous inadequacies in distinguishing different health facets. In addition greater care has been taken to ensure optimal translation to the underlying health concepts.

Future initiatives

In 2002 Euro-REVES proposed a plan for the development of health statistics in Europe paralleling the first European Public Health Programme (2003-2008). This plan, which was accepted by the Board of European Directors of Social Statistics, comprised three main points: (i) the implementation of an European Core Health Interview Survey (ECHIS) initially scheduled for 2006 (now scheduled for 2008/2009), and made of standardized modules and instruments, available from (ii) a repository of European survey instruments, this whole forming part of a broader (iii) European Health Survey System (EHSS). ECHIS was to be run every five years from 2008 onwards and would include four core modules on: health status, health care, health determinants and background variables. All the survey instruments were to be validated for European use and available in a repository of common instruments. Eventually EHSS was defined as a combination of existing international or national survey instruments with appropriately designed common modules. The ECHIS managed by the Community Statistical Programme (Eurostat) remains at its heart but it could be joined by a set of Special Health Interview Survey modules and by a European Health Examination Survey, managed by the Health Programme 2008-2013 (DG Health and Consumer Protection). In addition there will be an annual component with the EU-SILC and the Mini European Health Module (MEHM), providing the data needed annually for the European Structural Indicators in the field of health, such as the Healthy Life Years (HLY). The first round of the ECHIS will take place in 2008/2009 in all the EU Members States and thereafter will be repeated every five years. The survey might take various forms in the different countries, but in all Member States the common elements could be the core modules such as the European Module on Health Status (EMHS) which includes the MEHM together with the European Health Determinants Module (EHDM), the European Health Care Module

(EHCM) and the European Background Module (ECHIS, 2007). This design with the ECHIS including the MEHM will allow calibration every five years of the HLY series computed annually with the SILC as well as more in-depth analyses with the wealth of data collected by ECHIS and addressing the shortcoming on data availability across all Member States (Robine and Jagger 2007a).

Further political demands about the quality of life of populations will come in the near future and policy makers will have more experience and higher expectations of such indicators. To be ready to meet these, the scientific community should work on second generation summary measures: true period indicators (using incidence in place of prevalence), less subjective (using measured in place of self-reported morbidity and disability and covering the whole population (rather than excluding those living in institutions such as long-term care establishments).

Reference list

Bonte, J., Jagger, C., Robine, J-M. (2003) Vers un système européen d'enquête sur la santé. Actualité et Dossier en Santé Publique (42),33-35.

ECHIM (2007) http://www.echim.org/docs/echi_shortlist.pdf
(Accessed 14/12/2007)

ECHIS (2007)
http://ec.europa.eu/health/ph_information/dissemination/reporting/ehss_01_en.htm
(Accessed 14/12/2007)

Jagger, C., Cox, B., Le Roy, S., EHEMU (2006) Health Expectancy Calculation by the Sullivan Method. Third Edition. EHEMU Technical Report September 2006.

Robine, J-M. (2006) Summarizing health status. In: Pencheon D, Guest C, Melzer D, Muir Gray JA, (Eds). Oxford Handbook of Public Health Practice. OUP, New York, pp160-168.

Robine, J-M., Jagger, C., Euro-REVES (2003) Creating a coherent set of indicators to monitor health across Europe: the Euro-REVES 2 project. European Journal of Public Health 13(3),6-14.

Robine, J-M., Jagger, C, Mathers, C.D., Crimmins, E.M., Suzman, R.M. (2003) Determining Health Expectancies. Wiley, Chichester, 428p.

Robine, J-M., Jagger, C., Van Oyen, H. (2004) The Euro-REVES approach: a vision for Europe. In: Joint UNECE/WHO/Eurostat Meeting on the Measurement of Health Status, Geneva, 24-26 May 2004. Invited paper available at
http://www.unece.org/stats/documents/2004.05.health.htm
(Accessed 14/12/2007)

Robine, J-M., Romieu, I., Cambois, E. (1999) Health expectancy indicators. Bull WHO 77(2), 181–5.

Sicard, F. Montserrat, A. (2004) Strategy on European Community Health Indicators (ECHI): The "Short List" In: Network of Competent Authorities on Health Information, Luxembourg, 5-6 July 2004.
http://ec.europa.eu/health/ph_information/implement/nca/docs/ev20040705_co11_en.pdf
(Accessed 14/12/2007)

SILC (2007) http://europa.eu.int/estatref/info/sdds/en/ilc/ilc_base.htm
(Eurostat metadata) (Accessed 14/12/2007)

Sullivan, D.F. (1971) A single index of mortality and morbidity. HSMHA Health Reports 86, 347–54.

Van Oyen, H. van der Heyden J, Perenboom R, Jagger C (2006) Monitoring population disability: evaluation of a new Global Activity Limitation Indicator (GALI). Soc Preventiv Med 51(3):153-161.

Verbrugge LM, Jette AM (1994) The disablement process. Soc Sci Med 38(1):1–14.
World Health Organization (1997) The World Health Report 1997: Conquering suffering, Enriching humanity. World Health Organization, Geneva.

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