Europeans of retirement age: chronic diseases and economic activity

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Executive summary

Introduction

The Dutch National Institute for Public Health and the Environment (RIVM) prepared this report in 2012 in response to a call by the European Commission (DG SANCO, Directorate-General Health and Consumers). The purpose of the report is to review the impact of chronic disease on the population of pre- (50+) and post-retirement age in the European Union (EU).

This report addresses the following topics:

- The burden of chronic disease in the older population pre- and post-retirement (chapter 3);
- The impact of chronic disease on the exit from the labour market (including unemployment, disability and early retirement) (chapter 4);
- The impact of leaving the labour market on the burden of chronic disease (chapter 4);
- Interventions to increase the social participation (including work participation) of people with a chronic disease (chapter 5).

Chapter 6 provides a list of policy recommendations that follow from our analysis, including an overview of gaps and needs for further action at EU, and Member State level.

The primary focus of this report is on the population of pre- (50+) and post-retirement age and the following groups of chronic diseases: cardiovascular diseases, cancers, diabetes, chronic lung diseases and depression. Our overview of the chronic disease burden will also pay attention, although in a limited way, to some neurodegenerative diseases (such as dementia) because of their importance among older age groups. We recognise, however, that in this way we only address a narrow selection of chronic diseases and that many other chronic diseases, such as musculoskeletal problems, the bulk of mental health problems and diseases of the sense organs, would also deserve proper attention. Although these chronic diseases are not part of the original scope of this report, many of the described issues and possibilities for tackling chronic diseases are also quite relevant to these conditions.

The report focuses on EU Member States. Relevant information from EFTA (European Free Trade Association) Countries and Accession/Candidate Countries is included when possible.

Background

Chronic diseases are the main contributors to the total burden of disease and mortality in the EU. If chronic diseases remain highly prevalent or their burden increases, EU countries will be challenged by reduced country productivity and competitiveness, increased financial pressures on health systems, reduced health and wellbeing and threats of poverty and inequity for patients and their families. Employment opportunities for people with disabilities (including those resulting from chronic diseases) tend to drop during economic crisis and often do not improve with subsequent economic recovery. Therefore, increases in the number of persons receiving disability benefits during an economic crisis to avert increases in unemployment rates should be prevented. Furthermore, the ageing of the European population creates a need for elderly people to remain working up to an older age to maintain our economies sustainable by increasing total productivity and decreasing the future burden of pensions. This report addresses these issues by examining the burden of chronic disease in elderly Europeans of retirement age (50-70 years), the relationship of chronic disease with economic activity and interventions to improve the social participation of elderly Europeans with a chronic disease.

The publication of the EU Council Conclusion paper 'Innovative approaches for chronic diseases in public health and healthcare systems' and the adoption of a political declaration on Prevention and Control of Non-communicable Diseases by the United Nations' General Assembly in September 2011 show that these issues are high on the policy agendas of both the EU and the World Health Organization (WHO).

Methods

Chapter 3 gives a detailed description of trends and developments in morbidity, mortality and DALYs (Disability Adjusted Life Years) due to chronic diseases and in self-reported health measures in the older population in EU Member States. The selection of indicators and data sources for this overview was based on the European Community Health Indicators (ECHI) shortlist. The sources are mostly the Eurostat database which includes the Statistics on Income and Living Conditions (SILC), the European Health Interview Survey (EHIS) and the mortality statistics, and the databases of the International Agency for Research on Cancer (e.g. GLOBOCAN). The best suited data for international comparisons are not always available for all EU, EFTA and Accession/Candidate countries, or for the relevant age groups

or other subgroups (e.g. socio-economic status). In addition, self-reported data from EHIS are subject to recall bias and might not reflect the true prevalence of the disease. Therefore, we included data from several other relevant sources or epidemiological studies to add to the information on chronic disease prevalence.

To assess the impact of poor health or having a chronic disease on the exit from work and the health effects of older Europeans' exit from work, we have looked at the available scientific and grey literature and included studies with a longitudinal design, thus making conclusions about causality possible.

To answer the question of what interventions are effective for improving the social participation of people with a chronic disease, we identified relevant systematic reviews and meta-analyses in scientific literature databases. We included reviews and meta-analyses that included randomised controlled trials (RCT), non-randomised controlled trials (CCT), and/or controlled before-after studies (CBAs) that compared an intervention to usual care or a placebo intervention.

Results

The burden of chronic diseases on Europeans of retirement age is substantial and will increase due to population ageing and prevailing lifestyle risks

Chapter 3 shows that the burden of chronic diseases on Europeans of retirement age (50-70 years) is substantial. The burden of four major chronic diseases (cardiovascular disease, cancer, COPD, diabetes) increases with age in both men and women. Although their prevalence is highest in the population over 75 years of age, the prevalence and mortality of chronic diseases is already considerable in elderly people of retirement age in many European countries. For example, an estimated 52 million EU citizens aged 55-74 report having a long-standing illness or health problem. This is about half of all people in this age group. In addition, the percentage of people who perceive their health as good or very good decreases with age. Textbox A provides an overview of the disease burden for the selected chronic diseases in people of retirement age. There is a lack of good data on trends in chronic disease prevalence in Europe. However, because of the ageing population, the remaining high prevalence of lifestyle risk factors and increased survival, the total number of people with a chronic disease is still expected to increase.

Textbox A: Overview of disease burden for the selected chronic diseases.

Diabetes

- Self-reported diabetes prevalence varies considerably among EU Member States from 3.1 % in Romania to 7.9% in Hungary*.
- An estimated 13 million EU citizens aged 55-74 report having diabetes.
- Diabetes prevalence increases with age.
- Diabetes prevalence is expected to increase due to population ageing and the increasing prevalence of obesity.
- Diabetes prevalence is higher among lower educated people and certain ethnic groups.
- Mortality data for diabetes are often not very well comparable among countries and systematically underreported.

Cardiovascular disease

- There is a lack of up-to-date and internationally comparable data on morbidity from cardiovascular disease (ischaemic heart disease, stroke).
- Age-standardised attack rates are decreasing, but the absolute number of events is increasing due to population ageing.
- Cardiovascular diseases are more prevalent among lower educated people.
- There is considerable variation in mortality for ischaemic heart disease and stroke among European countries and among regions within countries.
- About a quarter of the men who die from cardiovascular disease are between 50 and 70. For women, this is about one in thirteen.
- Age-standardised mortality for stroke and ischaemic heart disease is decreasing in the EU for age groups 60-74 and 45-59. The absolute number of deaths for both stroke and ischaemic heart disease has been decreasing as well.

Cancer

- Cancer incidence varies considerably among EU Member States, from 160 per 100,000 population in Greece to 326 per 100,000 in Denmark.
- Cancer incidence increases with age.
- Each year, one million EU citizens aged 50-70 are diagnosed with cancer corresponding to 42% of all new cancer cases annually.
- Although there are often socio-economic inequalities in cancer incidence and mortality, the pattern is not consistent.
- There is considerable variation in mortality among European countries and among regions within countries.
- One-third of EU citizens who die from cancer are between 50 and 70 years old.
- Age-standardised mortality for cancer is decreasing in the EU for age groups 60-74 and 45-59. An exception is lung cancer mortality in women, which is increasing in the EU. The absolute number of cancer deaths is increasing.

COPD

- Self-reported COPD prevalence varies considerably among countries, from 1.2 % in Malta to 6.2% in Turkey*.
- COPD prevalence increases with age.
- An estimated five million EU citizens aged 55-74 report having COPD.
- COPD prevalence is higher among lower educated people.
- There is considerable variation in mortality among European countries and among regions within countries.
- 16% of EU citizens who die from chronic lower respiratory diseases are between 50 and 70 years old.
- Age-standardised mortality for chronic lower respiratory diseases is decreasing in the EU for age groups 60-74 and 45-59. The absolute number of deaths for chronic lower respiratory diseases is not decreasing.

Depression

- Self-reported depression prevalence varies considerably among EU Member States, from 0.8% in Bulgaria and Romania to 5.6% in Belgium*.
- Depression is more prevalent among people aged 45 years and over compared to young people.
- An estimated five million EU citizens aged 55-74 report having depression in the past 12 months.
- Depression prevalence is higher among lower educated people.

Neurodegenerative diseases

- There is a lack of comparable data on neurodegenerative diseases.
- On average, about 1.2% of EU citizens have dementia, and this corresponds to between 5.5 and 6.1 million people.
- Few people younger than 70 have dementia.
- The prevalence rates for Parkinson's disease and multiple sclerosis vary considerably. This is probably due to differences in the methodologies or age distributions of the study populations and differences in degree of disease ascertainment.

* Self-reported data are subject to recall bias and might not reflect the true prevalence of the disease.

In few EU countries people can expect to reach the retirement age without activity limitations

There are few EU countries (Sweden, Malta, Ireland, Greece, Bulgaria) where people can expect to reach the age of 65 (the retirement age in many countries) without activity limitations due to health problems. Men born in the EU in 2009 can expect to live on average 61.3 years without activity limitations (Healthy Life Years, HLY). Women born in 2009 can expect to live on average 62 years without activity limitations. The EU has set the overarching target of increasing the average number of HLYs by two years by 2020. Although trends vary among EU countries, the average number of HLYs for the EU has remained rather stable between 2005 and 2010. When the retirement age is increased, as proposed in several EU countries, the number of elderly workers with a chronic disease and with activity limitations due to health problems will therefore also increase.

Each year approximately three million productive life years are lost due to the premature mortality from chronic diseases among older Europeans of working age

The majority of people who die from chronic diseases are 70 years and over. However, one in five EU citizens who die from cardiovascular disease, cancer or chronic lower respiratory diseases is between 50 and 70 years old. Cancer is the largest contributor to mortality in this age group. Mortality due to cardiovascular disease, cancer or chronic lower respiratory diseases between the ages 50 and 65 contributes to an estimated loss of 2.9 million productive life years if the retirement age is 65 and 3.8 million if the retirement ages is set at 67 years. It should be noted that data based on registered primary causes of death seriously underestimate the actual number of deaths for which diabetes was a contributing factor. As many patients

with diabetes die from cardiovascular disease, it is usually their cardiovascular disease that is recorded as the primary cause of death. Therefore, we do not present data for mortality due to diabetes.

There are large differences in the burden of chronic diseases among EU Member States

The prevalence of and mortality from chronic diseases varies considerably among EU Member States. These differences in mortality are the main cause of the difference in life expectancy at birth among Member States. In 2009, the gap between the country with the highest and the country with the lowest life expectancy at birth was over 11 years for men and over seven years for women. Furthermore, the number of DALYs (Disability Adjusted Life Years) varies considerably among EU Member States. For example, many of the EU countries that joined the EU in or after 2004 have high DALY rates for cardiovascular diseases. DALYs are a combination of years of life lost by premature mortality and years of life lost due to a loss of quality of life from a particular disease. The four major chronic diseases (cardiovascular disease, cancer, COPD, diabetes) contribute significantly to the total disease burden in DALYs, although other chronic diseases, including mental health problems, musculoskeletal, sense organ, and digestive diseases are important as well.

Large differences in the burden of chronic diseases also exist within EU Member States

In addition to differences among countries, there are large differences in the burden of chronic disease among social economic groups or regions within most Member States. The prevalence of diabetes, cardiovascular disease, COPD and depression is higher in people with lower levels of education as compared with people with a higher level of education. Although there are often socio-economic inequalities in cancer incidence and mortality, the pattern is not consistent.

Chronic diseases among older European workers contribute to economic costs

The increase in the prevalence of chronic diseases among older European workers has a potentially negative influence on labour participation and can contribute to economic losses, both for society as a whole as well as for individuals. Whereas premature death due to chronic disease obviously has a direct influence on labour participation, the influence of living with a chronic disease on labour participation is less straightforward. Therefore, chapter 4 provides a closer look at the relationship between the health status of older Europeans of retirement age and their economic activity.

Labour participation decreases considerably after the age of 50

Chapter 4 shows that labour force participation in the European Union increases until the age of 50 years, and thereafter substantially decreases. Employment rates among the elderly vary considerably among European countries with the highest rates in the Nordic countries. These variations may partly be due to differences in health, but several other factors also influence the participation of the elderly in the labour force. For example, the availability of pension-like social benefits, statutory retirement age, the availability and levels of disability benefits and, of course, the general state of the economy, which will reflect job opportunities for the elderly and labour demand.

Poor health has an impact on the labour participation of elderly Europeans

In chapter 4, we conclude that poor self-perceived health is a major predictor of any type of exit from paid work (unemployment, disability and early retirement) for older workers in Europe. Specific health problems, including depression, limiting long-standing illness, chronic bronchitis, cardiovascular disease, musculoskeletal disorders and having one or more chronic conditions also predict an early exit from work among older persons.

Effect of retirement and unemployment on health among older workers remains unclear

Retirement (or early retirement) seems to have a positive effect on non-physical outcome measures, including mental health, depression and perceived general health. On the other hand, there are contradicting results from the literature on the effects of (early) retirement among older workers on stroke/cardiovascular disease (CVD), (disease specific) mortality and physical functioning. Hence, retirement may have both positive and negative health effects, but the evidence for the health effects of unemployment among older workers is limited. Although there is ample evidence that being without a job for a longer period is associated with worse health for the average working age population (25-65 years), evidence for the health effects of (early) retirement and unemployment on older Europeans is limited, complicated and varied. Therefore, it remains unclear to what extent and under what conditions retirement or unemployment influence (chronic) health conditions in the elderly and in what direction.

Effective interventions needed to improve the work participation of people with a chronic disease

The results of chapter 4 show that self-perceived poor health and other health problems such as depression and musculoskeletal problems can be predictors of economic inactivity among older workers. Given the expected future labour supply shortage, the intended increase in retirement age in several European countries and the fact that chronic diseases already cause a

considerable disease burden among Europeans of retirement age, the importance of preventing economic inactivity among older workers due to health problems is growing. Therefore, chapter 5 answers the question of what interventions are effective for increasing the social participation (including work participation) of older workers with a chronic disease.

Multidisciplinary interventions are effective

In chapter 5, we conclude that the following interventions are effective for improving social participation.

- Multidisciplinary interventions for patients diagnosed with cancer. Multidisciplinary interventions that include psychological, vocational, and physical training components increase return-to-work rates in patients with breast cancer and in patients with prostate cancer.

- Mixed physical training for patients with cardiovascular disease. 'Mixed' physical training, which is a combination of cardiorespiratory and resistance training decreases role limitations (i.e. problems with work or other daily activities) due to physical problems in stroke survivors and patients who have had a myocardial infarction. It also decreases role limitations due to emotional problems in stroke survivors. However, mixed training has no effect on social functioning.

