

Research Note

What are the methodological issues related to measuring health and drawing comparisons across countries?

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Abstract:

Measuring population health is vital for creating effective health interventions and policies, informing resource allocation, guiding health impact assessment, and identifying the determinants of health across diverse settings. The aim of this brief is to review the methodological issues related to measuring health within and across countries and outline recommendations for improving health measurement.

Population health can be measured using macro-level and micro-level indicators. While macro- or population-level data provides a broad picture or summary of health, (e.g. life expectancy, infant mortality and health-adjusted life expectancy), micro- or individual-level data comprise a variety of objective and self-assessed indicators on specific aspects or dimensions of health.

Population summary measures although useful for estimating the overall population health and the global burden of disease, may provide minimal indication of the underlying factors that may be influencing health attainment in a country. While efforts have been made to combine mortality and morbidity, e.g. in healthy- and disability-adjusted life expectancy, these methods have been criticized on the grounds of methodological limitations. Avoidable mortality – or causes of death that should be avoided in the presence of timely and effective health care – represents an alternative measure of population health that can be better attributed to the health system, broader public health policies and also changes in lifestyles.

On the micro-level, objective health measures such as blood pressure and body mass index are important both clinically and from a health system perspective, but they are often more expensive to collect and may be subject to measurement error. Conversely, self-assessed measures such as general health (usually ranging from excellent to poor) and limitations in daily activities although commonly available, are sensitive to variations in socio-economic conditions, individual expectations as well as wording and meaning of assessment questions. Developing an index of health on the basis of several indicators, or including vignettes in surveys are two possible methods of reducing systematic bias associated with general measures of self-assessed health.

Significant advances have been made at EU-level to systematically measure health status. However improved longitudinal data is needed to make robust causal determinations about health. In addition, while extensive information is collected at national level, better international coordination of survey design and implementation would help facilitate and improve cross-country comparisons. These efforts will help to provide decision-makers with more accurate and meaningful information necessary to develop policies and programmes that most effectively address health needs and inequalities within limited resources.

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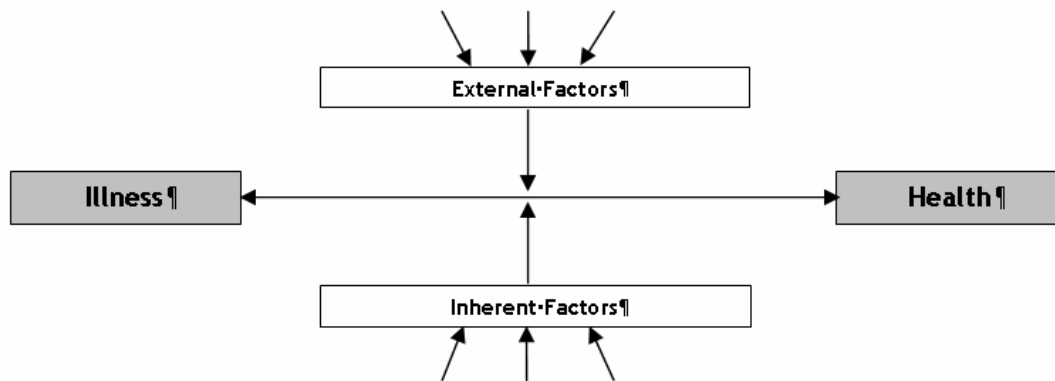
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I. Introduction

The World Health Organization (1948) defines health as “a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity”³. Thus health encompasses a broad spectrum of dimensions and is impacted by a multitude of different factors, some *inherent* and other *external* to the individual (Figure 1).



The *inherent* factors that impact health include age, genetics, and gender. Alternatively, the *external* factors that affect health encompass social class, occupation, education, lifestyle habits (e.g. diet, stress, and smoking), living and working conditions, social networks and support, and the environment. In light of the multidimensionality of health, numerous measurement tools have been developed by researchers, policy-makers and other stakeholders. These are differentiable into *macro*- and *micro-level* health indicators. Macro- or population-level indicators provide a broad picture or summary of health, often through a single, aggregate measure (the most common are life expectancy, mortality rates, infant mortality and indicators of healthy life expectancy), while micro- or individual-level indicators comprise detailed clinical, behavioural, and personal information. Micro-level indicators can be further categorized by *objective* and *self-assessed* health measures.

Among the micro-level indicators, objective measures gather clinical information such as body mass index, observed ability to carry out activities of daily living (ADLs), blood pressure, eye sight, hearing, walking speed, and basic anthropometry. In comparison, self-assessed health measures provide a subjective evaluation of health status. For example, the most commonly used self-assessed health indicator asks a respondent to classify their current health status on some form of hierarchical scale (“How would you rate your current health? Would you say it is excellent, very good, good, fair, or poor?”). Although there is large controversy on the use of self-assessed measures, they are important tools for evaluating population health not only because of commonly available but also because they predict objective health status, and capture a number of other factors associated with health (e.g., social and mental functioning) that are not normally available (Zimmer et al., 2000; Idler & Benjamin, 1997; Watson & Pennebaker, 1989).

Measuring health is essential to evaluate and compare changes within and across countries, both in a specific time period or over time. At national level, health measures can be used to identify health disparities, track population trends, measure trends in the incidence and prevalence of diseases over time, and build broad cooperation around a measure of population health (e.g. mental health). Moreover, on both local and national levels, health indicators provide valuable information on the state of health of particular sub-groups (e.g. adolescents, older people, immigrants, etc.). This information is

1 The views expressed are those of the authors and do not necessarily represent those of the European Commission.
2 A number of experts have contributed to this research note by providing country reports, for which the authors are grateful. Their names and affiliations are listed in Appendix 4.
3 This statement was extended to include the ability to lead a ‘socially and economically productive life.’ Furthermore, alternative definitions have been put forth such as that by Marc Lalonde from Canada which suggests four general determinants of health: human biology, environment, lifestyle, and healthcare organization (Lalonde 1974). More recently WHO stated: “The social conditions in which people live powerfully influence their chances to be healthy. Indeed factors such as poverty, social exclusion and discrimination, poor housing, unhealthy early childhood conditions and low occupational status are important determinants of most diseases, deaths and health inequalities between and within countries” (WHO, 2004).

vital for creating effective health interventions and policies, informing resource planning and allocation, as well as for monitoring the health impact of a particular programme. On an international level, measuring population health could allow comparisons across countries, to identify the determinants of health across diverse settings, and to evaluate the effectiveness of different health systems in achieving health improvement.

The aim of this brief is to outline the methodological issues related to measuring health within and across countries. Advantages and disadvantages of both macro- and micro-level health measures are discussed, and the most commonly used health indicators in the EU and other industrialized countries are presented. Finally, the brief will explore various issues inherent to cross-country comparisons, and provide recommendations for improving health measurement.

II. Macro-level health measures

Population summary health measures and key methodological issues

The most commonly used macro-level or summary measures of population health are life expectancy at different ages, mortality rates and infant mortality. However, these crude measures of mortality do not measure morbidity and/or quality of life, whereas most decision-makers are also interested in accounting for the morbidity of a population, in order to provide a more accurate picture of health. Key cross-cutting EU policies, such as the Lisbon agenda, emphasize the importance of using healthy life expectancy indicators as an appropriate indicator for short-term allocation of social and health resources. However, uptake of these measures are limited at the country level (Oortwijn, et al. 2006).

In recent years, various summary measures of population health have been developed that capture information on both mortality and morbidity (measured either as disease free or quality of life), as the volume of work produced by the members of the Réseau de l'Espérance de Vie en Santé (REVES) demonstrates (Robine et al., 1999; Mathers, et al. 1994). Healthy life expectancy indicators provide an estimate of the extent to which increases in longevity result in increased time spent in good health, as opposed to increased time spent with disease or disability. The main measures are disability-free life expectancy -DFLE- (Bronnum-Hansen, 1998; Mutafova et al. 1997; Sihvonen et al. 1998), disability-adjusted life expectancy -DALE-, and its revised version often called health-adjusted life expectancy -HALE- (Murray, Lopez, 1996, 1997). The DALE is formulated on the basis of disability-adjusted life years (DALYs), which represent the sum present value of future years of lifetime lost through premature mortality, adjusted for the average severity of any mental or physical disability⁴. DALYs were introduced as a method of method of measuring global burden of disease and as a tool for resource allocation (Murray & Acharya, 1997; Murray & Lopez, 1996).

Another measure that combines mortality data with quality of life data is quality-adjusted life expectancy (QALE) which is typically used to provide an indication of the benefits gained from medical procedures or treatments, typically, in the form of cost-effectiveness (Broome, 1990). It represents individuals' preferences for different health states, usually based on a measure of health-related quality of life (HRQL). The units of QALE are quality-adjusted life years (QALYs), which account for quality-of-life, by measuring preferences for different health states⁵.

While population summary measures are useful in monitoring health trends and highlighting macro-level inequalities across regions or countries, they possess several key weaknesses. They, indeed, offer policy-makers little indication of underlying factors, such as housing, education, transport and income and wealth that influence health attainment. Moreover, as many health-adjusted life expectancy measures (e.g. HALE) are based on underlying micro-level health measures, the quality and meaningfulness of the summary measure depends critically on the reliability and validity of these underlying indicators of health or disability⁶.

A wide debate on the use of DALYS as a global burden of disease and resource allocation instrument has been raised due to its underlying methodology, namely in the use of expert opinion to derive the

4 The DALY measure is composed of two main components: 1) quality of life due to mortality and 2) lifetime lost due to premature mortality. Disability weights are calculated used a panel of experts. Ageing and discounting effects are also included in the formula.

5 DALYs can be considered a variant of QALYs, which have been standardized for comparative use. In general, a QALY is a positive concept, representing a healthy life year, while a DALY is negative construct, defined as a lost healthy life year. In addition, DALYs tend to be estimated for particular diseases, as opposed to health states.

6 While the following section on micro-level health measures provides more detail, key concerns include: differential sensitivities that measures have in assessing decrements in particular aspects of health; divergent scoring strategies to value health states, and whose values are most appropriate to capture in judgments about health states.

disability weights (Murray & Acharya, 1997; Anand & Hanson, 1997; Williams, 1999). Other critiques concern the use of a standard life expectancy for people of that age and gender as reference for all countries⁷, and the age weighting that may lead to discrimination against older people.⁸ Following some of these critics, improvements in the methodology have been made in the early 2000s and this revised index is often called HALE to differentiate from the original DALE.

In light of the above shortcomings of summary measures related to health expectancy, alternative methods of measuring health improvement have been suggested, namely avoidable mortality. This approach, originally conceived by Rutstein (1976) and developed by Holland (1986, 1991, 1993, 1997), has the advantage of calculating the extent to which the health system contributes to overall population health. Thus, causes of death that should not occur in the presence of timely and effective medical intervention and prevention are considered 'avoidable', and high rates signify shortcomings in the health system or broader health policy. This method can differentiate the causes of death that are amenable to medical intervention ('treatable conditions'), and those responsive to public health interventions ('preventable' conditions)⁹. Lifestyle also impacts rates of death from diseases that are considered avoidable, therefore improvements in avoidable mortality could be attributed directly to improved health system performance and policy efforts but also to natural trends in lifestyles unrelated to policy.

Avoidable mortality has many advantages over the above health-adjusted life expectancy measures. Not only can avoidable mortality rates be directly attributed to health system functioning, but being based solely on mortality data, they cannot be subject to manipulation. However, a limitation with this approach is the lack of association with measures of health care provision (e.g. number of doctors and interventions) (Nolte & McKee, 2004). In addition, the conditions that are considered treatable or preventable (i.e. the selection of 'avoidable' causes of death) may change over time as new interventions become available, therefore posing a difficulty in measuring trends. Moreover, avoidable mortality does not account for differences in the underlying incidence of disease or the severity of disease at presentation; improvements in the latter may be due to social conditions or lifestyle, as opposed to better quality health care. It is important to note that the level of disability-adjusted life expectancy in a country does not necessarily correspond to the rate of avoidable mortality. Indeed, quite significant variations can be seen in country rankings generated on the basis of these two indicators, highlighting their underlying methodological differences and need for different interpretations (Nolte and McKee 2003). A final limitation applicable to all health macro-population measures, as mentioned previously, is that they are incapable of capturing (a) the role of underlying factors, such as housing, education, transport and economic development, in health improvements and (b) within countries differences in population health, for example by education and income level. Table 1 shows the country rankings on the basis of avoidable mortality, DALE, and life expectancy (note: only countries included in the analyses of avoidable mortality are included).