- Occupational multidisciplinary therapy for patients with chronic obstructive pulmonary disease (COPD). Role limitations due to emotional problems and physical problems, as well as social functioning improved in patients with COPD immediately following community-based occupational therapy provided by a multidisciplinary team. The team consisted of an occupational therapist, a physiotherapist, and a dietician.

Two out of three of these effective social participation interventions are multidisciplinary. Based on several RCTs and CBAs with a lower quality, there are indications that a few other interventions can also improve social participation:

1. Psychological interventions for patients diagnosed with cancer;
2. Patient education provided in a course for people with coronary heart diseases in general;
3. Cardiorespiratory physical training for stroke survivors in particular;
4. Enhanced primary care for people with a depressive disorder.

Limited evidence for recommendations on best interventions to improve social participation

There is only limited research evidence to formulate recommendations regarding the best interventions to improve the social participation of people with a chronic disease. Systematic reviews/meta-analyses on the effectiveness of interventions that focus on social participation outcomes in people with a chronic disease are scarce. To improve the evidence for interventions to increase social participation, longer follow-up and more methodologically robust evaluations are needed. In addition, more research is needed on interventions that focus on adapting the work environment and increasing the social participation of people with coexisting chronic conditions.

Recommendations for EU and Member States' action

We concluded in chapter 6 on Policy recommendations that there is considerable scope to reduce disease burden through effective prevention policies. Maintaining the functioning and workability of people with a chronic disease is important. The use of effective interventions to prevent and treat chronic diseases should be stimulated and an integrated and intersectoral approach is needed. The development and use of effective interventions to improve the social (including work) participation of people with a chronic disease who are at high risk of economic inactivity should be encouraged. Incentives should be used to ensure that intervention studies are adequately evaluated. An important issue would be to stimulate the evaluation of home-based information and communication technology (ICT)-enabled interventions on social participation effects and to include social participation as outcome measures in future intervention studies. Social participation outcomes would be an important additional indicator for evaluating health policies. As we know that countries can learn from each other, we should stimulate the exchange of best practices, for instance through the development of an EU-wide best practice database in this area.

To be able to monitor and prepare adequate policies, European countries should invest in sustainable and harmonised data collection and stimulate joint data collection and facilitate a central coordination thereof. It is an essential priority to focus on social and geographical inequalities.

Finally, several more detailed research needs have been identified in this report.

What can the EU and its Member States do?

Against the background of the growing burden of chronic diseases, two parallel strategies can improve the labour participation of Europeans of retirement age:
1. Prevent the onset or consequences of chronic diseases;
2. Improve the participation of people with a chronic disease.

To prevent the onset or consequences of chronic diseases, we recommend the following actions for the EU and EU Member States based on our findings described in chapters 3, 4 and 5 and in accordance with recommendations of international organisations as described in chapter 2:

- The EU and EU Member States should stimulate the use of effective interventions for the prevention and treatment of chronic diseases.
- The EU and EU Member States should use an integrated and intersectoral approach to combat the growing and unequally distributed burden of chronic diseases. Health should be an issue in all policies.

To improve the participation of people that have a chronic disease, we recommend that:

- The EU and EU Member States should encourage the development and use of effective interventions to improve the social (including work) participation of people with a chronic disease who are at high risk for economic inactivity.

At the same time, it is important to evaluate new chronic disease-related interventions for their effects on participation.

- EU and EU Member States' policy makers should use incentives to ensure that chronic disease-related intervention studies are adequately evaluated and that these include social participation outcome measures.
- EU and EU Member States should particularly stimulate the evaluation of innovative home-based ICT-enabled interventions for their effects on social participation.
- The EU and EU Member States should use participation outcome measures to evaluate their health policies.

Next, to stimulate the actual use of interventions that have been proven to be effective:

- EU Member States should learn from each other's experiences by an exchange of best practices.

- The EU and EU Member States should stimulate the exchange and implementation of best practices through the development of an EU-wide best practice database.

Policy makers should not forget the basics, i.e. systematic health monitoring, which requires the availability of comparable and good quality data for chronic diseases, risk factors as well as measures of participation. To improve future data availability in the European Union we recommend that:

- The EU and EU Member States should invest further in sustainable and harmonised data collections in the area of chronic diseases.
- The EU will take responsibility for improving current data in Europe by stimulating joint data collection and facilitating the central coordination of data harmonisation and quality control and the exchange of best practices in data collection.

Next, the EU could envisage a preliminary research agenda based on our findings by highlighting several specific research areas that in our view need more attention. We feel that the EU may also have an important coordination role here. We recommend that:

- Both the EU and EU Member States should stimulate research to counteract the lack of evidence on the impact of economic inactivity on the health of older Europeans and on effective interventions to improve the social participation of people with a chronic disease.
- The EU takes a coordinating and stimulating role to support the research efforts by individual Member States.

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1 Introduction

The European Commission and the Member States of the European Union (EU) have recently launched a reflection process to respond to the growing challenge of chronic diseases. The Council Conclusions 'Innovative approaches for chronic diseases in public health and healthcare systems' called for this action. In their conclusions, the Council invited the Member States and the Commission to "initiate a reflection process aiming to identify options to optimise the response to the challenges of chronic diseases, the cooperation between Member States and summarise its outcomes in a reflection paper by 2012" (1).

The Council also invited the Commission to integrate chronic diseases as a priority in current and future European research and action programmes, where possible (1). The Council identified scope for action in the following four areas:

- Health promotion and prevention of chronic diseases;
- Health care;
- Research into chronic diseases;
- Comparable information at a European level on the incidence, prevalence, risk factors and outcomes of chronic diseases

This report is part of a series of four reports prepared by the Dutch National Institute for Public Health and the Environment (RIVM) in 2012 in response to a call by DG SANCO (Directorate-General Health and Consumers). These reports should contribute to DG SANCO's work on chronic diseases and/or the reflection process described above. The purpose of the current report is to review the impact of chronic disease on the population of pre- (50+) and post-retirement age in the European Union. The other reports provide an overview of the data availability, indicators and information on the prevalence of chronic diseases. In addition, they provide an analysis of the outcomes of a European-wide stakeholder consultation as part of the so-called 'chronic disease reflection process' and an analysis of the use of Structural Funds for health. The reports should provide input for the development of an umbrella chronic disease policy by DG SANCO. Therefore, the main target audience are policy makers at the EU level.

This report addresses the following topics:

- The burden of chronic disease in the older population pre- and post-retirement (chapter 3);
- The impact of chronic disease on the exit from the labour market (including unemployment, disability and early retirement) (chapter 4);
- The impact of leaving the labour market on the burden of chronic disease (chapter 4);
- The effectiveness of interventions to increase the social (including work) participation of people with a chronic disease (chapter 5).

The primary focus of this report is on the population of pre- (50+) and post-retirement age and the following groups of chronic diseases: cardiovascular diseases, cancers, diabetes and chronic lung diseases. These diseases are responsible for the majority of disease burden in Europe and are largely caused by four shared behavioural risk factors that can be influenced by policies in a range of sectors: tobacco use, unhealthy diet, insufficient physical activity and the harmful use of alcohol. In addition, we included depression as an indicator for mental health because of its large disease burden. The overview of chronic disease burden will also pay attention, although to a limited extent, to some neurodegenerative diseases (such as dementia) because of their importance among older age groups. We recognise, however, that in this way we only address a narrow selection of chronic diseases and that many other chronic diseases, such as musculoskeletal problems, the bulk of mental health problems and diseases of the sense organs, would also deserve proper attention. Although these chronic diseases are not part of the original scope of this report, many of the described issues and possibilities for tackling chronic diseases are also quite relevant to these conditions.

The report focuses on EU Member States. Relevant information from EFTA Countries (European Free Trade Association countries: Iceland, Norway, Switzerland, and Liechtenstein), Acceding Countries (Croatia) and Candidate Countries (Iceland, Montenegro, the Former Yugoslav Republic of Macedonia (FYROM), Serbia, and Turkey) is also included when available.

Outline of this report

First, chapter 2 (Background and policy context) provides relevant background and contextual information on the burden of chronic diseases in the EU and globally. The chapter considers the relationship of chronic diseases to population ageing as well as its economic importance. It describes both the political context and importance of the theme and gives some examples

of European and global initiatives to collect good practices. The burden of chronic diseases (morbidity, mortality, DALYs and self-reported health measures) is described in chapter 3. Chapter 4 addresses the reciprocal relationship between economic (in)activity and disease burden on the basis of a summary of the scientific literature. Chapter 5 answers the question of what interventions are effective for increasing the social (including work) participation of people with a chronic disease. Each chapter starts with key messages and concludes with a short discussion. Chapter 6 provides a list of policy recommendations that follow from our analysis, including an overview of gaps and needs for further action at EU, and Member State level.

2 Background and policy context

2.1 Chronic diseases in relation to population ageing

Although large differences exist among and within Member States of the European Union (EU), the average life expectancy of Europeans has increased over the last few decades (approximately 0.25 years annually) while their number of healthy life years (HLY) remains unchanged in recent years (2). HLY are the lifespan that people spend in good health. Because the average number of HLYs remained unchanged, Europeans still spend 20-25% of their lives in poor health (2). Chronic diseases are the main cause of ill health in old age and are the greatest challenge for the EU goal to increase the number of HLY by two years by 2020.

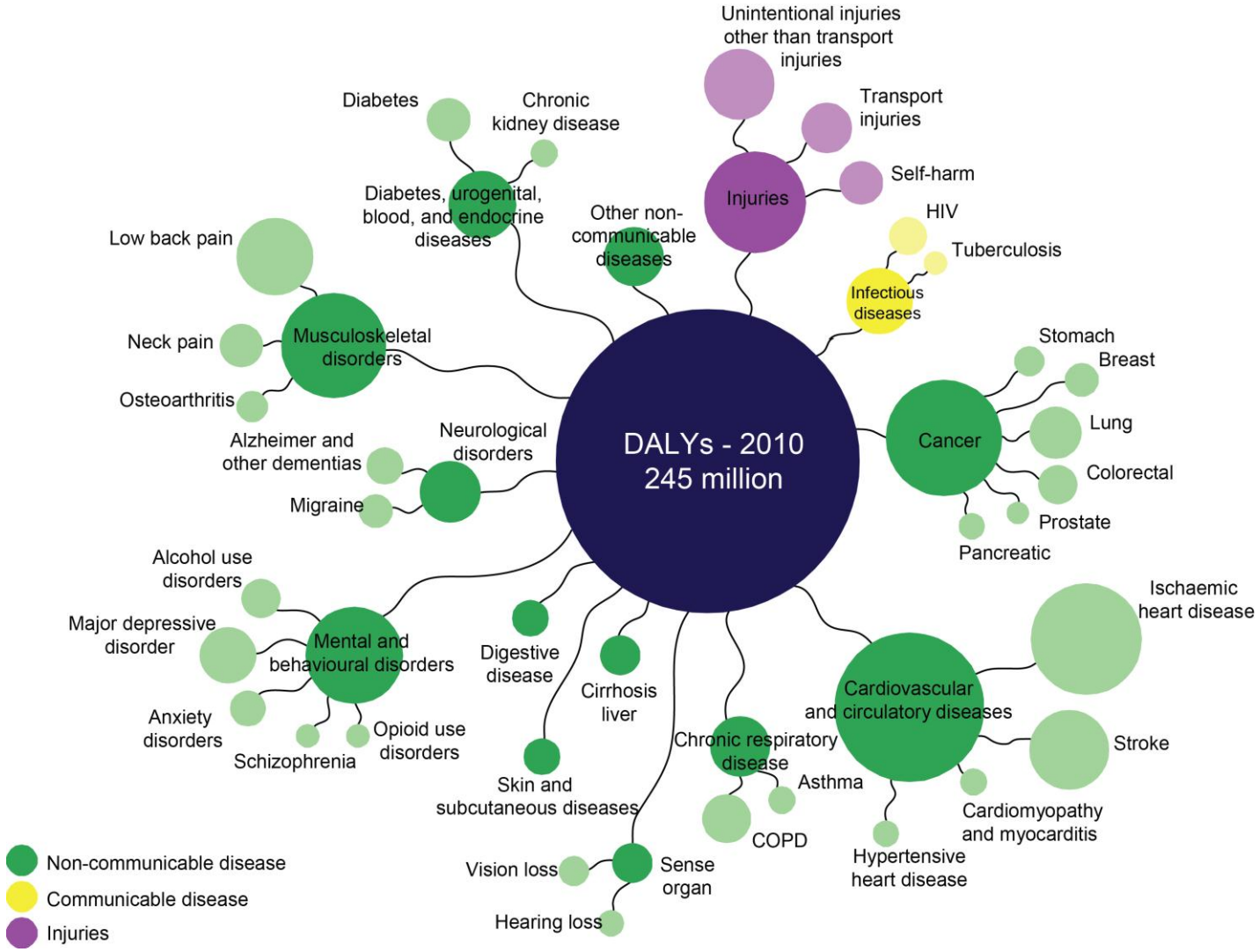
Almost 82% of disease burden due to non-communicable diseases

In 2010, non-communicable diseases (including major chronic diseases) were responsible for an estimated 82% of disease burden (expressed in disability-adjusted life years or DALYs) in the World Health Organization's (WHO) European region (see Figure 2-1). Cardiovascular diseases were responsible for approximately 24% of DALYs, malignant neoplasm for 15%, mental and behavioural disorders for 10%, chronic respiratory disease for 4%, and diabetes for 2%. Musculoskeletal disorders (12%) and neurological disorders (4%) (a broad group including Alzheimer's disease and other dementia's, Parkinson disease and multiple sclerosis) were also responsible for a large share of DALYs (3). In the Global Burden of Disease (GBD) Study 2010 the burden of musculoskeletal disorders is much larger than in previous GBD assessments (4) (see Figure 2-2).

Chronic disease burden is increasing

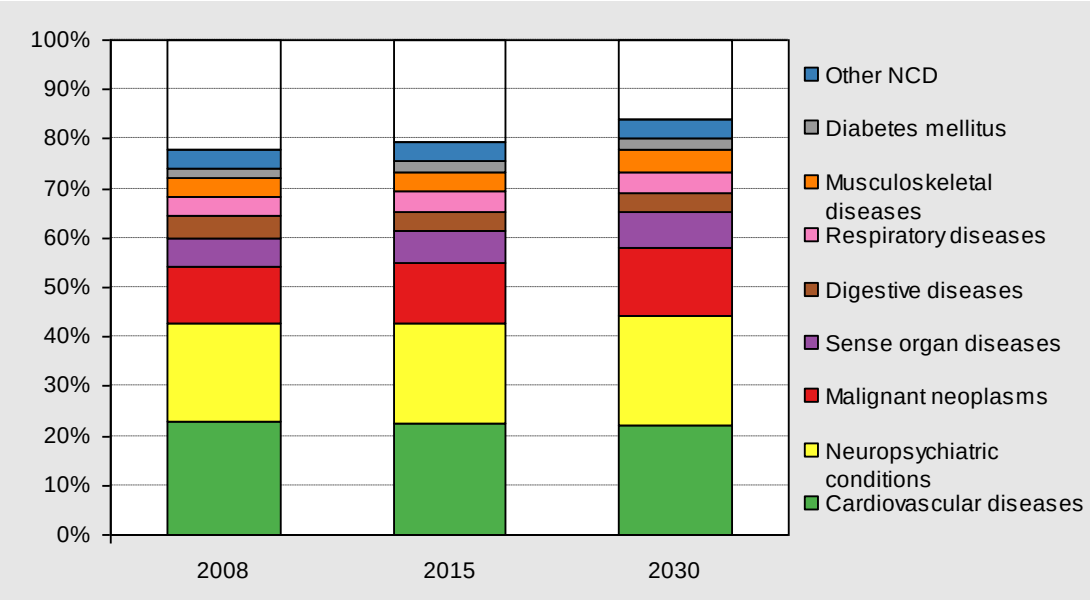
Between 2008 and 2030, the share of the total disease burden in DALYs due to non-communicable diseases is expected to increase from 78 to 84% (see Figure 2-2). The percentage due to cardiovascular disease will decrease slightly and the percentage due to neuropsychiatric conditions and malignant neoplasms will increase. The increase is due to the continuing high prevalence of risk behaviours (tobacco use, unhealthy diet, insufficient physical activity and harmful use of alcohol) and the ageing of the European population.

Figure 2-1: Disease burden in DALYs in the WHO European region in 2010[a] (source: WHO-GBD 2010, data processed by RIVM).



[a] The light green circles only include diseases that contribute at least 0.6% to the total disease burden in DALYs.

Figure 2-2: Percentage of disease burden (in DALYs) due to main chronic disease groups in the WHO-European Region in 2008 and projections for 2015 and 2030 (source: WHO-GBD 2004)[1].



Highest disease burden for non-communicable diseases is in ages 45-59

Although the proportion of disease burden in DALYs due to non-communicable diseases (NCDs) increases with age and reaches about 95% in people 60 years and older, in absolute numbers the disease burden due to NCDs is largest in the age groups 45-59. This is because there are more people in this age group and therefore a quarter of NCD burden falls in the 45-59 age group (see Figure 2-3).

Main causes of death are circulatory system diseases and malignant neoplasms

Non-communicable diseases such as circulatory system diseases (cardiovascular disease) and malignant neoplasms (cancers) are the main causes of death in the EU (see Figure 2-4). In 2009, 40% of all deaths in the EU27 were due to diseases of the circulatory system and 26% due to malignant neoplasms. Diseases of the respiratory system rank third with 8%. External causes (e.g. accidents and poisoning - not chronic diseases) rank fourth with 5%.

[1] The Institute for Health Metrics and Evaluation published new data from the GBD 2010 study on 14 December 2012. This provides regional estimates of deaths and DALYs (using a new method for calculation of DALYs) for the years 1990, 2005 and 2010. This will contribute to revisions for WHO global health estimates in 2013. New data visualisations from the IHME are available on: http://www.healthmetricsandevaluation.org/gbd/visualizations/regional

Figure 2-3: DALYs due to NCD in various age groups as percentage of total NCD DALYs in the WHO European regions, projections for 2015 (source: WHO-GBD 2004).

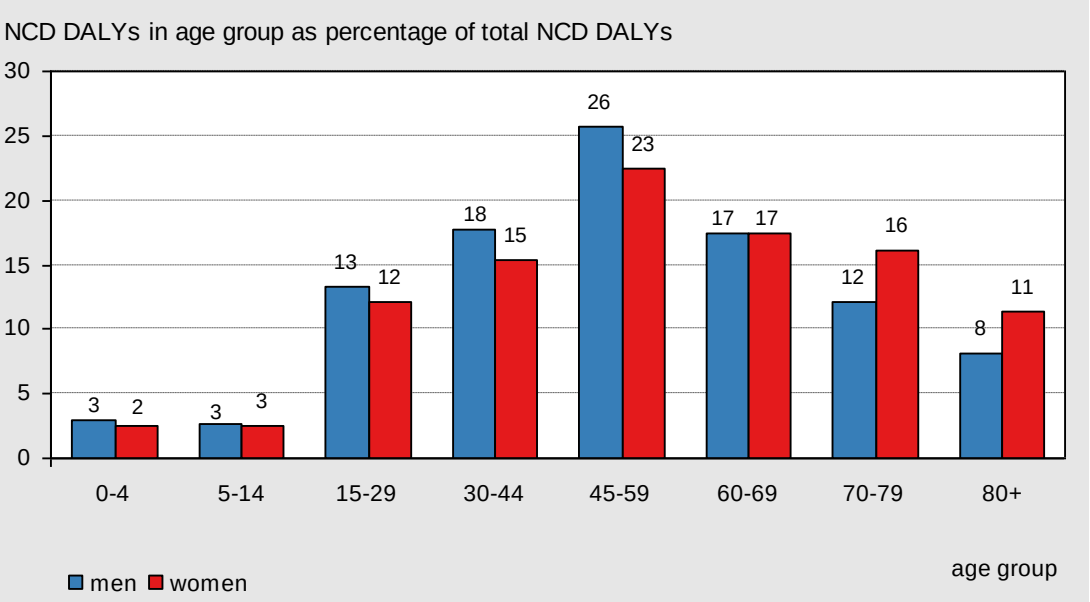
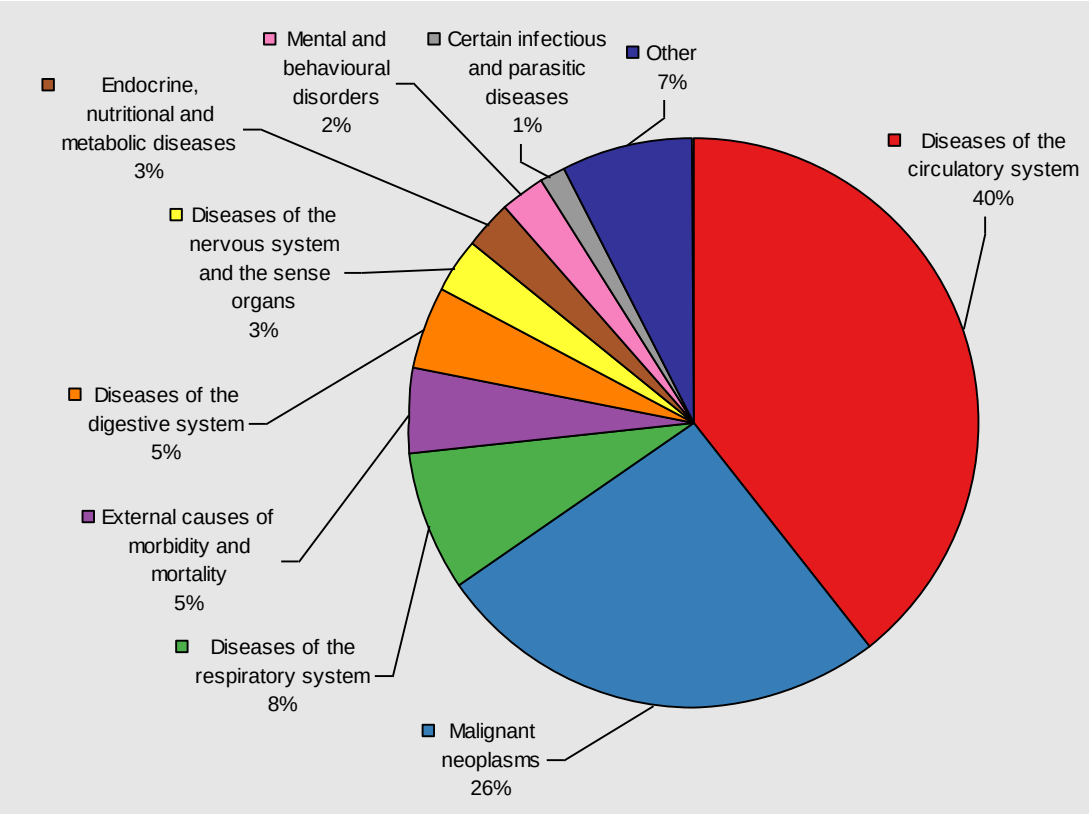


Figure 2-4: Main causes of death as a percentage of total deaths in the EU in 2009 (source: Eurostat 2012).



Premature mortality due to NCD large in low- and middle-income countries

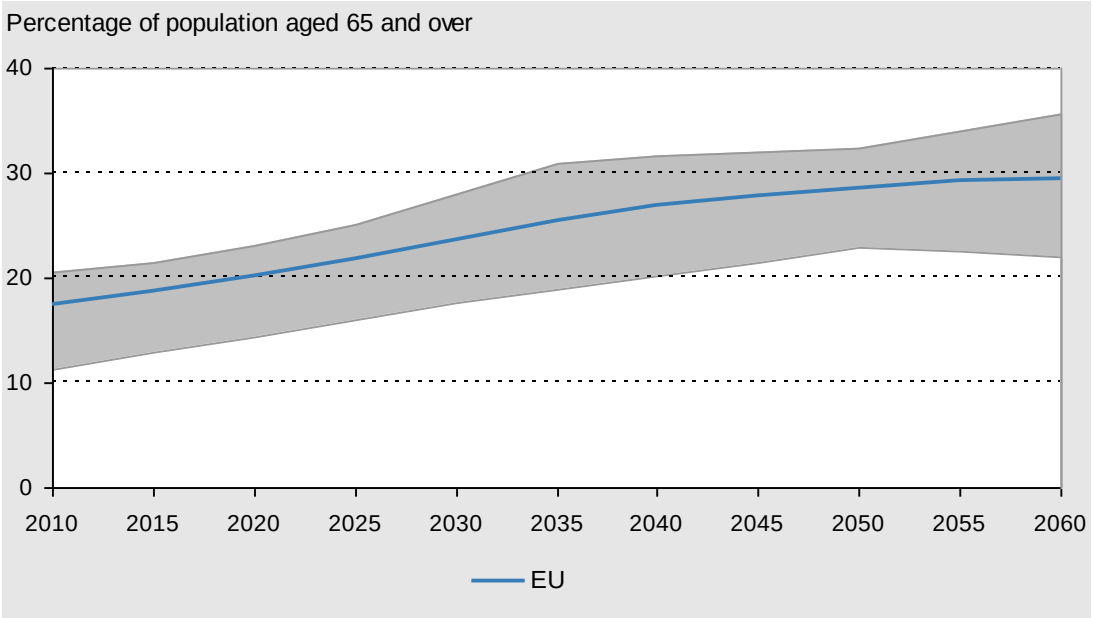
NCDs are also the leading causes of death globally. In 2008, almost two-thirds of global deaths (36/57 million) were due to NCDs, principally cardiovascular diseases, cancers, diabetes and chronic respiratory diseases (5).

Approximately 44% of all NCD deaths occurred before the age of 70. In low- and middle-income countries, 48% of all NCD deaths occur in people under the age of 70, compared to 26% in high-income countries (5). Premature mortality is a particularly valuable measure for evaluating the impact of NCDs on a given population.

Shortage of labour force expected due to ageing population

A decreasing birth rate and an increasing life expectancy due to lower age-specific mortality rates are causing rapid population ageing in Europe. According to Eurostat population projections, the percentage of the EU population aged 65 and over will increase from (on average) 17% in 2010 to almost 30% in 2060 (2) (see Figure 2-5). This means a steep increase in the number of retirees and a large decline in the percentage of the EU population of working age. By 2060, there will be only two people of working age (15-64 years) in the EU for every person over 65, compared to a ratio of 4-1 today. This will likely lead to a shortage in the labour force and could result in slower economic growth (6).

Figure 2-5: Figure of the projected percentage of population aged 65 and over: 2010-2060. Grey area reflects the range for the EU (source: Eurostat 2012, data processed by RIVM).



Increasing labour participation for people with disability can help prevent future labour force shrinkage

According to the Organisation of Economic Cooperation and Development (OECD), increasing the labour participation of older workers and women as well as people with disabilities can help prevent future labour force shrinkage. In OECD countries, the employment rate for people with a chronic disease that limits their daily activities is (on average) 40% below the overall employment level and their unemployment rates are twice as high. This reflects the significant disadvantage for people with disabilities in the labour market. The situation is worst for people with mental health problems (6).

Vicious cycle of chronic disease and poverty

Employment opportunities for people with disabilities tend to drop during economic crisis and do not improve with the subsequent economic recovery. Furthermore, a disadvantaged position in the labour market is accompanied by a lower income and a higher poverty risk for people with a disability as compared to the general population (6). This can create a vicious cycle. Poverty exposes people to behavioural risk factors for chronic diseases and, in turn, the resulting chronic diseases may become an important driver to a downward spiral that leads families towards poverty and further health loss (5).

Chronic diseases have a significant impact on national economies

Many studies and reports by international organisations have shown that chronic diseases have or will have a significant impact on health systems and national economies (5-10). Health systems will be facing high and increasing demands for care and increasing treatment costs. Apart from a reduced labour supply, the increasing burden of chronic diseases also hurts national economies with lower returns on human capital investment, increases in social welfare expenditures as well as increased costs for employers. For example, in 2007, OECD countries spent on average 1.2% of GDP on disability benefits alone and this figure reaches 2% when including sickness benefits. The high public spending is a result of the significantly high number of disability beneficiaries. On average, about 6% of the OECD working-age population was receiving disability benefits in 2007. The receipt of disability benefits is highest among older workers (aged 50-64), with average rates of 10-15% to over 20% in Sweden, Norway and Hungary (6).

Promoting the labour participation of people with chronic diseases is important

The above-mentioned findings highlight the importance of promoting the labour participation of older people, including elderly people with a disability or chronic disease. Increases in persons receiving disability benefits during an economic crisis to avert increases in

unemployment rate should be prevented (6). Not only to avoid long-term economic costs to both society as a whole and to individuals but also to preserve the valuable experience and knowledge of workers with a chronic disease. Although measures to prevent people from getting a chronic disease should be at the centre of any response to the NCD challenge, part of the increase in NCDs is an almost inevitable result of economic growth and increased control of communicable diseases (7). Therefore, it is important to mitigate the impact of chronic diseases on economies and societies, for example, through effective measures to retain people at work (7). Return to work of people with a chronic disease or disability should also be encouraged and supported more effectively.