7 For women, life expectancy in Japan is used as reference while for men it was supposed that a biological difference with women would allow only a 2.5 years gap at birth.

8 Disability-adjusted life expectancy (DALE) (presently also called Healthy life expectancy) estimates were made by WHO Headquarters for the World Health Report (WHR). National DALE estimates are based on the life tables for each Member State, population representative sample surveys assessing physical and cognitive disability and general health status, and detailed information on the epidemiology of major disabling conditions in each country. Data for 2000 are not directly comparable to those published in the WHR- 2000, due to improvements in survey methodology and the use of new epidemiological data for some diseases, overcoming some, but not all, methodological limitations.

9 There are over 30 conditions considered treatable, some examples are: cancer of the colon, skin, cervix, testis and breast; diabetes mellitus; epilepsy; pneumonia; appendicitis; thyroid disease; measles. Three conditions are considered preventable: deaths from lung cancer, motor vehicle and traffic accidents and cirrhosis of the liver.

Table 1. Comparison of countries ranked on the basis of life expectancy, DALE, and avoidable mortality (latest available year)

Life Expectancy (average at birth)	DALE (2002)	Avoidable mortality (1998)
Spain (80.46)	Sweden (73.3)	Sweden (49.55)
Italy (80.09)	Italy (72.7)	France (62.75)
Sweden (80.09)	Spain (72.6)	Finland (64.73)
Austria (79.7)	France (72)	Spain (66.24)
France (79.55)	Germany (71.8)	Denmark (68.37)
Netherlands (79.42)	Austria (71.4)	Italy (68.95)
Germany (79.36)	Netherlands (71.2)	Netherlands (71.15)
Greece (79.05)	Finland (71.1)	Greece (72.35)
United Kingdom (79.04)	Greece (71)	Austria (72.90)
Finland (78.99)	United Kingdom (70.6)	Germany (75.38)
Portugal (77.5)	Denmark (69.8)	United Kingdom (87.43)
Denmark (77.3)	Portugal (69.2)	Portugal (113.64)

Sources: WHO Health for All 2007; Nolte and McKee, 2004.

III. Micro-level health measures

Self-assessed health measures and key methodological issues

Self-assessed health measures aim to present health status, limitations in daily activities, and quality of life from the individual's perspective. Self-assessed health instruments can either measure *disease-specific* or *generic health*. Disease-specific measures are developed to assess the subjective health of patients with particular conditions (e.g. chronic conditions, cancers), while generic measures are used to measure general health among the population as a whole.

Hundreds of self-assessed health instruments are available to a researcher, clinician, or policy maker when attempting to measure health status (Haywood et al., 2005), often separated into two distinct classes: *health profiles* and *measures of utility* (Haywood et al., 2005). The health profile measure is a single question indicator. Respondents are asked to rate their general health over a specified range of possibilities, or reporting the extent of limitation in activities of daily living due to physical and/or mental conditions. These types of measures are most commonly used in studies investigating subjective health and are present in most surveys. Multi-dimensional indicators are more commonly used in economic evaluation analysis and capture aspects related with both health and quality of life (Torrance, 1986, Drummond et al. 2005; Dolan et al. 1995); among these it is worth mentioning the Short form 36-item Health Survey (SF-36)¹⁰, the EuroQol¹¹, and the Health Utility Index.

Among the self-assessed measures we can further differentiate indicators into subjective and quasi-objective indicators (Jurges 2007), with the latter being based on respondents' reporting on more factual items such as specific conditions or symptoms. Examples of these quasi-objective indicators include the presence of chronic conditions (where specific chronic conditions are listed), cancer in specified organs, limitations in activity of daily living (ADL) such as walking, climbing the stairs, etc, or in instrumental activity of daily living (IADL) such as eating or having a bath (see also Section on Objective health measures, below).

¹⁰ The SF-36 is a health related quality of life questionnaire that contains 36 questions on: subjective health, changes in subjective health over time, physical health problems, emotional health problems, social activities. This popular questionnaire has been used to derive the utility index, SF-6D.

¹¹ In the EQ-5D module respondents are asked to describe their health status using six attributes: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Each attribute has three level: no problem, some problem, and major problem. Therefore, 243 possible health status are described, to which have been added a further 2: unconscious and dead; for a total of 245 scenarios.

The vast number of different indicators used may introduce issues of comparability, especially in terms of the construction and use of summary population measures. Semantic differences (Box 1) in the self-assessed health questions may also lead to differences across countries (Eriksson et al, 2001; Idler & Benyamini, 1997, Hernandez_Quevedo et al. 2004). To correct for this effect, in the Survey of Health, Ageing and Retirement in Europe (SHARE) people were randomly selected to answer either the European version of the self-assessed health question (very good, good, fair, bad, or very bad) or the American version (excellent, very good, good, fair, or poor) at the beginning of the Health section of the survey and then the other question at the end of the section.

Box 1: Variations of the simple self-assessed health question amongst countries

Great Britain (2004-2005 General Household Survey):

“Over the last twelve months would you say your health has on the whole been good, fairly good, or not good?”

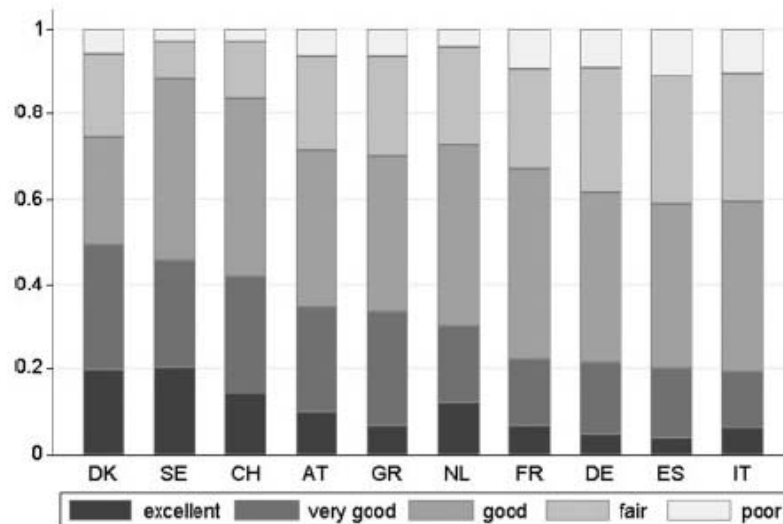
European Community Household Panel Survey (ECHPS):

"In general would you say your health is very good, good, fair, bad, or very bad?"

Australia (2001 National Health Survey), USA (1996 U.S. National Health Interview Survey), Canada (1996-1997 Canadian

Moreover, differences across countries in response styles may be due to cultural factors and not actually differences in health (Jurges, 2007). Figure 2 shows differences in self-reported health across the ten countries included in SHARE (age- and sex-standardized). The healthiest populations in terms of self-reported health are in Denmark, Sweden and Switzerland, with the least healthy in Italy, Spain and Germany. These results do not correspond to macro-level health measures such as life expectancy. When a health index is calculated on the basis of more objective measures of health included in the survey, Switzerland comes out 1st, Austria and Germany 2nd and 3rd, Sweden and Denmark drop to 4th and 6th, followed by France, Greece Italy and Spain. The author concludes that only part of the cross-country variation observed in self-reported health reflects true health differences (as measured by chronic conditions, grip strength, walking speed and BMI, whereas the remaining variation is explained by differences in reporting styles (Jurges, 2007).

Figure 2. Differences in self-reported health across countries, from SHARE



Source: Jurges, 2007

One of the main concerns behind the use of self-assessed health measures is its reliability as a good predictor of the objective health status as a whole. Many cross-national studies have demonstrated that self-assessed indicators are better predictors of mortality than medical records, denoting that these measures capture other important influences of mortality beyond objective measures (Mackenbach et al, 2002; McGee et al., 1999; Idler & Benyamini, 1997; Sundquist & Johansson, 1997). However, due to its subjective nature, self-assessed health can be influenced by a variety of factors that impact perceptions of health. In particular, the association between self-assessed health and mortality is often mediated by geographic location, psychosocial factors (e.g. social integration,

stress), gender, age, and socioeconomic position (Kievit et al, 2005; Lindeboom & Van Doorslaer, 2004; Sen, 2002; Cattell, 2001; Berkman et al., 2000; Idler & Benyamini, 1997). Thus, self-reported health is not only a function of actual health status, but also of individuals' or population groups' perceptions of health. For example, people in different age groups tend to use different threshold levels for assessing health (Lindeboom & Van Doorslaer, 2004; Groot, 2000). Nonetheless, the extent of the bias has yet to be well-substantiated (Mackenback et al., 2002), as some research on gender differences indicates that self-assessed measures better predict mortality in men than women, while other research supports the contrary (Sillen et al., 2005; Benjamini et al., 2003; Wolinsky & Johnson, 1992).

Another approach, a vignette, was developed to address these methodological issues, and to design comparable subjective scales in health (see for example King et al, 2004) (Box 2). Respondents are asked to rate the health status of the person described in a vignette (assuming that this person is of the same sex and age as themselves in order to avoid any implicit variation in health rating attributed to those factors) with the same scale used for rating their own health. Typically, a respondent will be asked to rate somewhere between three to seven vignettes, with scenarios ranging from athletes to severely disabled persons (Salomon et al., 2001). The use of vignettes has confirmed that health expectations and responses differ across age groups and countries, accounting for some of the variation in self-assessed health status (Salomon et al, 2004). Using vignettes allows a more reliable comparison of self assessed health measures, as it maps responses to a common comparable scale by controlling for those factors that impact health valuations across population groups.

Box 2: Example of a vignette

The following is an example of an instrument containing three vignettes for the domain of mobility. For each vignette, the respondent is asked to determine how much difficulty [*name in example*] had in moving around. Response categories range from: extreme difficulty/severe difficulty/moderate difficulty/no difficulty.

- Paul is an active athlete who runs long distance races of 20km twice a week and plays soccer with no problems.
- Vincent has a lot of swelling in his legs due to his health condition. He has to make an effort to walk around his home as his legs feel heavy.
- George has a brain condition that makes him unable to move. He cannot even move her mouth to speak or smile. He can only blink his eyelids.

Source: Salomon et al. (2004); Salomon et al. (2001).

Objective health measures and key methodological issues

Some of the most common objective indicators collected include height, weight, blood pressure, grip strength, gait speed, diagnosed medical or physical conditions, or medical illness. They can be measured directly by a nurse or trained interviewer. Often medical diagnoses and lifestyle factors such as nutrition, smoking, exercise, drinking and health care utilization are elicited through surveys; while these are considered to be more objective than more general self-assessed health, they are still subject to the same bias as other self-assessed measures (for example, self-reported weight tends to be underestimated). Objective indicators serve as useful tools for monitoring specific diseases (e.g. hypertension) and health threats (e.g. obesity). Yet, measuring morbidity and risk factors via objective measures do not allow a holistic determination of general health status. To adequately evaluate the multidimensional nature of health, it is, indeed, necessary to say something about the impact these factors have on people's lives.

One methodological issue to consider when using objective health indicators is the problem with standardization of data collection. It is not always guaranteed that one is comparing like with like, because the value of objective measures may vary according to the method with which they were collected. For example, a person's height and weight will differ if they do not take off their shoes before this is measured, or a person's blood pressure may vary according to the time of day it is taken. Yet, information on the details of objective health data collection is often not provided, thus one must not take for granted that objective indicators are more reliable than subjective ones.

IV. Current EU-level and national health measures

This section examines the key indicators used in the EU, with some reference to countries outside the EU. The collection of health indicators both at the macro- and micro- level serve a variety of purposes, including ascertaining overall population health and functioning of the health care system; determining distributions in health within and across countries; highlighting inequalities in health and access to services; directing the allocation of resources and funding; and, guiding health programme and policy development at national and local levels (AIHW, 2004; Ministry of Health, 2002; Chrvla & Bulger, 1999). In a few countries, indicators are also employed to monitor progress towards meeting key health objectives over time.

All EU Member States have some sort of systematic compilation of health indicators. The EU has made considerable efforts in the past several years to harmonize the data collection of social and health-related topics. Part of this effort has consisted of the creation of the European Community Household Panel (ECHP) survey and its successor, the EU Statistics on Income and Living Conditions (EU-SILC) survey, as well as the inclusion of special health modules in the Eurobarometer surveys. European funding has also allowed for the creation of the Survey of Health, Ageing and Retirement in Europe (SHARE) to collect panel data on individuals of age 50 and over, and the recent development of the European Core Health Interview Survey (ECHIS). Table 1 presents the key features of these surveys, along with their relative strengths and weaknesses. It is important to note that not all of the surveys listed in Table 1 were designed with the aim to collect information on population health and health inequalities (e.g. ECHP and EU-SILC), which accounts for the more limited health information included.

Furthermore, the Institute of Public Health in Belgium has created an inventory of health surveys administered at both national and international levels in the EU, the European region, in addition to Australia, Canada and the United States (funded by DG SANCO). This database outlines the different surveys available, the indicators included in the surveys, and their methodologies (Institute of Public Health, 2007). The variations across countries highlights the need to improve comparability (Aromaa et al. 2003). Moreover, the International Compendium of Health Indicators was established to provide an inventory of the health indicators currently collected by international organizations including the WHO Regional Office for Europe, the OECD, and the European Commission (Eurostat) (International Compendium of Health Indicators, 2007; European Commission, 2005). This resource includes macro and micro indicators of health including indicators of the health system and utilization (in 2006 the list contained approximately 400 items/indicators). It is coordinated by the European Community Health Indicators Monitoring project, funded by the Programme of Community Action in the Field of Public Health, 2003-2008. (See Appendix 3 for a detailed list of the macro-level health indicators collected by international organizations).

A series of Working Parties have been established to inform decisions on collection, harmonization, and dissemination of health indicators. The Working Party Morbidity and Mortality, among other things, aims to improve information flows, to help in achieving the use of a common framework for information on diseases; to contribute with morbidity and mortality indicators to the European Community Health Indicators (ECHI) list; to develop health information and analysis and reporting systems; and to contribute, in close coordination with Eurostat, to collect comparable morbidity data. More recently it aimed to contribute to the health modules on the Eurobarometer 2006 and 2007 and to the health modules on the European Health Interview Survey (European Commission Health and Consumer Protection DG, 2005).

Table 1: Description of key EU surveys collecting health information

Survey	Survey Profile	Key Strengths and Weaknesses
<p style="text-align: center;">European Community Household Panel Survey (ECHP)</p> <p>“An annual panel survey based on a representative panel of households and individuals in each country [in the EU15], covering a wide range of topics: income, health, education, housing, demographics and employment characteristics.”</p>	<ul style="list-style-type: none"> ● Pure panel survey: a sample of people were selected and followed-up throughout the survey's duration (1994-2001). ● Coverage for 14 countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, and the United Kingdom. ● Self-reported health indicators: <ul style="list-style-type: none"> - Self perceived health - Being hampered by daily activities - Temporary reduction (last two weeks) of activity because of health problems - Hospitalization in past 12 months - Medical consultations in past 12 months - Smoking - Self-reported height and weight (to derive body mass index) 	<p>Pros:</p> <ul style="list-style-type: none"> - Cross-sectional and longitudinal data came from the same survey and were processed at the same time. - Centralized questionnaires modified by each country to suit local conditions. - Multidimensional coverage of a range of topics (e.g., health, employment, income). - Standardized methodology and procedure (sampling, questionnaire design), yielding comparable information across countries. - Panel design (allows dynamic effects of cross-national policies to be explored in more depth, especially in countries which did not previously implement their own longitudinal surveys.) <p>Cons:</p> <ul style="list-style-type: none"> - Health questions tend to be very general and limited in scope. - Behavioral aspects, such as smoking and BMI, were not added until 1998. - No objective health measures. - Low initial response rates and panel attrition (also variable across countries, which limit data validity and comparability). Attrition rate was also found to be correlated with health status. (Response rate averaged 70% in wave 1, ranging from 50% in Germany and Luxembourg to 90% in Italy and Portugal). - Non-participation of Sweden and 12 accession countries. - From the third wave, data for Germany, Luxembourg, and the UK have been replaced with national surveys, respectively the SOEP, PSELL, and the BHPS - Health questions were phrased differently in France.

<p>European Union Statistics on Income and Living Conditions (EU-SILC) “Aims at collecting timely and comparable cross-sectional and longitudinal multidimensional microdata on income, poverty, social exclusion and living conditions.”</p>	<ul style="list-style-type: none"> ● Progressively replaced the ECHP, particularly following the Lisbon and Nice European summits. ● Rotational panel survey: a sample of people are selected and followed up for a minimum of 4 years (started in 2004), allowing new sub-groups of the population to be added each year. ● Coverage includes all 27 member states as well as Turkey, Iceland and Switzerland. ● Self-reported health indicators: <ul style="list-style-type: none"> - Self perceived health - Having a chronic illness or health problem - Limited activity due to health problem in the past 6 months - Smoking - Self-reported height and weight (to derive body mass index) <p>Other key variables:</p> <ul style="list-style-type: none"> - Unmet medical or dental care in past 12 months (on one or multiple occasions) - Main reason for unmet medical/dental need (financial, waiting list, no time due to work/care responsibilities, fear or doctors/hospitals/ treatment, wanted to wait and see if problem improved on its own, did not know of a good doctor/specialist, other reason) 	<p>Pros:</p> <ul style="list-style-type: none"> - Centralized questionnaires modified by each country to suit local conditions. - Addressed many of the limitations present in the ECHP, notably the problem of attrition. - Links to data from national registries, where available. - Very detailed information on income and wealth. <p>Cons:</p> <ul style="list-style-type: none"> - Health questions are very general and limited in scope; more limited than the ECHP. - Initial response rate low in some countries. - Cross sectional and longitudinal data may differ due to the rotational sample. - By removing many of the variables included in ECHP instead of adding new ones the continuity of data collection was disrupted thus making analyses of time trends extremely difficult.
<p>Euobarometer: The Health of Adults in the European Union “To assess the health of the European population on five levels: perceived health, chronic morbidity (long-standing illness), activity restriction due to a health problem, sensory and physical functional limitations.”</p>	<ul style="list-style-type: none"> ● Public opinion survey with multi-stage, random sampling (2002 only). ● Coverage includes EU-15. ● Self-reported health indicators: <ul style="list-style-type: none"> - Self perceived health - Chronic morbidity - Activity restrictions - Sensory functional limitations - Physical functional limitations 	<p>Pros:</p> <ul style="list-style-type: none"> - Good source of timely information on opinions held by the European population. <p>Cons:</p> <ul style="list-style-type: none"> - Not longitudinal (only one year) - Small sample size (1,000 persons/Member State) - Certain sampling procedures (e.g., replacement of non-responses), which makes data subject to bias, as certain groups may be poorly represented. - The Eurobarometer is useful for collecting data on opinions, rather than population health.

<p style="text-align: center;">Survey of Health, Ageing and Retirement in Europe (SHARE)</p> <p>“Multidisciplinary and cross-national survey on health, socio-economic status and social and family networks of individuals aged 50 or over.”</p>	<ul style="list-style-type: none"> ● Multi year panel survey: a probability sample in each participating country is selected (beginning in 2004, second wave completed by 2007). ● Coverage included 11 countries in the first instance (Austria, Belgium, Denmark, France, Germany, Greece, Italy, Sweden, Switzerland, Spain, the Netherlands), and subsequently Israel. The second wave will also include data from the Czech Republic and Poland. ● Self-reported health indicators: <ul style="list-style-type: none"> - Self perceived health - Prevalence of chronic conditions (e.g., hypertension, diabetes, arthritis) - Prevalence of cancer - Experience of certain symptomology in past 6 months (e.g., back or joint pain, cough, swollen legs, sleeping problems) - Difficulty performing daily activities (ADL) and instrumental ADL - Temporary reduction (last two weeks) of activity because of health problems - Height and weight (to derive body mass index) - Frequency of medication intake - Smoking - Amount of physical activities performed per week ● Objective health indicators: <ul style="list-style-type: none"> - Walking speed - Grip strength 	<p>Pros:</p> <ul style="list-style-type: none"> - Centralized questionnaires modified by each country to suit local conditions. - Contains more expansive and multilevel section on health. - More objective measures of health are also collected. Among these it is possible to differentiate those reported by individuals, e.g. ADL, IADL, chronic conditions, cancer; and those measured by trained interviewees, e.g. body mass index, and walking speed. - Cross-sectional and longitudinal data are processed from the same survey at the same time. - Information on both income and wealth is included - Data on individuals' expectations about their health are included <p>Cons:</p> <ul style="list-style-type: none"> - Focuses specifically on persons aged 50 and older and, therefore, does not provide information for younger age groups. - Relatively lower response rate, compared to the ECHP and its US counterpart, the Health and Retirement Survey (range from 38% in Switzerland and 50% in Sweden to 74% in France). - Low response rate for objective health indicators measured directly by interviewees.
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<p>European Core Health Interview Survey (ECHIS) “The goals of European Health Survey System can be summarized as follows: identification of health problems; description of the health status and health needs of the population; estimation of the prevalence and distribution of health indicators; analysis of social (in)equality in health and access to health services; study healthcare consumption and its determinants, and preventive care; and study possible trends in health status, life style and healthcare services consumption among the population.”</p>	<ul style="list-style-type: none"> • This is the core component of the European Health Survey System (EHSS), and will start in 2007 in all EU Member states to be administered annually thereafter. • The survey plan is still under construction, with the aim to take different forms in the different Member states, with some common elements. • Common elements will measure the European Structural indicators in the field of health such as Healthy Life Years, Health Status, Determinations of health, and Provision of Care. • Complementary sets of European Special Health Interview surveys will be added periodically to investigate different areas such as nutrition, mental health, chronic diseases, use of health services, etc. • Self-reported health indicators (in 2006 draft survey): <ul style="list-style-type: none"> - Self perceived health - Being hampered by daily activities - Temporary reduction (last six months) of activity because of health problems - Prevalence of chronic conditions (e.g., hypertension, diabetes, arthritis) - Health affecting work attendance - Self-reported height and weight (to derive body mass index) - Smoking - Difficulty performing daily activities - Amount of physical activities performed per week - Experiencing pain, discomfort, depression/ anxiety over the past 4 weeks <p>Utilization variables:</p> <ul style="list-style-type: none"> - How many visits to a medical doctor in the past year (GP & Specialist) - Inpatient and outpatient visits - How many visits to an alternative medical practitioner (e.g. acupuncturist) - Hospitalization (and type) in past year - Receipt of private and home care - Medication taken in past 2 weeks - Vaccinations received and date received - Last time blood pressure, blood sugar measured - Last time received a mammography / cervical smear test/ fecal occult blood test <p>Access variables:</p> <ul style="list-style-type: none"> - Waiting times - Unmet medical/ dental need - Reason for unmet medical/ dental need 	<p>Pros:</p> <ul style="list-style-type: none"> - Centralized questionnaire component, sections modified by each country to suit local conditions. - Contains more expansive section on health than any of the previous surveys. <p>Cons:</p> <ul style="list-style-type: none"> - Although it has been piloted in some countries, it is not yet in use, therefore will have to wait to see if there are issues related to response rates.
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Sources: Borsch-Supan & Jürges (2005), Eurostat (2005; 2006), European Commission (2002; 2004).