In short, chronic diseases are the main contributors to the total burden of disease and mortality in the EU. If the prevalence of chronic diseases remains high or their burden increases, EU countries are challenged with reduced productivity and competitiveness, increased financial pressures on their health systems, reduced health and wellbeing and threats of poverty and inequity for patients and their families. The previously described pattern of ageing in the EU highlights the need for elderly people (with or without a chronic disease) to remain working up to an older age to maintain our economies sustainable by increasing total productivity and decreasing the future burden of pensions. This report addresses these issues by looking at the chronic disease burden in elderly Europeans of retirement age and the relationship with economic activity as well as interventions to improve the social participation of elderly Europeans with a chronic disease.

2.2 European and global policy context

2.2.1 EU policy context

EU must ensure human health in all policies

Although defining national health policies remains the exclusive competence of Member States, the EU is required by its founding treaty to ensure that human health is protected in all its policies. Article 168 of the Treaty on the functioning of the EU (Lisbon Treaty) states that a high level of human health protection shall be ensured in the definition and implementation of all Union policies and activities (11). Union action shall be directed towards improving public health, preventing physical and mental illness and diseases, and obviating sources of

danger to physical and mental health. Action in the field of health complements national policies, and the Union encourages cooperation between Member States in this field.

EU Health Strategy implemented through the health programme

The EU Health Strategy (2008-13) for protecting and improving human health aims to deliver concrete health improvements in Europe. It has three objectives:

- Fostering good health in an ageing Europe;
- Protecting citizens from health threats;
- Supporting dynamic health systems and new technologies.

The EU's Health Strategy is implemented through the health programme that funds projects and actions in the fields of health security, health promotion (including action on major diseases and health determinants such as nutrition, alcohol, tobacco and drug consumption), and the generation and dissemination of health information. Investing in health and addressing the issue of an ageing society are priorities in the current health programme that is one of several programmes implementing health policy at the EU level. Other programmes are the 7th Framework programme on research and the EU Cohesion policy for which health is a financing priority. The upcoming 'Social Investment Package' which is currently being prepared by EU Directorate-General Employment, Social Affairs and Inclusion recognises the fact that investing in health for all and reducing inequalities in access to healthcare is vital if people are to be able to work and contribute to the economy[2].

EU policy and actions on specific lifestyle risk factors for chronic diseases

In the field of health promotion, the EU has developed policies and actions focusing on specific health determinants. For tobacco, EU legislation (mainly the Directive on Tobacco Products and the Directive on Tobacco Advertising) regulates tobacco product marketing for public health reasons and ensures appropriate consumer information and harmonised standards (12, 13). In addition, in 2011, the Commission launched a new campaign 'Ex-smokers are Unstoppable', to encourage young adults to stop smoking. The campaign focuses on the advantages of quitting.

With respect to alcohol, the Commission developed an EU Alcohol Strategy to help national governments and other stakeholders coordinate their actions to reduce alcohol-related harm in the EU (14).

[2] http://europa.eu/rapid/press-release_SPEECH-12-488_en.htm

Next, Article 168 of the Lisbon Treaty states that "The Union shall complement the Member States' action in reducing drugs-related health damage, including information and prevention" (11). To this end, the EU drugs strategy 2005-2012 and the EU drugs action plan 2009-2012 aim to reduce drug use and the resulting social and health damage by improving coordination, international cooperation and information, research and evaluation (15, 16).

Finally, the Commission White Paper, 'A Strategy on Nutrition, Overweight, and Obesity-related health issues', focuses on action that can be taken at local, regional, national and European levels to reduce the risks associated with poor nutrition and limited physical activity in the EU (17). The Commission also leads the EU platform for action on diet, physical activity and health. This is a forum for European actors (ranging from the food industry to NGOs for consumer protection) that want to contribute to tackling increasing overweight and obesity trends.

Chronic diseases are high on the EU policy agenda

In response to the growing burden of chronic disease, the Council of the European Union has published a Council Conclusion paper, 'Innovative approaches for chronic diseases in public health and healthcare systems'. The Council invited the Member States and the Commission to "initiate a reflection process aiming to identify options to optimise the response to the challenges of chronic diseases, the cooperation between Member States and summarise its outcomes in a reflection paper by 2012" (18). The Council also invited the Commission to integrate chronic diseases as a priority in current and future European research and action programmes where possible (18). Furthermore, in reaction to the United Nations General Assembly's political declaration on prevention and control of non-communicable diseases (see WHO's policy context in paragraph 2.2.2), the European Commissioner for Health and Consumer Policy declared[3] that the EU is determined to take forward the declaration in partnership with the global community. In advance to the General Assembly's meeting on the prevention and control of non-communicable diseases, the European Parliament adopted a resolution that calls for a strong political commitment from the Commission and EU Member States that reflects the significance and severity of the global NCD epidemic (19).

Increased elderly economic participation is important for inclusive growth

Increasing the elderly's economic participation is required to achieve the targets of Europe 2020, in particular the target to increase the employment rate for women and men aged 20-64 to 75% by 2020. This can be achieved by ensuring the employment of more people, especially

[3]http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/11/620&format=HTML&aged=0&language=EN

women, youth, older and low-skilled people and legal migrants. Europe 2020 is the EU's 10-year economic-growth strategy (20).

European Innovation Partnership on Active and Healthy Ageing

As part of the Europe 2020 strategy, the European Commission aims to make Europe a world-leader in developing innovative strategies to promote active and healthy ageing, which it considers to be a societal challenge common to all European countries. To achieve this goal, a pilot European Innovation Partnership on Active and Healthy Ageing (EIP-AHA) was launched in 2011. The main objective of the Partnership is to increase the average healthy lifespan in the EU by two years by 2020 (21, 22). This should:

- Enable older EU citizens to lead healthy, active and independent lives;
- Improve the sustainability and efficiency of social and healthcare systems;
- Boost and improve the competitiveness of the markets for innovative products and services that respond to the ageing challenge both at the EU and global level, thus creating new opportunities for businesses.

The partnership brings together stakeholders including researchers, health authorities, health professionals, businesses, patient organisations, regulators, and end users. The Partnership should spur innovation and bring these innovations to the market place.

Within the EIP-AHA six Action Groups were formed. Especially working groups A2 (Personalised health management: Falls prevention), B3 (Integrated care for chronic diseases, including remote monitoring at regional level), C2 (Interoperable independent living solutions) and D4 (Age friendly buildings, cities and environments) focus on improving elements of social participation through personal or environmental interventions.

2012 European Year of Active Ageing and Solidarity between Generations

To raise awareness of the contribution that older people make to society and highlight the benefits of active, healthy and independent elderly, the EU designated 2012 as the European Year for Active Ageing and Solidarity between Generations (23).

The European Year 2012 seeks to promote active ageing by:

- Giving older workers improved opportunities in the labour market;
- Ensuring greater recognition of what older people bring to society (e.g. as providers of informal care and volunteer work) and create more supportive conditions for this;
- Empowering the elderly to cope with declining health and to remain independent.

EU-OSHA and Eurofound collect good practices to increase the work participation of people with a chronic disease

Although national governments in EU Member States have full competence of their health systems, health and safety at work is one of the areas where the EU has a large impact with a solid legal framework. In this area DG Employment, Social Affairs and Inclusion collaborates with the European Agency for Health and Safety at Work (EU-OSHA[4]) and the European Foundation for the Improvement of Living and Working Conditions (Eurofound[5]) to disseminate information, offer guidance and promote healthy working environments (particularly for small businesses). EU-OSHA and Eurofound have gathered information on good practice initiatives to increase the work participation of people with a chronic disease. Ageing workers and workers with a disability are priority groups for both OSHA and Eurofound. In addition, Oortwijn et al. (2011) provided an overview of EU level, EU Member States and company level policies and initiatives to help retain people with a chronic illness in work, promote rehabilitation and reintegration into work following a serious health event, and support people who are on long-term sick leave to return to work in a report commissioned by DG SANCO (see also paragraph 5.2.2) (24).

Definition of good practice varies among countries

The definition of 'good practice' varies among EU countries. This is due to differences in occupational safety and health systems, legislation, cultures and languages. Depending on interests and levels of knowledge, various groups have distinct views on what constitutes good practice in the workplace (25).

Good practices that have been implemented successfully in one (work)place may be considered for use elsewhere. However, even with the same conceptual approach and techniques, good practices cannot be copied directly from one workplace to another. They must be adapted to the context of the specific workplace. In addition, a good practice should meet the relevant legislative requirements of the Member State where it is implemented. Thus, a good practice is not always directly transferable among Member States (25).

Database of good practices for reintegration of long-term disability claimants

Eurofound developed a database[6] of good practices for guidance and employment counselling services with case studies from 16 EU Member States. These case studies are designed to reintegrate people into the workplace who have been excluded by health or disability issues. The case studies target people who have previously worked, but who have been off work for

[4] http://osha.europa.eu/en
[5] http://www.eurofound.europa.eu/
[6] http://www.eurofound.europa.eu/areas/socialcohesion/egs/search.php

long enough to qualify for disability benefits. This group consists of predominantly older workers who are not well served by return-to-work systems. The selected case studies are relatively new and seek to integrate a range of services as well as provide integrated pathways to work.

EU-OSHA database of good practice at workplace level

EU-OSHA developed a database[7] containing good practices at the workplace level. Although the database contains interventions to improve the employability (for example, the case study from the Almada City Council[8]) it does not specifically focus on good practices to maintain workers or return them to the workplace, or address elderly workers.

A combination of prevention, workplace health promotion and active early intervention is needed to maintain or return an employee in/to work

Since 2003, Eurofound has published several reports on illness, disability and social inclusion. The report 'Employment and disability: back to work strategies' describes national approaches (policies) and some innovative company-level initiatives to maintain people in work or return people to work from seven EU counties (Finland, Germany, Ireland, Italy, the Netherlands, Sweden, and the United Kingdom) (26). The dimensions of the RETURN Protocol developed by the EU-funded RETURN project were used as criteria of good practice to assess the company-level initiatives and help identify innovative elements. The RETURN Protocol is based on the principles of Disability Management that combines policies of disability prevention (such as health and safety, occupational wellness programmes, ergonomics) with early intervention and safe and timely return-to-work policies (27). According to the authors of the Eurofound report, good disability management practice requires proactive policies that focus not only on return-to-work activities when an employee becomes chronically ill or injured, but also on prevention of occupational illness or injury, and health promotion. The authors also conclude that an important area for improvement across all the countries that were studied was the absence of clear and unambiguous data about the size of the problem of long-term absence and associated costs. Therefore, it is difficult to test and improve effective approaches to maintain workers or return them to the workplace.

[7] http://osha.europa.eu/en/practical-solutions

[8] http://osha.europa.eu/data/case-studies/alameda-city-council-an-example-of-good-practice-in-health-promotion-and-the-improvement-of-employability/view

Back-to-work interventions and policies for musculoskeletal disorders

In 2007, EU-OSHA published the report 'Work-related musculoskeletal disorders: Back to Work' that focuses on the retention, reintegration and rehabilitation of workers with musculoskeletal disorders (28). It provides a literature review on the effectiveness of work-related interventions, and an overview of return-to-work policy initiatives in EU countries and internationally, including several examples of good practice. The report concluded that multidisciplinary interventions offer the most promising results for people with work-related musculoskeletal disorders. However, although many studies have been conducted, the evidence for the effectiveness of the interventions is limited.

2.2.2 WHO's policy context

Non-communicable diseases have become a global priority

On 19 September 2011, the United Nations' General Assembly adopted a political declaration on the prevention and control of non-communicable diseases. In this declaration, the heads and representatives of States and Governments acknowledge, "that the global burden and threat of non-communicable diseases constitutes one of the major challenges for development in the twenty-first century, which undermines social and economic development throughout the world, and threatens the achievement of internationally agreed development goals" (29).

This was the second time in the history of the United Nations' General Assembly that health was addressed after the meeting on AIDS, in 2001. In addition, the First Global Ministerial Conference on Healthy Lifestyles and Non-communicable Disease Control also took place in 2011 (in Moscow, Russian Federation). On 9 November 2012 WHO Member States agreed on a Global Monitoring Framework on NCDs. The framework comprises nine voluntary global targets and 25 indicators to prevent and control NCDs. The nine voluntary global targets are aimed at combating premature mortality from NCDs (a 25% reduction in premature mortality by 2025), harmful use of alcohol, tobacco use, physical inactivity, salt/sodium intake, raised blood pressure, diabetes, obesity, promoting drug therapy and counselling, and medicines and technologies for NCDs.

WHO European Strategy and Action Plan for the Prevention and Control of NCDs

In the meantime (September 2011), the 53 European Member States of WHO-Europe adopted the European Action Plan 2012-2015 for implementation of the 2006 European Strategy for the Prevention and Control of NCDs (30, 31). Since the major non-communicable diseases that affect the European Region share common modifiable lifestyle risk factors, the Action

Plan uses an integrated approach to prevent NCDs as a group. Acknowledging that the wider determinants of NCDs lie largely outside the scope of the health sector, 'Health in all Policies' is one of the plan's guiding principles. The Action plan also describes strategies to empower people living with an NCD to manage their own health. The Strategy and the Action Plan both contribute to the development of a comprehensive European Health Policy entitled, 'Health 2020'.

The plan identifies four priority action areas:

1. Governance for NCD, including building alliances and networks, and fostering citizen empowerment;
2. Strengthening surveillance, monitoring and evaluation, and research;
3. Promoting health and preventing disease;
4. Reorienting health services further towards prevention and care of chronic diseases.

The plan also identified five priority interventions for countries to focus on:

1. Promoting healthy consumption via fiscal and marketing policies;
2. Elimination of *trans* fats in food (and their replacement with polyunsaturated fats);
3. Salt reduction;
4. Cardio-metabolic risk assessment and management;
5. Early detection of cancer.

The priority interventions are cost-effective and transferrable

The priority interventions were selected because they are not only evidence-based and cost-effective measures, but they are also feasible, both financially and politically, for implementation and scale-up in a range of country contexts. The WHO 'Global status report on non-communicable diseases 2010' summarises the evidence base of these priority interventions (5, 32). In addition, the Global Status report includes many of these priority interventions as 'best buys', i.e. "actions that should be undertaken immediately to produce accelerated results in terms of lives saved, diseases prevented and heavy costs avoided" (see the population-wide and individual health-care interventions in Textbox 2-1). The population-wide interventions must be complemented by individual health-care interventions because evidence from countries where there have been major declines in certain NCDs indicates that both prevention and treatment interventions are necessary (5).

Textbox 2-1: Interventions from the Global Status Report on NCDs.

Population-wide interventions

Best buys include:
• Protecting people from tobacco smoke and banning smoking in public places;
• Warning about the dangers of tobacco use;
• Enforcing bans on tobacco advertising, promotion and sponsorship;
• Raising taxes on tobacco;
• Restricting access to retailed alcohol;
• Enforcing bans on alcohol advertising;
• Raising taxes on alcohol;
• Reducing salt intake and salt content of food;
• Replacing trans-fat in food with polyunsaturated fat;
• Promoting public awareness about diet and physical activity, including through mass media.

Other cost-effective and low-cost population-wide interventions that can reduce risk factors for NCDs:
• Nicotine dependence treatment;
• Promoting adequate breastfeeding and complementary feeding;
• Enforcing drink-driving laws;
• Restrictions on marketing of foods and beverages high in salt, fats and sugar, especially to children;
• Food taxes and subsidies to promote healthy diets.

Individual health-care interventions

Among the best buys* and other cost-effective interventions are:
• Counselling and multidrug therapy, including glycaemic control for diabetes for people ≥30 years old with a 10-year risk of fatal or nonfatal cardiovascular events ≥30%*;
• Aspirin therapy for acute myocardial infarction*;
• Screening for cervical cancer, once, at age 40, followed by removal of any discovered cancerous lesion*;
• Early case finding for breast cancer through biennial mammographic screening (50-70 years) and treatment of all stages;
• Early detection of colorectal and oral cancer;
• Treatment of persistent asthma with inhaled corticosteroids and beta-2 agonists.

Innovative financing mechanisms to complement health budgets

In their response to chronic diseases, many countries face funding gaps, especially during this time of economic crisis and budget reductions. The WHO World Health Report 2010 gives examples of innovative financing mechanisms to complement national health budgets (33). This includes for example raising tobacco and alcohol taxes and allocating part of the revenue for health promotion. In addition, the report recommends including NCD prevention and control in health insurance. Innovative financing also refers to public-private partnerships and market-based financial transactions.

The WHO also produced a compendium of innovative medical devices and eHealth solutions for low-resource settings[9]. It is a neutral platform for technologies that are likely to be suitable for use in low-resource settings.

WHO research priorities

In the report 'Prioritized Research Agenda for Prevention and Control of Non-communicable Diseases' WHO prioritized the following research areas (32):

1. Intersectoral and multidisciplinary research to understand and influence the macroeconomic and social determinants of NCDs and exposure to NCD risk factors;
2. Translation research and health system research for global application of proven cost-effective strategies;
3. Research to enable expensive but effective interventions to become accessible and used appropriately in resource-constrained settings.

WHO activities on separate lifestyle factors

In addition to the integrated action plan that targets NCDs as a group, WHO also has developed activities on separate lifestyle factors. For example, this is reflected in the WHO Framework Convention on Tobacco Control (FCTC), the second WHO European Action Plan for Food and Nutrition Policy 2007–2012 (34), a European framework to promote physical activity for health (35) and a European action plan to reduce the harmful use of alcohol (2012–2020) (36). These documents contain guidance on designing and implementing policy and action on life-style risk factors, based on the best available evidence and practice.

Initiatives to collect information on effective interventions and good practices

Many other public health organisations and societies, in addition to WHO, have collected information on effective interventions and good practices related to the prevention of chronic diseases. For example, the GOLD initiative published the 'Global Strategy for Diagnosis, Management, and Prevention of COPD' (37) and the International Diabetes Federation publishes information on diabetes prevention studies showing that lifestyle changes are effective to prevent diabetes (38). DG SANCO recently published a report containing an EU-wide overview of community-based initiatives to reduce childhood obesity (39).

[9] http://www.who.int/medical_devices/innovation/compendium2012/en/index.html

3 The burden of chronic diseases

Maartje Harbers and Peter Achterberg

Key messages

The burden of chronic diseases for Europeans of retirement age is substantial

The burden of four major chronic diseases (cardiovascular disease, cancer, COPD, diabetes) is substantial and increases with age in both men and women. Although their prevalence is highest in the population over 75 years of age, the prevalence and mortality of chronic diseases in many European countries is already considerable in elderly Europeans of retirement age (50-70 years).

The burden of chronic diseases will increase due to the ageing of the population and lifestyle risks

There is a lack of good data on trends in disease prevalence. However, the total number of people with a chronic disease is expected to increase. The reason for this is the ageing population and the still high prevalence of lifestyle risk factors. Although age-standardised mortality is decreasing for several chronic diseases, the absolute number of deaths for cancer and chronic lower respiratory diseases is not decreasing.

In few EU countries people can expect to reach the retirement age without activity limitations

There are few EU countries (Sweden, Malta, Ireland, Greece, Bulgaria) where people can expect to reach the age of 65 (the retirement age in many countries) without activity limitations due to health problems (Healthy Life Years, HLY). Men born in the EU in 2009 can expect to live an average of 61.3 years without activity limitations. For women this is 62.0 years. Although trends vary among EU countries, the average number of HLYs for the EU remained rather stable from 2005 to 2010. When the retirement age is increased, as proposed in several EU countries, the number of elderly workers with a chronic disease and activity limitations due to health problems will also increase.

Each year approximately three million productive life years are lost due to premature mortality from chronic diseases among older Europeans of working age

The majority of people dying from chronic diseases are 70 years and over. However, one in five EU citizens who die from cardiovascular disease, cancer or chronic lower respiratory diseases are 50-70 years old. Cancer is the largest contributor to mortality in this age group.

Mortality due to cardiovascular disease, cancer or chronic lower respiratory diseases from 50-65 years of age contributes to an estimated loss of 2.9 million productive life years if the retirement age is 65 years and 3.8 million if the retirement age is set at 67 years.

There are large differences in the burden of chronic diseases among EU Member States

Chronic disease prevalence and mortality vary considerably among EU Member States. The differences in mortality are the main cause of the differences in life expectancy at birth among Member States, which in 2009 was over 11 years for men and over seven years for women. Furthermore, the number of DALYs (Disability Adjusted Life Years) for chronic diseases varies considerably among EU Member States. For example, many of the EU countries that joined the EU in or after 2004 have high DALY rates for cardiovascular diseases. DALYs are a combination of years of life lost due to premature mortality and years of life lost because of a decreased quality of life caused by disease. The four major chronic diseases (cardiovascular disease, cancer, COPD, diabetes) contribute significantly to the total disease burden in DALYs, although mental health, musculoskeletal, sense organ, and digestive diseases are important contributors as well.

Large differences in the burden of chronic diseases also exist within EU Member States

In addition, there are large differences in the burden of chronic disease among social economic groups or regions within most Member States. The prevalence of diabetes, cardiovascular disease, and COPD is higher in people with a low level of education as compared to people with a high level of education.

In short, we recommend the following actions for the EU and Member States:

- The EU and EU Member States should stimulate the use of effective interventions for the prevention and treatment of chronic diseases.
- The EU and EU Member States should use an integrated and intersectoral approach to combat the growing and unequally distributed burden of chronic diseases. Health should be an issue in all policies.
- EU Member States should learn from each other's experiences by an exchange of best practices.
- The EU and EU Member States should invest further in sustainable and harmonised data collections in the area of chronic diseases.
- The EU will take responsibility for improving current data in Europe by stimulating joint data collection and facilitating the central coordination of data harmonisation and quality control and the exchange of best practices in data collection.

3.1 Introduction

This chapter gives an overview of the burden of chronic diseases on the population of pre-(50+) and post-retirement age in the European Union. It gives a detailed description of trends and developments in morbidity, mortality and DALYs due to chronic diseases and in self-reported health measures in the older population in EU Member States, by disease group, sex and age group (ideally age groups 50-60, 60-70, and above 70). Wherever possible, data are also presented by educational level and some information is given for ethnicity.

This overview primarily focuses on four major chronic diseases that can to a large extent be prevented through lifestyle changes: diabetes, cardiovascular disease, COPD and cancer. These diseases are largely caused by four shared behavioural risk factors: tobacco use, unhealthy diet, insufficient physical activity and the harmful use of alcohol. In addition, depression (as an indicator for mental health) and neurodegenerative diseases (such as dementia) are addressed, the first because of its large disease burden, and the latter because of their importance among older age groups.

The first part of the overview (paragraph 3.3.1) is mainly based on the following indicators for chronic diseases from the European Community Health Indicators (ECHI) shortlist[10]:

- Diabetes prevalence;
- Rate of acute myocardial infarction (AMI) (non-fatal and fatal);
- Rate of stroke (non-fatal and fatal);
- Cancer incidence: 1) for all cancers combined, 2) trachea, bronchus or lung, 3) breast, and 4) colorectal;
- Depression prevalence;
- Chronic obstructive pulmonary disease (COPD) prevalence;
- Dementia/Alzheimer's disease prevalence.

We also present data on disease-specific mortality in people of retirement age for the following diseases or disease groups, as specified by the ECHI shortlist: all malignant neoplasms, ischaemic heart disease, cerebrovascular disease and chronic lower respiratory disease. Mortality data underestimate the burden of disease attributable to conditions that rarely cause death, such as mental illness. They also underestimate the burden of disease for conditions that may not be listed as the immediate cause of death on death certificates, but nevertheless do contribute to mortality, such as diabetes. The coding practice for dementia as

[10] http://www.healthindicators.eu/object_document/o5956n29063.html

a cause of death may also differ strongly between countries. For these reasons, mortality for diabetes and mental health/depression have not been included in the ECHI shortlist, and we do not present these mortality data in the current report.

The ECHI shortlist also contains indicators for some generic and summary public health measures that are relevant for the health status and labour participation of older age groups: self-perceived health, self-reported chronic morbidity, and particularly Healthy Life Years as it is based on the concept of activity limitations. These generic and summary measures are included in the second part of our disease burden overview (paragraph 3.3.2). This part also includes an overview of the summary indicator 'disability-adjusted life years' (DALYs). DALYs combine information on mortality and non-fatal health outcomes (40). They represent the sum of years of life lost and years of life lived with disability. It measures the gap between the current health status of a given population and an ideal situation in which everyone in the population lives to old age in full health.

The methods are described in paragraph 3.2 and the general conclusions and discussion of the results in paragraph 3.4. The chapter ends with a summary of the policy recommendations based on the results.

3.2 Methods

Table 3-1 gives an overview of the data sources used in this chapter. Appendix C provides relevant metadata on the comparability and quality of these data sources. This information should be taken into account when making comparisons among countries.

For the selected ECHI indicators, our first choice was to use the data sources that are preferred by the Joint Action for European Community Health Indicators Monitoring (JA for ECHIM). For the suggested indicators, these sources are: (see indicator documentation sheets in JA for ECHIM final report II, (41)):

- The Eurostat database (including SILC, EHIS and mortality statistics);
- The databases of the International Agency for Research on Cancer (e.g. GLOBOCAN).

Because data that is preferred by ECHIM are not available for all countries or age groups needed for this report, we also checked additional information sources. We used the overview of available data that we prepared for the report 'Information, indicators and data on the prevalence of chronic diseases in the European Union' as a starting point for this (42). For the aforementioned report, we gathered and reviewed existing information on the availability, quality and comparability of prevalence data from the following sources:

1) Relevant EU-sponsored health information projects identified through the project database of the Executive Agency for Health and Consumers.
2) Databases containing health data and indicators, such as:

- Eurostat database;
- WHO Health for All database;
- OECD health database;
- GLOBOCAN database.

3) European health information initiatives, such as:

- The European Health Interview Survey (EHIS);
- The Eurostat morbidity statistics pilot.

In addition, we scanned reports from relevant international institutes (e.g. OECD, WHO and the European Commission), expert networks (e.g. Alzheimer Europe, International Diabetes Federation, European Heart Network, European Respiratory Society) and EU-funded health information and reporting projects. For example, the Global Status Report on Non-Communicable Diseases (5), 'Health of people at working age' (43), 'Health at a Glance: Europe 2012' (44), 'the Major and Chronic Diseases Report' (45), 'European Cardiovascular Disease Statistics 2012' (46) and 'The state of mental health in the European Union' (47). We also scanned several reports on the prevention and management of chronic disease for information on relevant data sources of chronic disease prevalence (8-10, 48, 49).

Finally, we searched the research databases MEDLINE, EMBASE, SciSearch and PsycINFO for reviews and comparative studies on the prevalence of the selected disease groups that were published after 2008. We have prioritised the use of data that are available from ready-to-use sources that provide comparable information for more than one country (see report 'Information, indicators and data on the prevalence of chronic diseases in the European Union' (42) for more detailed information on the methodology used).

Table 3-1: List of data sources used and available age groups for the overview of disease burden in the population of retirement age.

Source	Indicator	Age groups	Countries
EHIS (European Health Interview Survey)	Self-reported prevalence of diabetes, depression and COPD	45-54, 55-64, 65-74, 75-84, 85+	17 EU countries (BE, BG, CZ, DE, EE, EL, ES, FR, CY, LV, HU, MT, AT, PL, RO, SI, SK) + Turkey.
EU-SILC (Statistics on Income and Living Conditions)	HLY, self-reported long-standing illness, self-perceived health	Self-perceived health and self-reported long standing illness: 45-54, 55-64, 65-74, 75-84, 85+ HLY: at birth, at age 50, at age 65	EU27 countries + Iceland, Norway, Switzerland and Croatia
GLOBOCAN	Cancer incidence	50-59, 60-69, 70+	All EU27 countries + EFTA (except Liechtenstein) and accession/candidate countries
IDF Diabetes Atlas	Diabetes prevalence	Percentage for age group 20-79. Absolute numbers for age groups 20-39, 40-59 and 60-79.	All EU27 countries + EFTA and accession/candidate countries
Alzheimer Europe/EuroCoDe	Dementia prevalence	Absolute number per country for age groups 30-59, 60-64, 65-69, 70-74, 75-79, 80-84, 85-89, 90-94 and 95-99). EU estimates for age groups 60-64, 65-69, 70-74, 75-79, 80-84, 85-89, 90-94 and 95+.	EU and EFTA (except Liechtenstein) countries + Turkey
WHO-MDB (Mortality Database)	Age-standardised mortality for ischaemic heart disease, stroke, cancer and chronic lower respiratory diseases	45-59, 60-74, 75+	All EU27 countries + EFTA (except Liechtenstein) and accession/candidate countries (except Turkey).
Eurostat mortality statistics	Number of deaths for ischaemic heart disease, stroke, cancer and chronic lower respiratory diseases	50-59, 60-69, 70>	All EU27 countries + Iceland, Norway, Switzerland, Croatia and the Former Yugoslavian Republic of Macedonia (FYROM)
WHO-GBD (Global Burden of Disease study)	DALYs	Regional data for age groups 45-59, 60-69, 70-79, 80+. Country data for age groups 15-59, 60+ and total	All EU27 countries + EFTA (except Liechtenstein) and accession/candidate countries

Wherever possible, data are also presented by gender, educational level and ethnicity. For information on differences by socio-economic status and ethnicity, relevant publications by the EUROTHINE project on socio-economic inequalities in health[11] and the Migrant and Ethnic Health Observatory (MEHO)[12] were scanned.