While significant progress has been made to date in the EU in terms of building a robust health information infrastructure to meet measurement goals, there exists methodological limitations. For instance, there is not sufficient national survey data on various objective measures, such as blood glucose, cholesterol, and other key biomedical risk factors. Additionally, there tends to be a lack of national information on diet and nutrition as well as mental health status. Specific examples of health indicators collected through surveys in a selection of EU Member States are presented in Appendix 1¹².

Countries outside of Europe such as the United States and Canada have had long histories of comprehensive health data collection. In the United States, the *Leading Health Indicators* were created to track and measure a smaller subset of the nearly 500 objectives outlined in 'Healthy People 2010'¹³ (Chrvala & Bulger, 1999). The indicators selected reflect a group of ten high-priority public health issues, such as tobacco use and immunization. Similarly, Canada publishes a compilation of over 80 national health indicators, produced jointly by Statistics Canada and the Canadian Institute for Health Information (CIHI) (CIHI, 2006). While there are subtle differences between countries, the selected indicator sets tend to capture the multi-dimensional nature of health and strive toward comparability, where possible, across different geographic regions¹⁴. Appendix 2 presents a summary of the key health indicators collected by the United States, Canada, Australia, and New Zealand.

V. Issues in cross-country comparisons

Comparing population health across countries is a useful exercise to evaluate the performance of different health systems and public health policies, to highlight best practices, and to identify key contributors to differences in population health. The collection of appropriate indicators to perform such evaluations is of increasing importance, and a growing number of countries have promulgated the need for better population health information.

However, there are several methodological issues associated with cross-country comparisons. The majority of comparative studies rely on self-assessed health or limitation in daily activity for practical reasons (Jurges, 2006; Zimmer et al., 2000). These indicators are indeed commonly collected in all national and international surveys. However, the use of these measures bring along implications related with the comparability of the questions across countries and reliability of the information as indicative of objective health, and issues of translation of key terms in different languages, as noted above. Additional methodological issues linked to cross-country comparison include:

- Divergent health indicators and measures
- Variable political and policy priorities
- Unique cultural influences

Differences in survey methodologies limit their comparability. Surveys may focus on a different population groups, ranging from certain population subgroups (e.g., older people) to the whole population. In addition, surveys may attach different time frames to measuring certain indicators (i.e., ratings of health during last 30 vs. 60 days) or they may use varying sampling methodologies which can under- or over-represent certain population groups.

The political and policy priorities of a country can influence the selection of health indicators. For example, information on reproductive and sexual practices may not be collected in religious and socially conservative countries, or countries with a high prevalence of a chronic diseases (for example obesity and heart disease) may focus more on collecting indicators on lifestyle-related behaviors and attitudes. As a result, long-term monitoring of health status across countries may be difficult, as the indicators used may change according to changing priorities of various political parties.

12 Currently the 'HIS/HES database' (http://ec.europa.eu/health/ph_projects/1998/monitoring/fp_monitoring_1998_annexe4_02_en.pdf) is available to provide information on member state surveys, including sections on questions, methodologies, and recommendations.

13 Healthy People 2010 constitutes a broad-based collective effort to set national health objectives, in an effort to increase the quality and years of healthy life and to eliminate health disparities.

14 Beyond broad national health indicator sets, several countries have developed measures specific to particular health issues or sectors, depending on health and policy priorities. For instance, New Zealand focuses on the collection of environmental health indicators, as part of the Ministry of Health's Environmental Health Indicator (EHI) project (Khan et al., 2004). The indicators aim to build upon a framework proposed by the World Health Organization (WHO) to facilitate national and international comparisons of the impact of the environment on health. Key indicators are collected on air quality, drinking water quality, recreational water quality, traffic, and radiation.

While some of these issues can be taken into account in health measurement, it is likely that residual differences across countries are left unexplained (Lindeboom & Van Doorslaer, 2003; Sen, 2002; Groot, 2000). Remaining “country effects”, resulting from differences in self-assessments of health that cannot be accounted for may affect the reliability of these comparisons since even individuals with similar demographic and health profiles often report their health differently across countries, as demonstrated above with SHARE data (Jurges, 2007).

Cultural and language differences across countries, and within countries among different population groups are subtle and difficult to evaluate. Since self-reported health categories are essentially verbal representations of different health states, they may not hold the same meaning to all respondents (Jurges, 2006). As such, differences in language use and linguistic variation may hinder cross-country comparison of self-assessed health. Important psychological and psychosocial characteristics such as stress, locus control, and psychological well-being, tend to vary across cultures. Culture may play a significant role in the subjective interpretation and reporting of health (Angel and Thoits, 1987), and may help in explaining why the existence of chronic conditions and self-assessed health do not always correspond (Zimmer et al., 2000).

Based on the above-mentioned potential biases, when assessing self-reported health in diverse populations, it is advantageous to pursue validated and normative data, in order to make meaningful comparisons. As put forth by an Institute of Medicine (1998) panel, “all measures of population health involve choices and value judgments in both their construction and their application”. Therefore, cross-country and culture-sensitive context effects should be accounted for when drawing conclusions, for example in regarding disparities in health.

VI. Conclusions and recommendations

Most industrialized countries collect a variety of health information, on both a macro- and micro-level, to measure the health of their populations, evaluate health system performance, and make cross-country comparisons. Simple and multiple dimension measures are used for different aims, each characterized by methodological strengths and weaknesses that must be considered when used for policy and planning purposes.

On the macro-level, summary population measures such as life expectancy, mortality rate, infant mortality or more complex health expectancy indicators (that combine information on both mortality and morbidity) are powerful instruments to measure differences in population health across countries and within countries over time. However, they may provide minimal indication of the underlying factors (for example education, economic position) that may be influencing such health attainment. Moreover, the conceptual and technical frameworks underpinning the health expectancy measures (for example DALYs) may introduce judgments that inaccurately reflect societal values.

On a micro-level, objective measures are significant from clinical and health system perspectives, but difficult to collect because they often rely on nurses or trained interviewers; and they may be subject to measurement error, whether random or systematic¹⁵. Moreover, disease specific indicators miss the totality of health (for example psychosocial elements) and the individual utility - preferences associated with a health condition.

Self-assessed health is commonly used in national and cross-national comparisons because of its broad availability. Numerous studies have established a strong association between self-assessed health and mortality (Mackenback et al., 2002; McGee et al., 1999; Idler & Benjamin, 1997). Measures of self-assessed health have also been found to be predictive of changes in functional ability and life satisfaction. However, these measures can be influenced by differences across populations in actual health status, as well as more subjective variances in other characteristics that impact health perceptions (for example locus of control, individual definitions of health, cultural expectations). Methodological challenges also exist in comparing health measures across countries relating to, among other things, differences in survey methodology, political priorities and cultural and linguistic differences.

The EU has made considerable efforts to harmonize the data collection of health indicators across Member States. Examples of such efforts are the European Community Household Panel (ECHP) survey, now replaced by the EU Statistics on Income and Living Conditions (EU-SILC) survey, the Survey of Health, Ageing and Retirement in Europe (SHARE), and the European Health Interview

15 Random variation may occur across the interviewers due to human error, while systematic variation can occur if standards of collection are different (e.g. shoes on or off for weight and height measurement, or time of day for blood pressure measurement).

Survey (EHIS), which combines the European Core Health Interview Survey (ECHIS) with the European Commission's European Special Health Interview Survey (ESHIS). These surveys provide useful instruments for both researchers and policy makers to understand the key determinants of the variation in health status in Europe. However, often quality is sacrificed to obtain higher comparability and response rates. The introduction of a section on objective health status or vignettes may help limit the bias of individual perceptions on self-reported health measures. Moreover, the collection of objective measures of health should be encouraged at the European level to complement and standardize current national efforts, as in England, Finland, Germany, Ireland, the Netherlands, Norway and Scotland (see Appendix and (Institute of Public Health 2007) for information on national surveys collecting objective health indicators).

In light of the strengths and weakness associated with both macro- and micro-level health measures, the following considerations may contribute to improving health measurement:

- A variety of measures both at the population and individual level should be used to provide a comprehensive picture of health, in order to effectively inform policy and planning efforts.
- While population summary measures provide policy-makers with integral information on population health, they must be employed with care in light of their limitations. Health expectancy population measures, such as the HALE, should be supplemented with measures of avoidable mortality to account for the impact of health system performance on population health status.
- Routine analyses of avoidable mortality among EU Member States should be supported, in addition to exploring within-country regional differences.
- The presentation of population health indicators by broad socio-economic characteristics such as education and income level may help in identifying the main determinants of health status within and across countries, and to design specific policy programmes.
- More generally, indicators should be collected on the regional or local level, where possible, to capture key geographical differences.
- There is a need to explore in detail the effect of psychological and psychosocial characteristics on health indicators. Existing self-assessed health measures could be adjusted for possible cross-cultural bias or linguistic differences. Common question wording and the use of vignettes may help achieve this end.
- Efforts should be made to include the institutionalized population (for example older people in long-term care) in surveys, thus taking a population approach to sampling instead of a household approach (e.g. in SHARE in Sweden and Denmark, the institutionalized population is included).
- The recent efforts set forth by the European Health Survey System (EHSS) help to facilitate cross-country comparative studies. However, while a credible source of health information, such surveys should be reviewed periodically for validity, reliability, and functionality, in terms of providing relevant information for decision-makers.
- Since micro-data are extensively used for Health Technology Assessment (HTA) across Europe in the priority-setting process, better coordinated methodologies and instruments are needed. As HTA often uses summary measures of health outcomes (e.g., QALYs, DALYs) to ascertain the costs and benefits of health interventions, EU countries (and beyond) should work together to address the methodological issues inherent to their use in health measurement and comparability across countries. For example, greater collaboration will help to address existing issues surrounding the non-comparability of the values elicited with different health state elicitation instruments and the generalizability of studies beyond the study setting or country.
- To improve the efficiency and effectiveness of health measurement, governments should capitalize on the experience of other countries and consult the HIS/HES database when constructing new health measures or surveys¹⁶.

16 See http://ec.europa.eu/health/ph_projects/1998/monitoring/fp_monitoring_1998_annexe4_02_en.pdf

References

- Anand, S. and Hanson, K. (1997). Disability-adjusted life years: a critical review. *Journal of Health Economics* 16(6): 685-702.
- Angel, R. and Thoits, P. (1987). The impact of culture on the cognitive structure of illness. *Culture, Medicine, and Psychiatry*, 11: 465-94.
- Aromaa, A., Koponen, P., Tafforeau, J., Vermeire, C., and the HIS/HES Core Group (2003). Evaluation of Health Interview Surveys and Health Examination Surveys in the European Union. *European Journal of Public Health*; 13 (S1): 67-72.
- Australian Institute of Health and Welfare (2004). *National Report on Health Sector Performance Indicators 2003*. Available at: <http://www.aihw.gov.au/publications>.
- Baker, M., Stabile, M., and Deri, C. (2001). *What Do Self-Report, Objective, Measures of Health Measure?* NBER Working Paper Series: Working Paper 8419. Cambridge, MA.
- Behr, A., Bellgardt, E., and Rendtel, U. (2005). Extent and determinants of panel attrition in the European Community Household Panel. *European Sociological Review*, 21(5): 489-512.
- Benyamini, Y., Blumstein, T., Lusky, A., and Modan, B. (2003). Gender differences in the self-rated health mortality association: Is it poor self-rated health that predicts mortality of excellent self-rated health that predicts survival? *The Gerontologist*, 43: 395-405.
- Berkman, L.F., Glass, T., Brissette, I., and Seeman, T.E. (2000). From social integration to health: Durkheim in the new millennium. *Social Science and Medicine*, 51: 843-57.
- Borsch-Supan, A. and Jurges, H. (2005). *The Survey of Health, Aging, and Retirement in Europe – Methodology*. Mannheim Research Institute for the Economics of Aging: Mannheim.
- Bosma, H., Schrijvers, C., Mackenbach, J.P. (1999). Socioeconomic inequalities in mortality and importance of perceived control: Cohort study. *British Medical Journal*, 319: 1469-170.
- Bronnum-Hansen, H. (1998) Trends in healthy life expectancy in Denmark, 1987-1994. *Danish Medical Bulletin*, 45(2): pp 217-221.
- Broome, J. (1993). QALYs. *Journal of Public Economics* 50(2): 149-167.
- Canadian Institute of Health Information (2006). *Health Indicators*. Statistics Canada, Catalogue No. 82-221-XIE. Available at: <http://www.statcan.ca/english/freepub/82-221-XIE/2006001/doc.pdf>.
- Cattell, V. (2001). Poor people, poor places, and poor health. *Social Science and Medicine*, 52: 1501-16.
- Chipperfield, J.G. (1993). Incongruence between health perception and health problems. *Journal of Aging and Health*, 59(4): 475-96.
- Chrvala, C.A. and Bulger, R.J., eds. (1999). *Leading Health Indicators for Healthy People 2010: Final Report*. Institute of Medicine: National Academies Press.
- Crossley, T. and Kennedy, S. (2002). The reliability of self-assessed health status. *Journal of Health Economics*, 21:643-58.
- David, P. and Haberlen, S. (2005). 10 best resources for....measuring population health. *Health Policy and Planning*, 20(4): 260-3.
- De Luca, G. and Peracchi, F. (2005). *Survey Participation in the First Wave of SHARE*. In Borsch-Supan, A., Jurges, H. (2005). *The Survey of Health, Aging, and Retirement in Europe – Methodology*. Mannheim Research Institute for the Economics of Aging: Mannheim.
- Dolan, P., Gudex, C., Kind, P. and Williams, A. (1995) "A social tariff for EuroQol: Results from a general population" York discussion paper.
- Drummond, M. et al (2005) *Methods for the Economic Evaluation of Health Care Programmes (3rd Edition)*. Oxford: Oxford University Press [Chapter 6].
- Eriksson, I., Unden, A., and Elofsson, S. (2001). Self-rated health. Comparisons between three different measures. Results from a population study. *International Journal of Epidemiology*, 30: 326-33.

- European Commission (2004). *Building a European Health Survey System: Improving Information on Self-Perceived Morbidity and Chronic Conditions*. Working Party Morbidity and Mortality, Health & Consumer Protection Directorate-General. European Commission: Brussels.
- European Commission (2004). *Special Eurobarometer: The Health of Adults in the European Union*. European Opinion Research Group, European Commission: Brussels.
http://ec.europa.eu/public_opinion/archives/ebs/ebs_183.7_en.pdf
- European Commission (2005). *The European Community Health Indicators (ECHI) Comprehensive Indicator List*. Available at:
http://ec.europa.eu/health/ph_information/indicators/docs/longlist_en.pdf.
- European Commission Health and Consumer Protection DG (2005). Working Party Morbidity and Mortality: Short report on activities and projects. Luxembourg.
- EuroQol Group. (1990). A new facility for the measurement of health-related quality of life. *Health Policy*, 16: 199-208.
- Eurostat (2006). *European Health Interview Survey Questionnaire: English Version*. Partnership on Public Health Statistics, Group HIS. Eurostat: Luxembourg.
- Eurostat (2007). Population and social conditions: Public health. Brussels: European Commission.
- Groot, W. (2000). Adaption and scale of reference bias in self-assessments of quality of life. *Journal of Health Economics*, 19: 403-20.
- Haywood, K.L., Garratt, A.M., and Fitzpatrick, R. (2005). Quality of life in older people: A structured review of generic self-assessed health instruments. *Quality of Life Research*, 14: 1651-68.
- Helmer, C., Barberger-Gateau, P., Letenneur, L., and Dartigues, J.F. (1999). Subjective health and mortality in French elderly women and men. *Journal of Gerontology Series B: Psychological Sciences and Social Sciences*, 54: S84-92.
- Hernandez-Quevedo, C., Jones, A., Rice, N. (2004). Reporting bias and heterogeneity in self-assessed health. Evidence from the British Household Panel Survey. *ECuivity Project III, Working paper # 19*.
- Holland, W. W. (1986). "The 'avoidable death' guide to Europe." *Health Policy* 6: 115-7.
- Holland, W. W., Ed. (1988). *European Community atlas of 'avoidable death'*. Commission of the European Communities Health Services Research Series No.3. Oxford, Oxford University Press.
- Holland, W. W., Ed. (1991). *European Community atlas of 'avoidable death'*. Commission of the European Communities Health Services Research Series No.6. Oxford, Oxford University Press.
- Holland, W. W., Ed. (1993). *European Community atlas of 'avoidable death'*. Commission of the European Communities Health Services Research Series No.9. Oxford, Oxford University Press.
- Holland, W. W., Ed. (1997). *European Community atlas of 'avoidable death' 1985-89*. Oxford, Oxford University Press.
- Idler, E. and Benyamini, Y. (1997). Self-rated health and mortality: A review of twenty-seven community studies. *Journal of Health and Social Behavior*, 38: 21-37.
- Institute of Medicine (1998). *Summarizing Population Health: Directions for the Development and Application of Population Metrics*. Institute of Medicine: National Academies Press.
- Institute of Public Health (2007). European Health Interview & Health Examination Surveys Database. <https://www.iph.fgov.be/hishes/> (accessed 25 February 2007).
- International Compendium of Health Indicators (2007).
<http://www.healthindicators.org/ICHI/General/StartMenu.aspx> (accessed 25 February 2007)
- Jurges, H. (2007). True health vs response styles: Exploring cross-country differences in self-reported health. *Health Economics*, 16: 163-78.
- Kahn, R., Voice, T., Fowles, J., and Phillips, D. (2004). *Environmental Health Indicators for New Zealand. Towards a National Environmental Health Information System*. Available at:
http://www.surv.esr.cri.nz/PDF_surveillance/EHI/EHI_AnnualReport_2003.pdf.

- Kievit, W., Welsing, P., Adang, E., Eijsbouts, A.M., Krabbe, P.F.M., and Van Riel, P. (2005). *The Longitudinal Association between Objective Clinical Measures and Patient Self-Reporting Information in Rheumatoid Arthritis*. The 27th Annual Meeting of the Society for Medical Decision Making, October 21-24, 2005.
- King, G., Murray, C., Salomon, J.A., and Tandon, A. (2004). Enhancing the validity and cross-cultural comparability of measurement in survey research. *American Political Science Review*, 98: 191-207.
- Lalonde, M. (1974) ["A New Perspective on the Health of Canadians."](#) Ottawa: Minister of Supply and Services.
- Lindeboom, M. and Van Doorslaer, E. (2004). Cut-point shift and index shift in self-reported health. *Journal of Health Economics* 23: 1083-1099
- Link, B.G. and Phelan, J. (1995). Social conditions as fundamental causes of disease. *Journal of Health and Social Behavior*, Extra Issue: 80-94.
- Machenbach, J.P., Simon, J.G., Looman, C.W.N., and Joung, I.M.A. (2002). Self-assessed health and mortality: Could psychosocial factors explain the association? *International Journal of Epidemiology* 31: 1162-68.
- Mathers, C., McCallum, J., Robone, J.M. (1994). eds. *Advances in health expectancies: proceeding of the 7th meeting of the international network on Health Expectancy (REVES)*. Canberra, Australian Institute of Welfare, 1994.
- McGee, D.L., Liao, Y., Cao, G., and Cooper, R.S. (1999). Self-reported health status and mortality in a multiethnic US cohort. *American Journal of Epidemiology*, 149: 41-6.
- Menec, V.H., Shooshtari, S., and Lambert, P. (2007). Ethnic differences in self-rated health among older adults: A cross-sectional and longitudinal analysis. *Journal of Aging and Health*, 19: 62-86.
- Ministry of Health (2000). *The New Zealand Strategy*. MOH: Wellington, NZ.
- Ministry of Health (2002). *An Indication of New Zealanders' Health*. Public Health Intelligence Occasional Report No. 1. MOH: Wellington, NZ.
- Murray, C., Salomon, J., Mathers, C.D., Lopez, A.D., (2000). A critical examination of summary measures of population health: *Bulletin of the World Health Organization*, 78(8): pp981-994.
- Murray, C., Salomon, J., Mathers, C.D., Lopez, A.D., eds. (2002). *Summary Measures for Population Health: Concepts, Ethics, Measurements, and Applications*. Geneva, World Health Organization.
- Murray, C.J. and Acharya, A.K. (1997). Understanding DALYs (disability-adjusted life years). *Journal of Health Economics* 16(6): pp.703-30.
- Murray, C.J.L. and Lopez, A.D. (1997). Mortality by cause for eight regions of the world: Global Burden of Disease Study. *Lancet* 349: pp.1269-1276.
- Murray, C.J.L. and Lopez, A.D. (2000). Progress and directions in refining the Global Burden of Disease approach: a response to Williams. *Health Economics* 8(1): pp.69-82.
- Mutafova, M. Et al (1997). Health expectancy calculations: a novel approach to studying population health in Bulgaria. *Bulletin of the World Health Organization*, 75(2): pp147-153.
- Nolte, E. and M. McKee (2003). "Measuring the health of nations: analysis of mortality amenable to health care " *British Medical Journal* **327**(7424): 1129-34.
- Nolte, E. and McKee, M. (2004). *Does Health care Save Lives? Avoidable Mortality Revisited*. Nuffield Trust: London.
- OECD (2006). OECD Health data 2006. Paris: Organisation for Economic Co-operation and Development.
- Oortwijn, W., Mathijssen, J., Lankhizen, M., & Cave, J. (2006). Evaluating the uptake of Healthy Life Years Indicator: final report. RAND Europe, prepared for DG SANCO http://ec.europa.eu/health/ph_information/indicators/docs/RAND_HLY_en.pdf
- Robine, J.M, Romieu, I, & Cambois, E. (1999). Health expectancy indicators. *Bulletin of the World Health Organization*, 77(2): pp181-185.