[11] http://survey.erasmusmc.nl/eurothine/
[12] http://www.meho.eu.com

From the information that we gathered, it became clear that routinely collected European-wide data on the prevalence of chronic diseases are scarce. Data from EHIS are not available yet for all EU, EFTA and Accession/Candidate countries, and the available data from the ECHIM data collection pilot for countries that did not participate in EHIS did not focus on the relevant age groups that we needed for this report. In addition, registry-based data collected in the Eurostat morbidity statistics pilot are only available for about half of the countries and will not be published by Eurostat. Not surprisingly, data on trends in prevalence are even scarcer. The second wave of EHIS will provide information on prevalence trends, but is scheduled to take place in 2014. In addition, the self-reported data from EHIS may be influenced by reporting biases and sampling related biases. Therefore, they may not reflect the true prevalence of the disease in a country, and other estimates would probably be better suited for this purpose (41). For these reasons, we also included data from several relevant epidemiological studies to add to the information on disease prevalence. However, EHIS data suit the purpose of international comparison and benchmarking rather well because a common methodology is underlying the gathering of EHIS data.

For most indicators included in the overview of disease burden, the preferred age groups (50-60, 60-70, 70+) are not directly available from the existing databases. Therefore, we used various age groups depending on relevance and data availability (see Table 3-1).

In contrast to the lack of routinely available and comparable data on disease prevalence, mortality data are routinely available in most countries and are considered rather comparable. This data can also be used as a proxy for monitoring disease trends.

3.3 Results

3.3.1 Major chronic diseases

3.3.1.1 Diabetes

Introduction

Diabetes is a chronic disease that occurs when the pancreas does not produce enough insulin (the hormone that regulates blood glucose), or when the body cannot effectively use the insulin it produces. Uncontrolled diabetes results in hyperglycaemia (raised blood glucose), which over time causes damage to blood vessels, nerves and other tissues. Combined with disturbances in lipid metabolism (dyslipidemia), raised blood pressure (hypertension) and smoking, this often leads to serious complications such as cardiovascular disease, retinopathy (impaired vision and blindness) and nephropathy (kidney disease) (50).

Data based on registered primary causes of death seriously underestimate the actual number of deaths for which diabetes was a contributing factor and coding practice may vary strongly between countries (51, 52). Since many diabetic patients die of cardiovascular disease, it is usual for cardiovascular disease to be recorded as the primary cause of death. Therefore, see paragraph 3.3.1.2 for the disease burden and mortality due to cardiovascular disease.

Obesity due to physical inactivity and/or a poor diet is a risk factor for diabetes. The current significant increase in obesity in Europe predicts a strong rise in the prevalence of diabetes in Europe in the near future. In the EU countries participating in the first wave of EHIS about 16% of people aged 15+ reported that they are obese (2). Therefore, large health improvements can be achieved by reducing the prevalence of obesity through correcting an unhealthy diet and insufficient physical activity.

Morbidity

Diabetes prevalence varies considerably among EU Member States

In the European countries that participated in the first wave of EHIS, the percentage of people (aged 15+) who reported having diabetes varied from 3.1% in Romania to 7.9% in Hungary (2). In the majority of countries, self-reported prevalence is higher among women (see Table D-1 in appendix D). The EHIS-based data may be influenced by reporting bias and sampling related bias and may not reflect the true prevalence of the disease in a country. According to the IDF Diabetes Atlas, which presents 'best estimates' for all European countries, diabetes prevalence (population aged 20-79 years) in the EU, EFTA and Candidate countries varies from 3.2% in Iceland to 9.6% in Portugal (53). See appendix C for more information on the comparability and the quality of the data used in this chapter.

Diabetes prevalence increases with age

Figure 3-1 shows that the average self-reported diabetes prevalence for EU countries participating in EHIS increases considerably with age. The self-reported prevalence of diabetes in the age group 55-64 is twice the prevalence in the age group 45-54. The prevalence in the age group 65-74 is triple the prevalence in the age group 45-54 (see Figure 3-1). This is the case for almost all European countries participating in EHIS and for both sexes (see Figure 3-2 and Table D-1 in appendix D).

Figure 3-1: Average self-reported diabetes prevalence by age for 17 EU countries that participated in EHIS in 2008 (source: EHIS first wave, Eurostat 2012, data processed by RIVM).

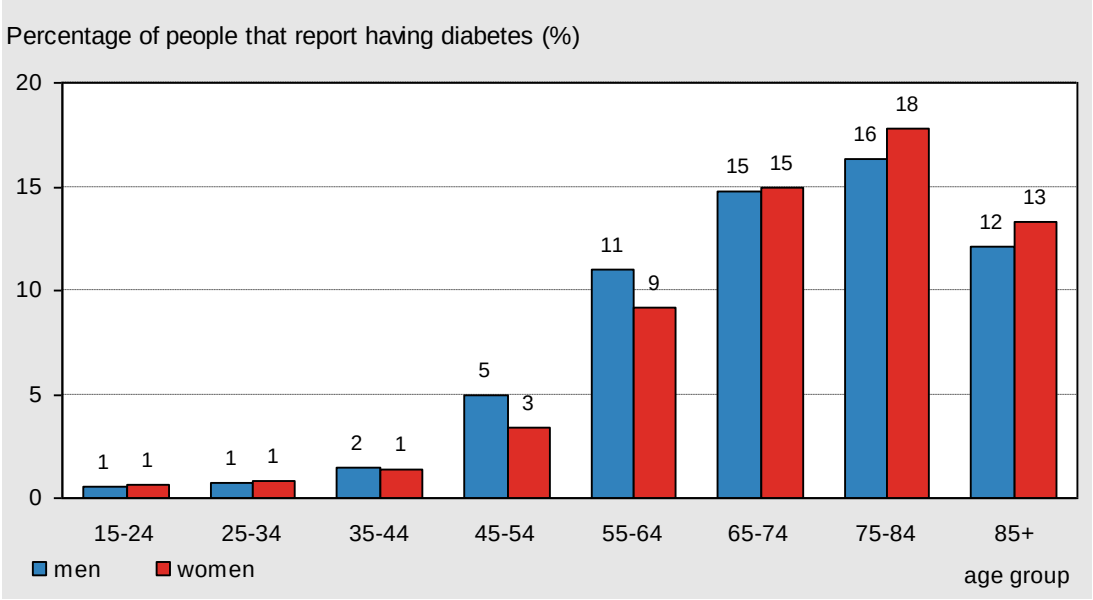
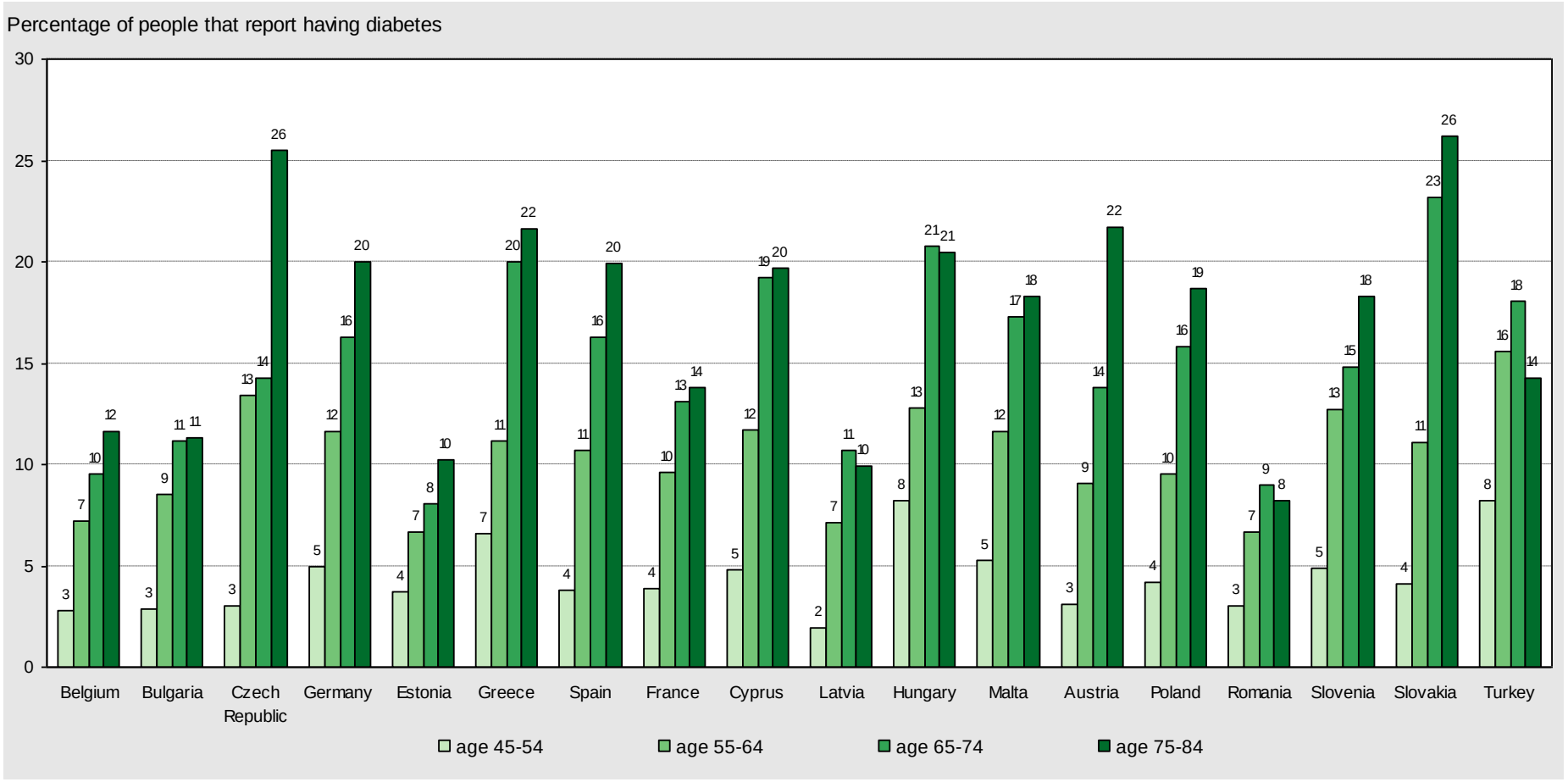


Figure 3-2: Percentage of people who reported having diabetes by age groups (45-54, 55-64, 65-74, 75-84) in various European countries in 2008 (source: EHIS first wave, Eurostat 2012).



An estimated 13 million EU citizens aged 55-74 report having diabetes

In the age group 55-64, the percentage of people who report having diabetes varies from 6.7% in Romania to 15.6% in Turkey (see Figure 3-2), with an unweighted average of 10.1% for the 17 EU countries providing data. Based on the range in the EU, the total number of people, aged 55-64, with diabetes in the EU is estimated to be 4-8.2 million with an average of 6.2 million. In the age group 65-74, the percentage of people who report having diabetes varies from 8.1% in Estonia to 23.2% in Slovakia (see Figure 3-2), with an unweighted average of 14.9% for the 17 EU countries providing data. Based on the range in the EU, the total number of people aged 65-74 with diabetes in the EU is estimated to be 3.7-10.6 million with an average of 6.8 million.

The IDF (International Diabetes Federation) provides estimates for other age ranges. According to the IDF about 11.3 million people aged 40-59 and 18.5 million people aged 60-79 in the EU27 have diabetes. In the age group 20-39 years about 1.9 million people have diabetes (38).

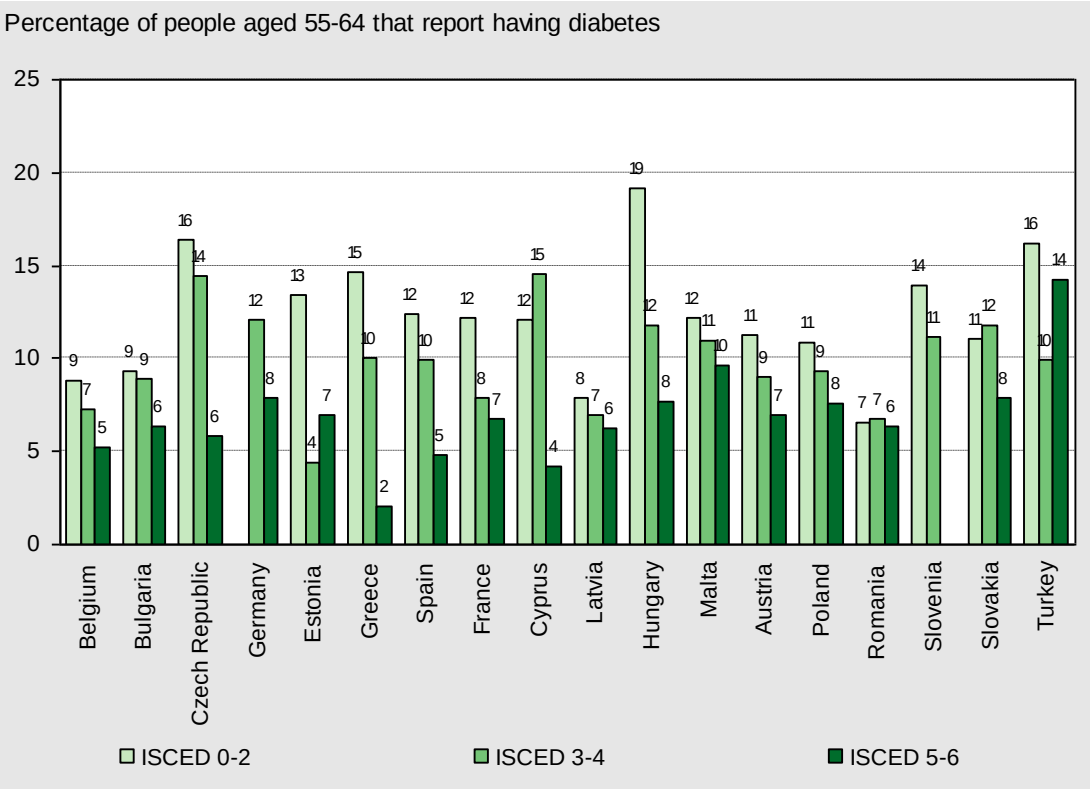
Diabetes prevalence is expected to increase between 2012 and 2030

According to the IDF, the prevalence of diabetes will increase in the EU27 from 32 million people in 2012 to 35 million by 2030 if no measures are taken (38). The increase is partly due to population ageing since age is an important risk factor for type 2 diabetes. However, age-specific prevalence rates will probably also rise due to the increasing frequency of obesity.