- Rutstein, D. D., W. Berenberg, et al. (1976). "Measuring the quality of medical care." *New England Journal of Medicine* **294**: 582-8.
- Salomon, J., Tandon, A., and Murray, C.J.L. (2004). Comparability of self-rated health: cross-sectional multi-country survey using anchoring vignettes. *British Medical Journal*, 328: 258-64.
- Salomon, J., Tandon, A., Murray, C.J.L. (2001). Using vignettes to improve cross-population comparability of health surveys: concepts, design, and evaluation techniques. *Global Programme on Evidence for Health Policy Discussion Paper*, No. 41. WHO: Geneva.
- Schoenfeld D.E., Malmrose, L.C., Blazer, D.G., Gold, D.T., and Seeman T.E. (1994). Self-rated health and mortality in the high-functioning elderly. A closer look at healthy individuals: MacArthur field study of successful aging. *Journal of Gerontology*, 49: M109-115.
- Seeman, T. (2000). Health promoting effects of friends and family on health outcomes in older adults. *American Journal of Health Promotion*, 14: 362-70.
- Sellen, U., Nilsson, J., Mansson, N., and Nilsson, P. (2005). Self-rated health in relation to age and gender: influence on mortality risk in the Malmo Preventative Project. *Scandinavian Journal of Public Health* 33: 183-189
- Sen, A. (2002). Health: perception versus observation. *British Medical Journal*, 324:860-61.
- Sihvonen, A.P., et al. (1998). Socioeconomic inequalities in health expectancy in Finland and Norway in the late 1980s. *Social Science and Medicine*, 47:303-315.
- Singh-Manoux, A., Martikainen, P., Ferrie, J., Zins, M., Marmot, M., and Goldberg, M. (2006). What does self-rated health measure? Results from the British Whitehall II and French Gazel cohort studies. *Journal of Epidemiology and Community Health*, 60: 364-72.
- Sundquist, J. and Johansson, S.E. (1997). Self-reported poor health and low educational level predictors for mortality: A population-based follow up study of 39,156 people in Sweden. *Journal of Epidemiology and Community Health*, 51: 35-40.
- Torrance, G. (1986) "Measurement of Health State Utilities for Economic Appraisal: A Review" *Journal of Health Economics* 5(1): 1-30
- Van Doorslaer, E. and Gerdtham, U.G. (2003). Does inequality in self-assessed health predict inequality in survival by income? Evidence from Swedish data. *Social Science and Medicine*, 57: 1621-29.
- Ware, J.E. (1997). *SF-36 Health Survey, Manual and Interpretation Guide: The Health Institute, New England Medical Center. Second Edition*. Nimrod Press: Boston.
- Watson, D. and Pennebaker, J.W. (1989). Health complaints, stress, and distress: exploring the central role of negative affectivity. *Psychological Review*, 96: 234-54.
- Williams, A. (1999) "Calculating the global burden of disease: time for a strategic reappraisal?" *Health Economics*, 8: 1-8.
- Williams, A. (1999). Calculating the global burden of disease: time for a strategic re-appraisal. *Health Economics* 8(1): 1-8.
- Williams, A. (2000). Comments on the response by Murray and Lopez. *Health Economics* 8(1): pp.83-86.
- Wollinsky, F.D. and Johnson, R.J., (1992). Perceived health status and mortality among older men and women. *Journal of Gerontology: Social Sciences*, 47: S304-312.
- World Health Organization (1948). *Constitution of the World Health Organization*. WHO: Geneva.
- World Health Organization (2000) World Health Report. Health Systems: Improving Performance. WHO: Geneva.
- World Health Organization (2004). *Commission on social determinants of health: note by the Secretariat*. Geneva, World Health Organization (document number: EB115/35).
- WHO Health for All (2007) European Health for All Database. <http://www.euro.who.int/hfad> (accessed Feb 25 2007).
- Zimmer, Z., Natividad, J., Lin, H.S., and Chayovan, N. (2000). A cross-national examination of the determinants of self-assessed health. *Journal of Health and Social Behavior*, 41(4): 465-81.

Appendix 1: Micro-level health indicators collected from selected European countries

Country	Measurement Tools	Health Status Indicators	Link to Health Policies or Targets
Belgium	<ul style="list-style-type: none"> • Routine annual statistics collected by the regional governments: the Flemish and French communities and the Brussels region. Data on the Flemish region is collected by the Flemish Care and Health Agency, data on the French region is collected by the Ministry of the French Community and data on the Brussels region by the <i>Obsevatoire de la Santé et du Social</i>. • National Health Survey organized by the Scientific Institute of Public Health and the National Institute of Statistics. <ul style="list-style-type: none"> - 1997 - 2001 - 2004 	<ul style="list-style-type: none"> • Self-assessed health (National Health Survey, Brussels Region) • Health Complaints (National Health Survey) • Social health, mental health (National Health Survey) • Long-term and short-term disorders (National Health Survey) • Life expectancy, morality (Brussels Region, Flemish Region, French Region) • Fetal and infantile health indicators: birth weigh, neonatal mortality, infant mortality, serious morbidity of the mother, congenital deviations (Brussels Region, Flemish Region, French Region) • Potential years of life lost (French Region) • Mortality due to infectious disease, cancers, endocrine & metabolic disorders, mental health care, cardiovascular disorders, accidents (Brussels Region, Flemish Region) • Hospitalizations due to infectious disease, cancers, endocrine & metabolic disorders, mental health care, cardiovascular disorders, accidents (Brussels Region, Flemish Region) • Health related lifestyles (National Health Survey): <ul style="list-style-type: none"> ○ physical activity ○ tobacco consumption ○ alcohol consumption ○ blood pressure ○ cholesterol ○ diabetes 	<ul style="list-style-type: none"> • Information from the Health Interview Survey has informed policy by revealing that negative health behaviour and attitudes such as smoking, lower physical activity and worse nutritional habits in the Southern part of the country. This suggests that more measures should be taken in the field of health education, health promotion, and preventative health care in order to mitigate the remaining inequalities in health.
Bulgaria	<ul style="list-style-type: none"> • National Health Interview Survey (NHIS) <ul style="list-style-type: none"> - 1996 - 2001 • Generations and Gender Panel Survey (GGS) <ul style="list-style-type: none"> - 2004 - Expected 2007 - Expected 2010 	<ul style="list-style-type: none"> • Self-assessed health (NHIS, GGS) • Morbidity due to chronic illnesses (NHIS) • Reporting a chronic illness (NHIS, GGS) • Health related lifestyles (NHIS): <ul style="list-style-type: none"> ○ physical activity ○ tobacco consumption ○ alcohol consumption ○ BMI • Long term limitations in daily activities (NHIS, GGS) 	<ul style="list-style-type: none"> • Mortality and Morbidity statistics are used to elaborate the Government's National Health Strategy by detecting the most problematic areas.

Czech Republic	<ul style="list-style-type: none"> • Health Interview Survey Czech Republic (HISCR): <ul style="list-style-type: none"> - Every three years from 1993 to 2005 	<ul style="list-style-type: none"> • Self-assessed health, quality of life (HISCR) • Reporting a chronic illness (HISCR) • Health related lifestyles (NHIS): <ul style="list-style-type: none"> - physical activity - tobacco consumption - alcohol consumption - drug consumption - nutrition - BMI • Daily activities (HISCR) 	<ul style="list-style-type: none"> • No reported link to health policies or targets.
Denmark	<ul style="list-style-type: none"> • Health and Morbidity Survey organized by the National Institute of Public Health <ul style="list-style-type: none"> ○ 1987 ○ 1994 ○ 2000 ○ 2005 	<ul style="list-style-type: none"> • Self-assessed health, Quality of life, functional capacity, DALY • Reporting a chronic illness • Limitations in daily activities, functional limitations • Health related lifestyles: <ul style="list-style-type: none"> - physical activity - tobacco consumption - alcohol consumption - attitude towards health promotion - medical check-ups - nutrition • Prevalence of eating disorders, allergies, suicide attempts, violence, and chronic pain • House hygiene and health • Child health • Dental health 	<ul style="list-style-type: none"> • The results of the Health and Morbidity Survey serve as: <ul style="list-style-type: none"> - A baseline for the evaluation of the Government Public Health Programme, - Material used for the health planning of individual county councils.
Estonia	<ul style="list-style-type: none"> • Routine surveys of the population: <ul style="list-style-type: none"> ○ Estonian Health Survey (Ministry of Social Affairs): every 10 years (1996/7, 2006/7) ○ Health Behaviour Survey Among Estonian Adult Population (National Institute for Health Development): every 2 years (1990-2006) ○ Health Behaviour Survey Among School Children (National Institute for Health Development): every 4 years: (1991-2006) ○ European School Survey Project on Alcohol and Other Drugs (National Institute for Health Development): every 4 years (1995-2003) ○ Patient and Insured Persons Satisfaction Survey (Estonian Health Insurance Fund and Ministry of Social Affairs): annual (1998-2006) 	<ul style="list-style-type: none"> • Self-assessed health (Estonian Health Survey, Health Behaviour Surveys, EU SILC) • Reporting a chronic illness (Estonian Health Survey, Health Behaviour Surveys, EU SILC) • Limitations in daily activities (Estonian Health Survey, Health Behaviour Surveys, EU SILC) • Health behaviour (Health Behaviour Surveys): • Adolescent and Child health (Health Behaviour Survey Among School Children, European School Survey Project on Alcohol and Other Drugs) 	<ul style="list-style-type: none"> • There are different health sector policies with explicit targets. Different indicator sources are utilized to measure the progress in these areas, as well as different monitoring organizations. The national health strategies are: <ul style="list-style-type: none"> - The national HIV/AIDS prevention strategy - The national drug prevention strategy - The national tuberculosis control program

	<ul style="list-style-type: none"> ○ EU SILC (Statistical Office of Estonia): annual (2004-2006) ○ Estonian Labour Force Survey (Statistical Office of Estonia): annual ○ Household Budget Survey (Statistical Office of Estonia): annual ○ European Social Survey (University of Tartu) annual 		
Finland	<ul style="list-style-type: none"> • Health Behaviour and Health among the Finish Adult Population: annual survey organized by the National Public Health Institute • FINRISK 2002 	<ul style="list-style-type: none"> • Self-assessed health (Health Behaviour and Health among the Finish Adult Population) • Morbidity (Health Behaviour and Health among the Finish Adult Population) • Chronic diseases (Health Behaviour and Health among the Finish Adult Population) • Risky lifestyles (Health Behaviour and Health among the Finish Adult Population) • Limitations in daily activities (Health Behaviour and Health among the Finish Adult Population) • Healthy behaviours (Health Behaviour and Health among the Finish Adult Population) • Objective health measures (e.g. blood tests, anthropometric tests) (FINRISK) 	<ul style="list-style-type: none"> • Data is used by the Ministry of Health to produce reports on health and welfare in Finland and the measures which are taken to retain and enhance them. These reports are used to create health programs in necessary areas such as the 2015 Public Health Programme and the Development Project for Social Services.
France	<ul style="list-style-type: none"> • French National Health Survey conducted by the National Office of Statistics: every 10 years (every 5 in the future) • Survey on Health and Social Protection (<i>Enquete Sante Protection Sociale</i>) conducted by the National Research Institute, the National Statistics Office and the Institut de Recherche et de Documentation en Economie de la Sante: conducted biennially since 1988. 	<ul style="list-style-type: none"> • Self-assessed health (French National Health Survey, Survey on Health and Social Protection) • Morbidity (French National Health Survey) • Chronic diseases (French National Health Survey, Survey on Health and Social Protection) • Risky lifestyles (French National Health Survey): <ul style="list-style-type: none"> - tobacco consumption - alcohol consumption - physical activities - BMI • Limitations in daily activities in the last 6 months (French National Health Survey, Survey on Health and Social Protection) • Physical and Functional limitations, quality of life limitations (French National Health Survey) • Arthritis questions for people over 65 (Survey on Health and Social Protection) 	<ul style="list-style-type: none"> • Public Health Law (2004) calls for 100 health targets to be measured (with one or more indicators) for the years 2005-2009 at the regional level. • The evaluation of these targets enables the evaluation of public health policy.

<p>Germany</p>	<ul style="list-style-type: none"> • The Federal Health Monitoring system is a reporting system drawing on 200 different sources, including the statistical offices of the Laender and the Federation, was created in 1998. This is a joint task of the Robert-Koch-Institute and the Federal Statistical Office. • The Federal Health Monitoring system includes Federal Health Surveys and telephone health surveys. The Federal Health Survey has been conducted in 1998 (for adults) and 2003-6 (for children). Previous Health Surveys were undertaken in 1984-86, 1987-89, 1990/91 in the West, and in 1991/92 in the East. The telephone health survey has been administered annually since 2003 • National microcensus, organized by the Federal Statistical Offices and regionally administered by the Statistical Offices of the Laender, includes questions on health every 4 years. • German National Health Interview and Examination Survey (1998) • The German Health Survey for Children and Adolescents 	<ul style="list-style-type: none"> • Self-assessed health, quality of life, health related quality of life (Federal Health Monitoring system) • Medical examinations, laboratory tests (Federal Health Monitoring system) • Physician interviews(Federal Health Monitoring system) • Incidence and prevalence of diseases (Federal Health Monitoring system) • Mental health (Federal Health Monitoring system) • Ability to work (Federal Health Monitoring system) • Need of health care (Federal Health Monitoring system) • Exposure to undesirable substances (Federal Health Monitoring system) • Exposure to health risks at the workplace (Federal Health Monitoring system) • Accidents (Federal Health Monitoring system) • Chronic illnesses (Federal Health Monitoring system, National microcensus) • Disability and physical limitation (National microcensus) • Risky lifestyles (Federal Health Monitoring system, National microcensus) <ul style="list-style-type: none"> - tobacco consumption - alcohol consumption - physical activities - BMI • Objective health measures (e.g. anthropometric measures) (National Health Interview and Examination Survey); and urine and blood samples (German Health Survey for Children and Adolescents) 	<ul style="list-style-type: none"> • Health targets are gradually becoming more popular in the health policy agenda. • Six targets have recently been developed which aim to guide all stakeholders in the health system. The targets are in the areas of smoking, mental health, breast cancer and diabetes.
<p>Hungary</p>	<ul style="list-style-type: none"> • National Health Interview Survey organized by the Ministry of Health (Study Group on Health Promotion). Survey was meant to be carried out every three years starting in 2000, but only the first two were completed. 	<ul style="list-style-type: none"> • Self-assessed health • Chronic diseases • Risky lifestyles • Limitations in daily activities 	<ul style="list-style-type: none"> • Health targets have been introduced since 1994. The most recent targets were introduced in 2003 under the National Public Health Programme. This programme, in coordination with the National School of Public Health, University of Debrecen collects and analyses data on health care services and supports health policy makers by providing accurate information.