Diabetes prevalence higher among people with a low education and certain ethnic groups

In Europe, educational level and diabetes are inversely related in terms of both morbidity and mortality rates (54). Figure 3-3 shows that in almost all the countries that participated in EHIS, the percentage of people who reported having diabetes is higher for people aged 55-64 with a low level of education. The same is true for people aged 65-74 (figure not shown). In several European studies on the association between socio-economic status and diabetes prevalence, a disadvantaged socio-economic status was related to a higher prevalence of diabetes (55-57). Part of these inequalities is explained by differences between people with low versus high levels of education for the prevalence of risk factors for diabetes. Socio-economic differences in diabetes tend to be greater in women than in men (57). Furthermore, compared to European populations certain ethnic groups have higher rates of diabetes, primarily African-Caribbean, African and Asian (Indian) populations (58-60). In general, diabetes mortality is also higher in migrant populations compared to local-born populations (61).

Figure 3-3: Percentage of people aged 55-64 who reported having diabetes in various European countries by educational level[a] in 2008 (source: EHIS first wave, Eurostat 2012).



[a] ISCED 0 = Pre-primary education; ISCED 1 = Primary education or first stage of basic education; ISCED 2 = Lower secondary or second stage of basic education; ISCED 3 = Upper secondary education; ISCED 4 = Post-secondary non-tertiary education; ISCED 5 = First stage of tertiary education not leading directly to an advanced research qualification; ISCED 6 = Second stage of tertiary education leading to an advanced research qualification.

3.3.1.2 Cardiovascular disease

Introduction

Cardiovascular diseases (CVD) comprise a wide range of pathological conditions of the heart muscle and blood vessels. This section focuses on the ECHI indicators for acute myocardial infarction (AMI) and stroke.

Tobacco use, high blood pressure, high cholesterol levels, obesity, diabetes and harmful use of alcohol are major risk factors for cardiovascular disease. In the EU countries participating in the first wave of EHIS about 25% of people aged 15+ reported that they smoke, about 25% reported that they have hypertension and about 16% reported that they are obese (2). Although these figures are probably an underestimate, especially for hypertension, they show

that large health improvements can be achieved by reducing tobacco use and reducing the prevalence of hypertension and obesity through correcting an unhealthy diet and physical inactivity.

Morbidity

Lack of comparable data on morbidity from cardiovascular disease

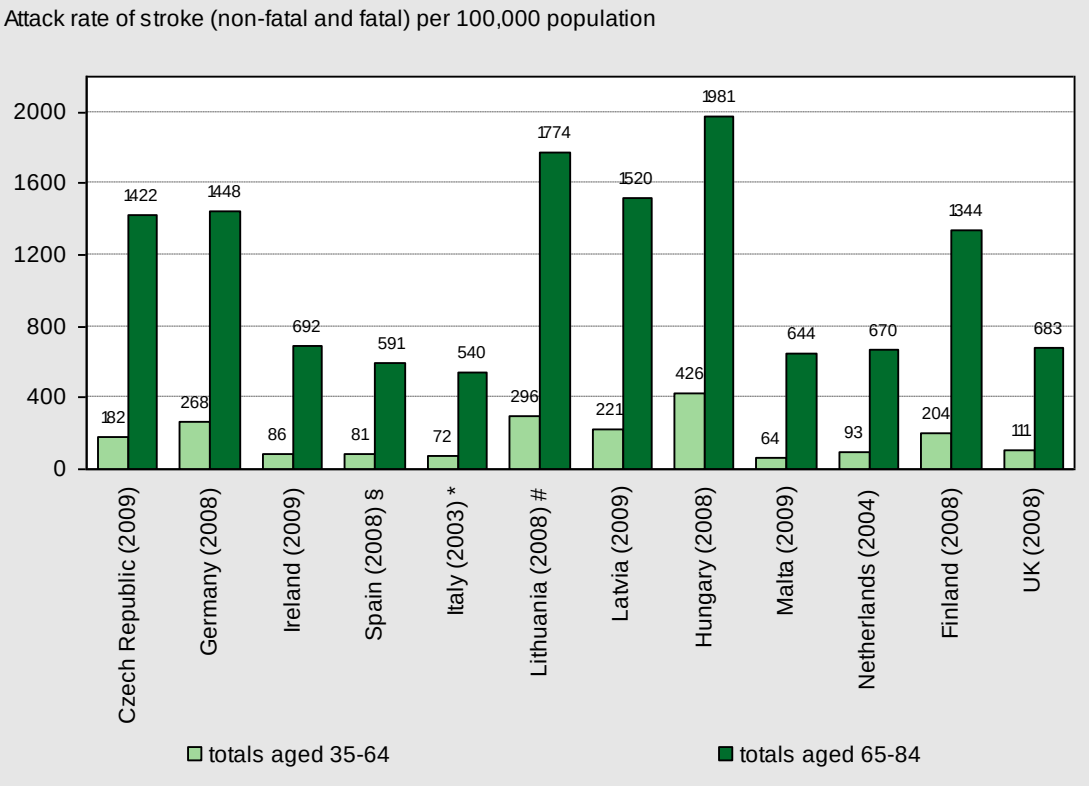
At present, comparable data on morbidity from cardiovascular disease are not collected on a sustainable and European-wide basis. Between the mid-1980s and the mid-1990s, the WHO's MONICA project (MONItoring trends and determinants in CArdiovascular disease) examined the incidence of coronary and cerebrovascular events in various populations across Europe. Although these populations were not necessarily nationally representative, the data are comparable across Europe because the project used a standardised methodology. Attack rates for coronary events (myocardial infarction = heart attack) were higher in the MONICA project populations in northern, central and eastern Europe than in southern and western Europe (with the exception of the United Kingdom) (62). In general, the attack rates for stroke were higher among populations in eastern than in western Europe (63).

Large variation in the number of stroke and heart attacks among EU countries

During the Joint Action for ECHIM, data on the attack rates of acute myocardial infarction and stroke (non-fatal and fatal) were collected as a pilot. Twelve countries submitted data on attack rates for stroke for the ECHIM Pilot data collection. The submitted attack rates in the age group 35-84 (35-74 in case of Italy) varied from 154 (Italy) to 743 (Hungary), with an unweighted average of 364 per 100,000 population (64). For the age group 65-84, attack rates varied from 540 in Italy to 1,981 in Hungary, with an unweighted average of 1,022 per 100,000. Attack rates for stroke were five to 10 times higher in the age group 65-84 compared to the age group 35-64 (see Figure 3-4).

Thirteen countries submitted data and related metadata on Acute Myocardial Infarction (AMI) during the ECHIM pilot data collection. The submitted AMI attack rates in the age group 35-74 varied from 142 (Spain) to 446 (Latvia), with an unweighted average of 260 per 100,000 population (64). For the age group 65-74, attack rates varied from 320 per 100,000 in Spain to 1,287 per 100,000 in Latvia with an unweighted average of 735 per 100,000. Attack rates of AMI were three to five times higher in the age group 65-74 compared to the age group 35-64 (see Figure 3-5).

Figure 3-4: Attack rates of stroke (non-fatal and fatal) per 100,000 population (source: ECHIM pilot data collection, Thelen et al., 2012).

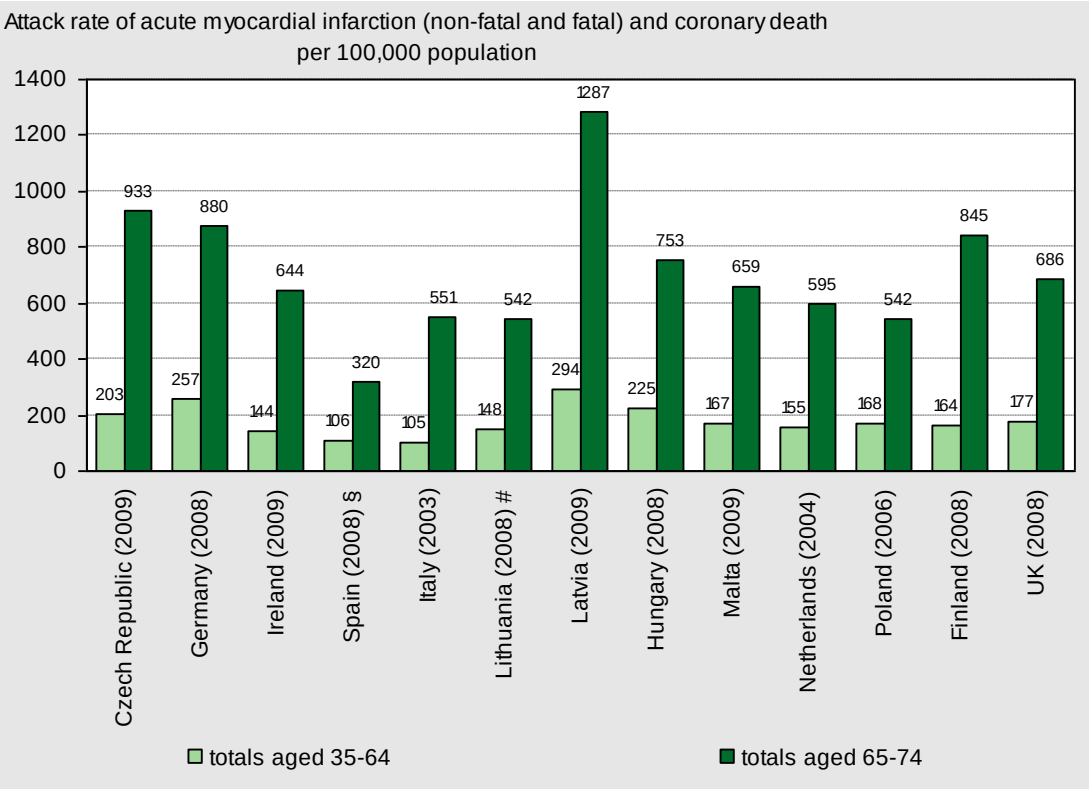


§ = Data have been age-standardised and refer to total discharges from hospitals (fatal or non-fatal), but do not include data from death registry
* = Max age is 74 years instead of 84 years
# = Counted individuals, not separate attacks during the year

International comparisons of attack rates for AMI and stroke should be made with caution

The attack rates for AMI and stroke are based on hospital discharge registries (which register the cause of admission to hospital) combined with causes of death registries. The attack rates count the first and recurrent events when there are at least 28 days between event onsets. Hence, the attack rate is not the same as incidence or prevalence. The ECHIM data were collected as part of a pilot data collection; not all countries devoted adequate resources or time for accessing primary data sources or developing and testing new data processing procedures to calculate the required indicators. In addition, countries used different methods and some used experimental methods to provide the data (64). Furthermore, the comparability of hospital discharge data is limited due to differences in the design of hospital registries, the use of various classification systems, differences in coding practices and coding standards as well as financial incentives for using specific codes or events (41). Therefore, international comparisons should be made with caution. More details are available in the Joint Action ECHIM Final Report Part III (64).

Figure 3-5: Attack rates of acute myocardial infarction (non-fatal and fatal) and coronary death per 100,000 population (source: ECHIM pilot data collection, Thelen et al., 2012).



§ = Data have been age-standardised and refer to total discharges from hospitals (fatal or non-fatal), but do not include data from death registry
# = Counted individuals, not separate attacks during the year

Age-standardised attack rates are decreasing; but the absolute number of events is increasing due to population ageing

During the MONICA project period, age-standardised rates for coronary events fell rapidly in northern and western Europe but not as fast in southern, central and eastern Europe; in some countries, such as Lithuania (Kaunas), East Germany and Spain (Catalonia), the rates even rose (62). Annual age-standardised stroke rates decreased in most populations (63). According to the WHO estimates however, the absolute number of stroke events in EU and EFTA countries is likely to increase from 1.1 million per year in 2000 to more than 1.5 million per year in 2025 solely because of demographic changes (65).

Stroke and heart disease more prevalent among people with low education levels

Both stroke and heart disease show a higher prevalence among people with low education levels. Socio-economic differences for the prevalence of stroke are larger than for the prevalence of heart disease. Inequalities in the prevalence of heart disease are larger in northern European countries as compared with southern European countries (55). Cardiovascular mortality is also higher in lower socio-economic groups in all European countries according to available data (66, 67). In all countries, mortality from stroke is higher among those with lower education level compared to those with a higher education level. However, this is not true for ischaemic heart disease for which no clear differences between educational groups are found in some southern European populations (66, 68). These findings suggest that the social pattern of the main risk factor for stroke, hypertension, is also similar across Europe.

Higher rates of stroke among people of African descent

In Europe, migrants of African descent have a relatively high rate of stroke. This high rate may be explained by the relatively high prevalence of hypertension and diabetes among African populations. Their relatively low rate of coronary heart disease may be explained by the low rates of other risk factors, such as smoking and a more favourable lipid profile (60). Also, the risk of mortality due to cardiovascular disease varies by country of birth in a range of European countries. The excess mortality observed for many migrant populations is substantial, particularly among women (69).

Mortality

A quarter of European men that die from cardiovascular disease are younger than 70

Each year cardiovascular disease (CVD) causes over 1.9 million deaths in the EU. This includes about 460,000 deaths from stroke and 680,000 deaths from ischaemic heart disease. The percentage of people who die from diseases of the circulatory system increases with age and the majority of people dying from stroke and ischaemic heart disease are 70 years and over. However, a considerable proportion of people who die from stroke or ischaemic heart disease are between 50 and 70, especially men. Nineteen per cent of all men who die from stroke and 26% of all men who die from ischaemic heart disease are between 50 and 70. For women these percentages are 7% and 8%, respectively (see Figure 3-6 and 3-7) (2).