Italy	<ul style="list-style-type: none"> • The National Survey of Health and Health Services (<i>Indagine Istat Multiscopo Condizioni di Salute e Ricorse ai Servizi Sanitari</i>) organized by the Italian Institute of Statistics. This is administered every 4-5 years 	<ul style="list-style-type: none"> • Self-assessed health • Morbidity • Disability • Chronic diseases • Healthy and unhealthy behaviour <ul style="list-style-type: none"> - tobacco consumption - alcohol consumption - physical activities - BMI • Limitations in daily activities 	<ul style="list-style-type: none"> • Health targets are often linked to health policies in Regional health plans, which can either be quantitative targets or more general targets. • The latest NHS health plan (2006-2007) implemented regular monitoring activities using the available data from the National Health Information System. This involves all levels of government (central, regional and local).
Latvia	<ul style="list-style-type: none"> • There is no national health survey collected on a regular basis. 	<ul style="list-style-type: none"> • Death rates, age standardized death rates, cause of death • Incidence and prevalence of disease • Disability causes and rates • Health state of adolescents and children 	<ul style="list-style-type: none"> • These health indicators are used to define Latvia's Health Strategy.
Lithuania	<ul style="list-style-type: none"> • The Health Interview Survey of the Lithuanian Population is organized by Statistics Lithuania, and has been carried out once in 2005. • The Health Behaviour Monitoring Project (Finbalt Health Monitor) launched as an initiative from the National Public Health Institute in Finland for all the Baltic States. This was carried out seven times from 1994 – 2006. 	<ul style="list-style-type: none"> • Self-assessed health (Health Interview Survey of the Lithuanian Population, The Health Behaviour Monitoring Project) • Chronic diseases (Health Interview Survey of the Lithuanian Population, The Health Behaviour Monitoring Project) • Healthy and unhealthy behaviour (Health Interview Survey of the Lithuanian Population, The Health Behaviour Monitoring Project) <ul style="list-style-type: none"> - tobacco consumption - alcohol consumption - physical activities - BMI • Limitations in daily activities (Health Interview Survey of the Lithuanian Population, The Health Behaviour Monitoring Project) • Personal opinions about the causes of disease (The Health Behaviour Monitoring Project) 	<ul style="list-style-type: none"> • Health monitoring is part of the explicit targets of the Lithuanian Health Programme 1997-2010.
Poland	<ul style="list-style-type: none"> • National Health Survey conducted by the National Statistics Office in 1996 and 2004. • Health Care in Households conducted biannually 	<ul style="list-style-type: none"> • Self-assessed health (National Health Survey) • Legal health status in terms of claims (National Health Survey) • Physical disability (National Health Survey) • Chronic diseases (National Health Survey) • Healthy and unhealthy behaviour (National Health Survey) <ul style="list-style-type: none"> - tobacco consumption 	<ul style="list-style-type: none"> • The National Health Program has a set of indicators which are monitored each year and presented in a report published by the Ministry of Health.

		<ul style="list-style-type: none"> - alcohol consumption - physical activities - BMI - emotional happiness • Limitations in daily activities (National Health Survey) • Child health <ul style="list-style-type: none"> - birth weight - length of breast feeding time - inherited malformations - BMI 	
Romania	<ul style="list-style-type: none"> • National Health Survey conducted by the National Statistics Office in 1996 and 2004. • Conducted biannually 	<ul style="list-style-type: none"> • Hospital infections • Chronic diseases 	<ul style="list-style-type: none"> • Only a small fraction of the data collected is used for decision-making and the evaluation of health system performance.
Slovenia	<ul style="list-style-type: none"> • The Slovenian Public Opinion Survey carried out by the Centre for Public Opinion and Mass Communication Research at the University of Ljubljana, and the National Institute of Public health. These surveys have been carried out 4 times since 1994, in 1994, 1996, 1999, and 2001. • The Health Monitor Questionnaire also carried out by the Centre for Public Opinion and Mass Communication Research at the University of Ljubljana. These surveys were carried out in 2001 and 2004. • The World Health Survey, carried out by the National Institute of Public Health. This was carried out in 2003. 	<ul style="list-style-type: none"> • Self-assessed health including mental health and psychosomatic problems • Healthy and unhealthy behaviour: <ul style="list-style-type: none"> - tobacco consumption - alcohol consumption - physical activities - weight - health habits - Limitations in daily activities 	<ul style="list-style-type: none"> • The reporting of national health indicators is closely linked to health policy and strategy. National health indicators play an important role in setting targets in the National Health Plan.
Spain	<ul style="list-style-type: none"> • The National Health Survey (Encuesta Nacional de Salud) has been carried out since 1993 on a biannual basis. This survey is carried out by the National Statistical Institute in collaboration with the Ministry of Health. • Regional health surveys are carried out by the departments of the autonomous communities, sometimes in collaboration with the regional statistical offices. These surveys are administered on an irregular basis, with the exception of the Basque community, who collects data every 5 years. 	<ul style="list-style-type: none"> • Self-assessed health (National Health Survey) • Limitations in daily activities over the 12 months prior to interview (National Health Survey) • Limitations in daily and leisure activities over the last 2 weeks and symptoms (National Health Survey) • Dental health status • Healthy Behaviour (National Health Survey) <ul style="list-style-type: none"> - hours of sleep - physical activity in the workplace - leisure-time physical activity - eating habits • Risky life styles (National Health Survey) <ul style="list-style-type: none"> - smoking - drinking • Chronic conditions (National 	<ul style="list-style-type: none"> • The reporting of national health indicators is used by the Ministry of Health and Consumption to: <ul style="list-style-type: none"> - Evaluate the success of existing National Health Strategy - Assess the achievement of main goals - Elaborate new strategies - Detect priority areas of action - Draft national health plans of action - Assess epidemiological surveillance

		<p>Health Survey)</p> <ul style="list-style-type: none"> - hypertension - high cholesterol - diabetes - asthma - heart disease - gastric ulcer - allergy - depression 	
Sweden	<ul style="list-style-type: none"> • The Survey on Living Conditions published by Statistics Sweden, administered annually since 1975. • The National Survey on Public Health published by the Swedish National Institute of Public Health, administered annually since 2004. 	<ul style="list-style-type: none"> • Self-assessed health (Survey on Living Conditions, National Survey on Public Health) <ul style="list-style-type: none"> - physical - dental - mental • Health condition over the last 2 weeks (Survey on Living Conditions) • Medication (Survey on Living Conditions, National Survey on Public Health) • Limitations in daily activity (Survey on Living Conditions, National Survey on Public Health) • Means of assistance (e.g. wheelchair) (Survey on Living Conditions) • Self-assessed needs of social welfare services (Survey on Living Conditions) • Healthy Behaviour (Survey on Living Conditions, National Survey on Public Health) <ul style="list-style-type: none"> - physical activity - diet • Risky life styles (Survey on Living Conditions, National Survey on Public Health) <ul style="list-style-type: none"> - smoking - drinking - drugs - gambling 	<ul style="list-style-type: none"> • The Statistical yearbook by Statistics Sweden containing information on pharmaceutical sales, professional staff, costs and activities is used in health policy.
Turkey	<ul style="list-style-type: none"> • The Turkish Demographic Health Survey is carried out by the Hacettepe University Institute of Population Studies in collaboration with the Ministry of Health. It is conducted in five year intervals starting in 1993. • The Household Survey is conducted by Baskent University and the Refik Saydam School of Public Health. This was conducted in 2003 to estimate the burden of disease. • The Official Statistical Program (to be kicked off in 2008) will also include health surveys. 	<ul style="list-style-type: none"> • Maternal and child health and nutrition • Infant and child mortality • Trends in infant and child mortality • Fertility • Abortions and stillbirths 	<ul style="list-style-type: none"> • The current 'Health Transformation Programme' has the objectives of organizing, delivering and financing health services in line with the principles of equity, effectiveness and efficiency. Indicators of mortality and morbidity are used to measure efficiency, while no monitors are used to measure equity.

<p>United Kingdom</p>	<ul style="list-style-type: none"> • The General Household Survey, an annual cross sectional survey conducted by the National Statistics Office. • The British Household Panel Survey conducted annually since 1991 by the National Statistics Office • The English Longitudinal Survey of Aging conducted biannually since 1998 by University College London, the Institute of Fiscal Studies and the National Centre for Social Research. • 1970 British Cohort Study conducted by the Centre for Longitudinal Studies at the Institution of Education. Surveys have been conducted at birth (1970), then again after ten, sixteen, twenty-six and twenty-nine years. • Millennium Cohort Study funded by the ESRC conducted at birth (2000) and three years later. • Health Surveys for England and Scotland (annual) 	<ul style="list-style-type: none"> • Self-assessed health, quality of life, health related quality of life • Incidence and prevalence of diseases • Ability to work • Chronic illnesses • Disability and physical limitation • Health condition over the last 2 weeks • Risky lifestyles <ul style="list-style-type: none"> - tobacco consumption - alcohol consumption - physical activities - BMI • Objective measures of health: anthropometric measures, height and weight, blood tests 	
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Appendix 2: Key national health indicators in the United States, Canada, Australia, and New Zealand

Broad Indicator Category	Measures
Health and Disease Outcomes	<ul style="list-style-type: none"> • Self-reported health status • Functional health status (frequently measured via health utility index) • Incidence/mortality of heart attacks or heart disease • Life expectancy, including HALE and DALE • All-cause infant and perinatal mortality • Psychological distress (e.g., depression, self-rated mental health) • Incidence/mortality of cancer • Incidence/mortality of AIDS cases and STDs (e.g., gonorrhoea) • Severe or profound core activity limitations (frequently measured via days of school or work lost due to activity limitations) • Incidence/mortality of diabetes • Incidence/mortality of asthma and other respiratory diseases • Rates of injury and injury-related hospitalizations/mortality • Rates of suicide (adults and youths) • Total mortality (also, avoidable mortality) • Teenage fertility rate
Preventive Health Behaviors/Health Determinants	<ul style="list-style-type: none"> • Child exposure to tobacco smoke in the home • Adult (18 years and older) use of tobacco products • Availability of fluoridated water • Daily intake of fruits and vegetables • Low birth weight • Daily participation in school PE education programs amongst young people • Use of contraception amongst all females aged 15 to 44 years of age • Rates of overweight and obesity • Childhood (aged 19 to 35 months) immunization • Rates of high blood pressure • Rates of blood cholesterol • Daily alcohol consumption • Use of safety belts and child restraints
Health System Performance	<ul style="list-style-type: none"> • Rates of cervical and breast cancer screening • Proportion of population living within 60 miles of primary health care facility (U.S.) • Rates of Caesarean Section • Number of hospital beds • Hospital length of stay • Access to elective surgery • Waiting times in emergency departments

Sources: CIHI, 2006; AIHW, 2004; Ministry of Health, 2002; Ministry of Health, 2000; Chrvala & Bulger, 1999.

Appendix 3: Macro-level health indicators collected by international organizations

Type of Indicator	Macro-level health indicators collected from WHO, OECD and Eurostat
General self-assessed health	<ul style="list-style-type: none"> • Percent of population self-assessing health as good (WHO) • Perceived health status at good and above for males, females and all (at all ages, 15-24, 25-44, 45-64, 65+) (OECD) • General mental health (% of population) based on answers to SF-36 questionnaire and “Andrews single item happiness scale” (EU EuroREVES project)
Life Expectancy	<ul style="list-style-type: none"> • Life expectancy at birth, and ages 1, 15, 45, 65, by gender and total using Wiesler’s method (Eurostat) • Life expectancy for the general population and males and females separately at birth and at ages 40, 60, 65, 80 (OECD) • Life expectancy at birth, at ages 1, 15, 45, 65 in years (WHO) • Reduction of life expectancy through death before 65 years (WHO) • Life expectancy of intellectually disabled at birth and at ages 1, 15, 45, 65, 75, by gender and level of intellectual disability, separate for downs syndrome (EU Pomona project) • Disability-adjusted life expectancy (WHO) • Estimated life expectancy (WHO)
Mortality Indicators	<ul style="list-style-type: none"> • Crude death rate per 1,000 population (WHO) • Death rates by age per 100,000 population, by gender and 5-year age band (Eurostat) • Child death rate for per 1,000 live births age 0-5 (Eurostat) • Infant, fetal, neonatal, perinatal and postnatal mortality per 1,000 live births (Eurostat, OECD, WHO) • Early neonatal, late neonatal, post neonatal and maternal deaths per 1,000 live births (WHO) • Estimated probability of dying before age 5 years per 1,000 live births general, male, female (WHO) • Estimated maternal mortality per 100,000 live births (WHO/UNICEFF/UNFPA estimates) • Chance of dying in age intervals 0-5, 15-45, 45-65, 65-85, 85+ and by gender (Eurostat) • Death rate crude and standardized by 100,000 population (Eurostat, OECD, WHO) sorted by gender, 5-year age bands and region for (Eurostat): <ul style="list-style-type: none"> - All causes - All infectious/parasitic diseases (tuberculosis, meningitis, AIDS, viral hepatitis) - All cancers (including lip-oral-pharynx, oesophagus, stomach, colon, anorectal, liver & intrahepatic bile ducts, pancreas, larynx/trachea/bronchus/lung, melanoma, breast, cervix, other uterus, ovary, prostate, kidney, bladder, lymphatic & hematopoietic tissue) - All blood/immunology - All endocrine, diabetes - All mental/behavioural (alcohol abuse, drug dependence) - All nervous system/sense - All circulatory (ischaemic heart disease, cerebrovascular disease, other heart disease, stroke) - All respiratory (influenza, pneumonia, COPD, asthma) - All digestive (stomach/duodenum ulcer, chronic liver disease) - All musculoskeletal (rheumatoid arthritis and osteoarthritis) - All congenital malformations (nervous system, circulatory system) - All symptoms, sudden infant death, unknown causes - All external (transport, falls poisoning, suicide, homicide, undetermined) - Motor vehicle traffic accidents and transport accidents (WHO) - Diarrhoeal diseases (under 5 years) (WHO) - Disease of the genitourinary system (OECD, WHO) - Acute respiratory infections, pneumonia and influenza in children under 5 years (WHO) - Mental disorder & disease of nervous system & sense organ (WHO) - Complications of pregnancy/childbirth (OECD) - Perinatal conditions (OECD) - Diseases of skin and subcutaneous tissues (OECD) - Assault (OECD) - Adverse effects from medicines (OECD) - Misadventures to patient during surgical/medical care (OECD) • SDR, appendicitis, all ages, 0-64 per 100,000 (WHO) • SDR, hernia and intestinal obstruction, all agents, 0-64 per 100,000 (WHO) • SDR, adverse effects of therapeutic agents, all ages, 0-64 per 100,000 (WHO)

Morbidity	<ul style="list-style-type: none"> • Potential life years lost (Eurostat, OECD) <ul style="list-style-type: none"> - All causes - Infectious/parasitic diseases - HIV - Cancers (trachea/bronchus/lung, cervix, female breast) - Blood/immunology diseases - Endocrine, diabetes - Nervous system/sense - Circulatory (ischaemic heart disease, cerebrovascular disease, other heart disease, stroke) - Respiratory (influenza, pneumonia, COPD, asthma) - Digestive (stomach/duodenum ulcer, chronic liver disease) - Musculoskeletal (rheumatoid arthritis and osteoarthritis) - Congenital malformations (nervous system, circulatory system) - All symptoms, sudden infant death, unknown causes - External (transport, falls poisoning, suicide, homicide, undetermined) - Motor vehicle traffic accidents and transport accidents (WHO) - Diarrhoeal diseases (under 5 years) (WHO) - Disease of the genitourinary system (OECD, WHO) - Acute respiratory infections, pneumonia and influenza in children under 5 years (WHO) - Selected alcohol related causes (WHO) - Selected smoking related causes (WHO) - Mental disorder & disease of nervous system & sense organ (WHO) - Complications of pregnancy/childbirth (OECD) - Perinatal conditions (OECD) - Diseases of skin and subcutaneous tissues (OECD) - Assault (OECD) - Adverse effects from medicines (OECD) - Misadventures to patient during surgical/medical care (OECD) • Incidence and Prevalence (Eurostat) <ul style="list-style-type: none"> - Infectious/parasitic diseases (Creutzfeld-Jacob disease, hepatitis B, HIV/AIDS, Measles, Meningitis, Sexually Transmitted Diseases, Tuberculosis, Vaccination scheme diseases) - Cancers (including colorectal, melanoma, mouth/pharynx/lip, bladder, brain/CNS, breast, cervix uteri, endometrium, gall bladder, biliary tract, kidney, liver, lung/larynx/trachea/bronchus, oesophagus, ovary, pancreas, prostate, stomach, testis, thyroid, kaposi's sarcoma, leukaemia, lymphomas, mesothelioma, multiple myeloma, childhood cancers, total cancers) - Blood/immunology - Endocrine, diabetes (diabetes type 1 in children, all diabetes, nephropathy in diabetics, blindness, retinopathy) - All mental/behavioural (alcohol related, anxiety disorder, dementia/alzheimer, depression, intellectually disability, post-partum depression, suicide attempt, - Nervous system/sense (cataract, migraine or frequent headache) - Circulatory (acute coronary syndromes, acute myocardial infraction, effort angina, heart failure, other heart disease: rheumatic, atherosclerosis, stroke) - Respiratory (asthma, COPD) - Digestive (gastric or duodenum ulcer) - Dental (periodontal health, removable dentures) - Musculoskeletal (rheumatoid arthritis and osteoarthritis) - Genito-urinary system (erectile dysfunction, urinary incontinence) - Pregnancy (deliveries after assisted reproductive therapy, fecal incontinence chronic, problems getting pregnant, severe maternal morbidity, trauma to perineum) - Perinatal conditions (APGAR score, low birth weight, cerebral palsy, hypoxic-ischemic encephalopathy, multiple birth rate, pre-term births) - All congenital malformations (downs syndrome, neural tube defects) - Symptoms - External causes (alcohol related traffic accidents, burns in children, hip fractures, injuries: home/leisure, violence, road traffic injuries, workplace injuries, long-bone fractures, poisoning in children) • Disease incidence per 100,000 for the following (WHO): <ul style="list-style-type: none"> - tuberculosis - viral hepatitis, viral hepatitis A, viral hepatitis B - syphilis - gonococcal infection - pertussis - measles - malaria
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	<ul style="list-style-type: none"> - diphtheria - tetanus - acute poliomyelitis - congenital syphilis - congenital rubella - neonatal tetanus - rubella - mumps - HIV, AIDS - Haemophilus influenza type b invasive disease - Cancer incidence (and specifically for trachea, bronchus and lung cancer , female breast cancer, cervix uteri cancer) - Mental disorders - Alcoholic psychosis - Ischaemic heart disease - Cerebrovascular disease • Prevalence (%) of the following (WHO): <ul style="list-style-type: none"> - cancer - diabetes - mental disorders - chronic obstructive pulmonary disease • Certain specific (avoidable) causes per 1000, 000 population by gender, age, main diagnostic groups such as dermatosis, silicosis, asthma, cancer, infections, poisonings, consequences of noise, vibration, excessive loads (Eurostat) • Functional health problems (% of population) by gender, age, region, SES such as problems with eating/chewing, hearing, mobility, speaking, psychological disability, memory limitations etc. (EU EuroREVES project) • Decayed, missing or filled teeth at age 12 (DMFT-12 index) (OECD, WHO) • New invalidity/disability cases per 100,000 (WHO) • Road traffic accidents with injury per 100, 000 (WHO) • Persons killed or injured in road traffic accidents per 100,000 (WHO), per million (OECD) • Low infant birth weight (OECD) • Congenital anomalies per 1,0000 births (spina bifida, transposition of great vessels, limb reduction, down's syndrome) (OECD) • AIDS rate per million population (OECD) • Cancers per 100000 & cancer rate standardized to 1960 world standard population (malignant neoplasms and more specifically of the colon, lung, female breast, cervix, and prostate) (OECD) • Surgical wound infection rate, in percent, all operations (WHO)
Behavioural	<ul style="list-style-type: none"> • Percent of regular daily smokers in the population, age 15+ (Eurostat, OECD, WHO) • Adults smoking 20 cigarettes per day, average number of cigarettes per year by gender, age, region, SES (WHO) • Number of cigarettes consumed per person per year (WHO) • Pure alcohol consumption, litres per capita (Eurostat, OECD, WHO) • Average number of calories available per person per day (kcal) (WHO) • Percent of total energy available from fat, and from protein (WHO) • Use of illicit drugs (including children), lifetime/ever by gender, age, region, SES (Eurostat)

Sources: OECD Health data 2006, Eurostat 2007, WHO Health for all 2007, European Commission 2005

Appendix 4. Country experts

The following experts contributed to this research note by providing country reports:

Belgium – Dirk Corens and Maarten van Stiphout (Centre for Health Economics, Free University of Brussels); Bulgaria – Alexandrina Stoyanova (CRWE, University of Barcelona); Czech Republic – Martin Dlouhy (Czech Institute of Health Policy and Economics); Denmark – Karsten Vrangbaek (University of Copenhagen); Estonia – Triin Habicht (Health Economics Department, Estonian Health Insurance Fund) and Jarno Habicht (World Health Organization Country Office, Estonia); Finland – Jan Klavus (STAKES, Helsinki); France – Sandra Mounier-Jack (London School of Hygiene and Tropical Medicine); Germany – Stefanie Ettelt (London School of Hygiene and Tropical Medicine); Hungary – Roza Adany (School of Public Health, University of Debrecen); Ireland - Helen McAvoy (Institute of Public Health, Belfast); Italy - Margherita Giannoni-Mazzi (University of Perugia); Latvia - Daiga Behmane (University of Latvia); Lithuania - Skirmante Starkuviene (Dept of Social Medicine, Kaunas University of Medicine); Netherlands – Jeanine Suurmond (Dept. of Social Medicine, Academic Medical Centre, University of Amsterdam); Poland - Adam Kozierkiewicz (Health Information Systems Unit, Institute of Public Health of Jagiellonian University, Kraków); Romania - Victor Olsavszky (World Health Organization); Slovenia - Tit Albreht (Institute of Public Health of the Republic of Slovenia); Spain - Alexandrina Stoyanova (University of Barcelona); Sweden - Anna Melke (Göteborg University and the Vårdal Institute); Turkey - Omer Saka (Kings College London) and Nebibe Varol (London School of Economics and Political Science Health and Social Care); United Kingdom - Sara Allin, Cristina Masseria, Corinna Sorenson and Irene Papanicolas (London School of Economics and Political Science Health and Social Care).