In 2009, for people aged 50-59, 11,500 EU men and 6,300 EU women died from a stroke. However, in the age group 60-69, 24,300 EU men and 14,800 EU women died from a stroke. For ischaemic heart disease, these numbers are: 33,700 EU men and 7,600 EU women aged 50-59, and 59,900 EU men and 20,300 EU women aged 60-69.

Figure 3-6: Mortality in the EU due to stroke in various age groups as a percentage of the total number of deaths due to stroke in 2009 (provisional data) (source: Eurostat 2012, data processed by RIVM).

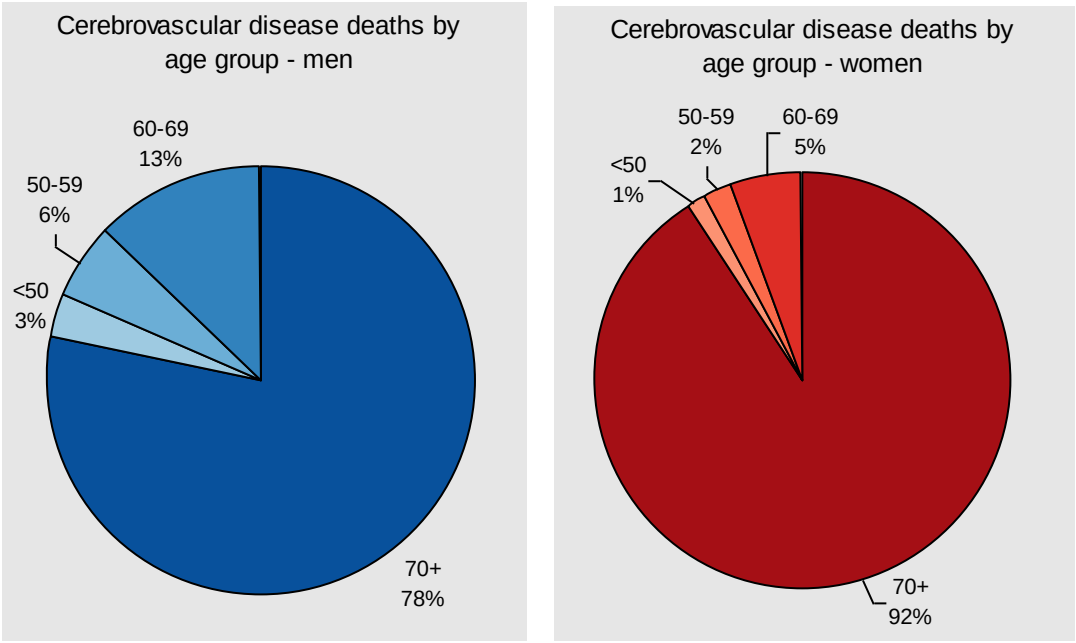
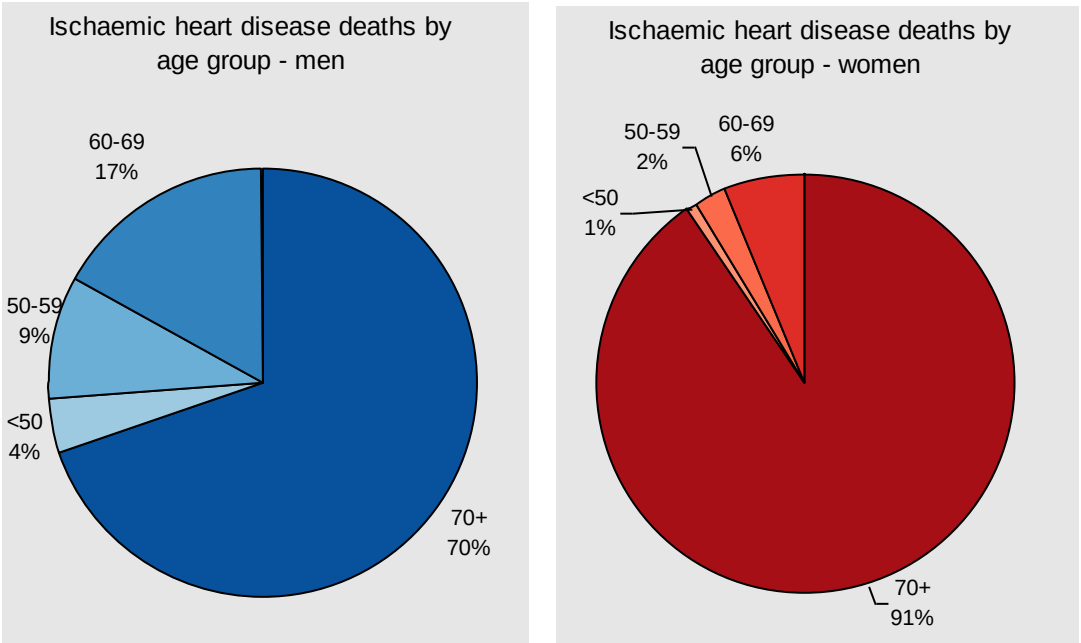


Figure 3-7: Mortality in the EU due to ischaemic heart disease in various age groups as a percentage of the total number of deaths due to ischaemic heart disease in 2009 (provisional data) (source: Eurostat 2012, data processed by RIVM).



Approximately 1 million productive life years lost due to mortality from cardiovascular disease

Each year mortality from diseases of the circulatory system (cardiovascular disease) between the ages 50 and 65 contributes to an estimated 1.0 million productive life years lost if the retirement age is set at 65. If the retirement age is set at 67 (the current retirement age in Norway the country with the highest current retirement age of the EU/EFTA), an estimated 1.4 million productive life years are lost.

Age-specific mortality for stroke and ischaemic heart disease is decreasing in the EU

Cardiovascular disease mortality is decreasing in most European countries, including central and eastern European countries which saw large increases until the beginning of the 21st century (46). For age groups 60-74 and 45-59 and for both sexes the average EU standardised mortality rate due to stroke and ischaemic heart disease has been decreasing since 1990. The absolute number of deaths for both stroke and ischaemic heart disease has also been decreasing; mortality for European men is higher than for women. See Figures 3-8, 3-9, 3-10, 3-11.

The observed decrease in mortality for stroke and ischaemic heart disease can be related to a decreased exposure to several risk factors by (70):

- A decrease in smoking prevalence, especially among men;
- Improved diets (increases in the intake of polyunsaturated and omega-3 fatty acids, and decreases in the intake of salt, saturated fats and particularly *trans* fatty acids);
- Improved control of high blood pressure;
- A decrease in high cholesterol levels through the wider use of statins.

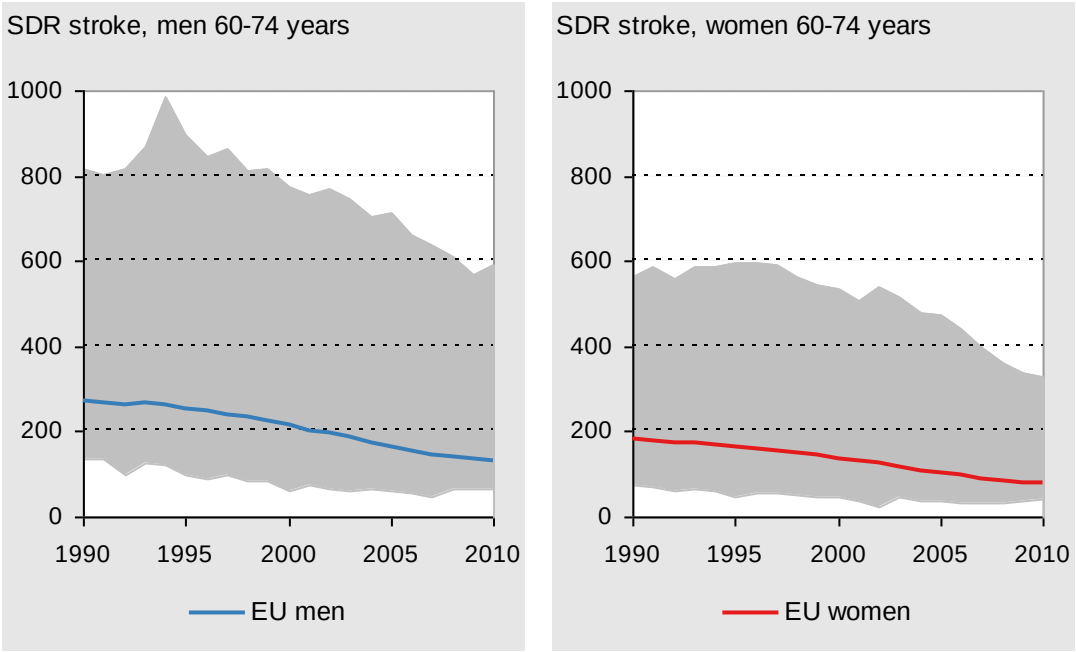
Improvements in the treatment and management of patients with stroke and ischaemic heart disease may also have contributed to the decreases in mortality (70).

Considerable variation in mortality among European countries

There is considerable variation in mortality due to stroke and ischaemic heart disease among EU Member States, EFTA and Accession and Candidate countries (see Figures 3-8, 3-9, 3-10, 3-11 and Tables D-2 and D-3 in appendix D). Death rates are generally higher in central and eastern Europe than in northern, southern and western Europe (46). However, the differences are decreasing. The differences in death rates for cardiovascular disease are, together with differences in the rates for cancer, the main cause of the gaps in the life expectancy at birth among Member States that are over 11 years for men and over seven years for women in 2009

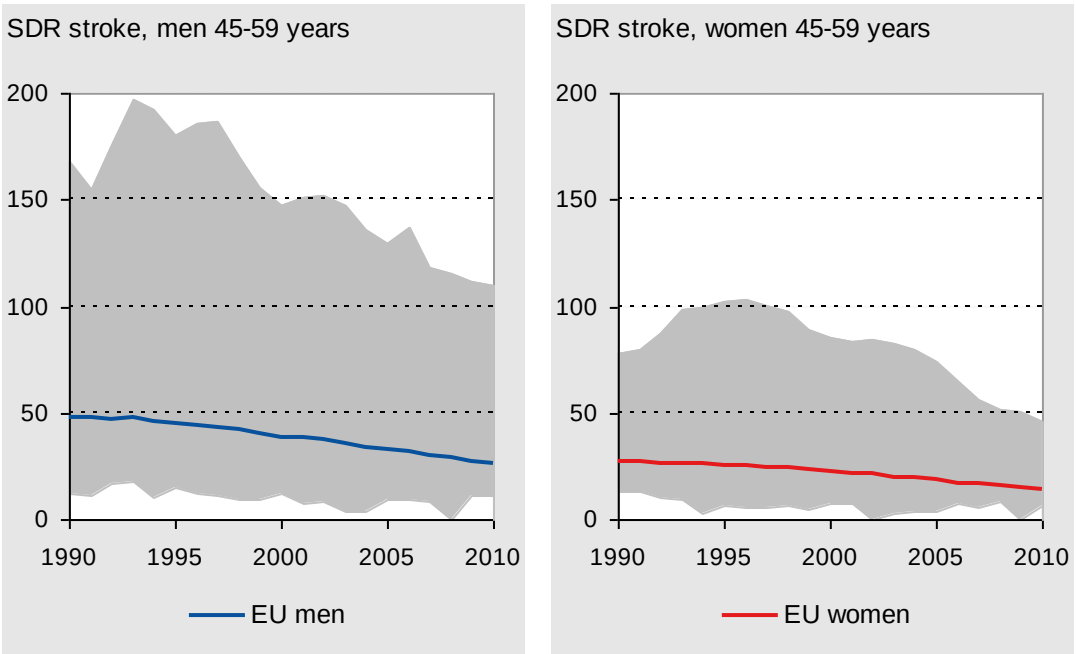
(2). In addition to the large variation among countries, there is also a large variation among regions within countries (71, 72).

Figure 3-8: Trends in age-standardised mortality (SDR) for stroke for men and women aged 60-74 years, 1990-2010[a] (source: WHO-MDB 2012).



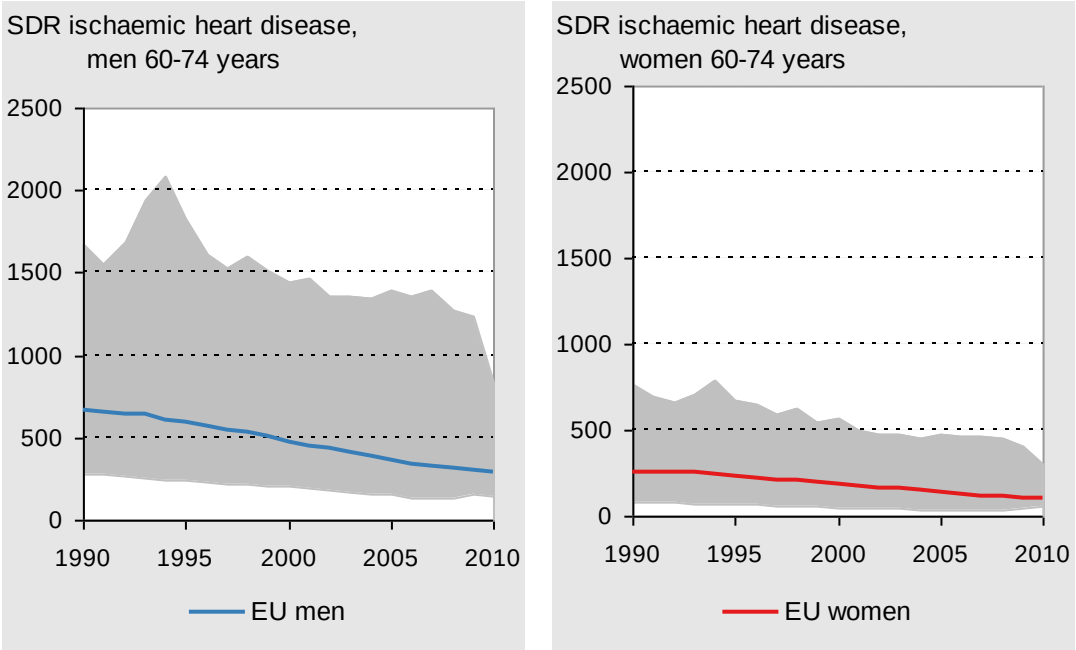
[a] Grey area reflects the range for the EU27 countries and Croatia, Iceland, Montenegro, Norway, Serbia, Switzerland and FYROM.

Figure 3-9: Trends in age-standardised mortality (SDR) for stroke for men and women aged 45-59 years, 1990-2010[a] (source: WHO-MDB 2012).



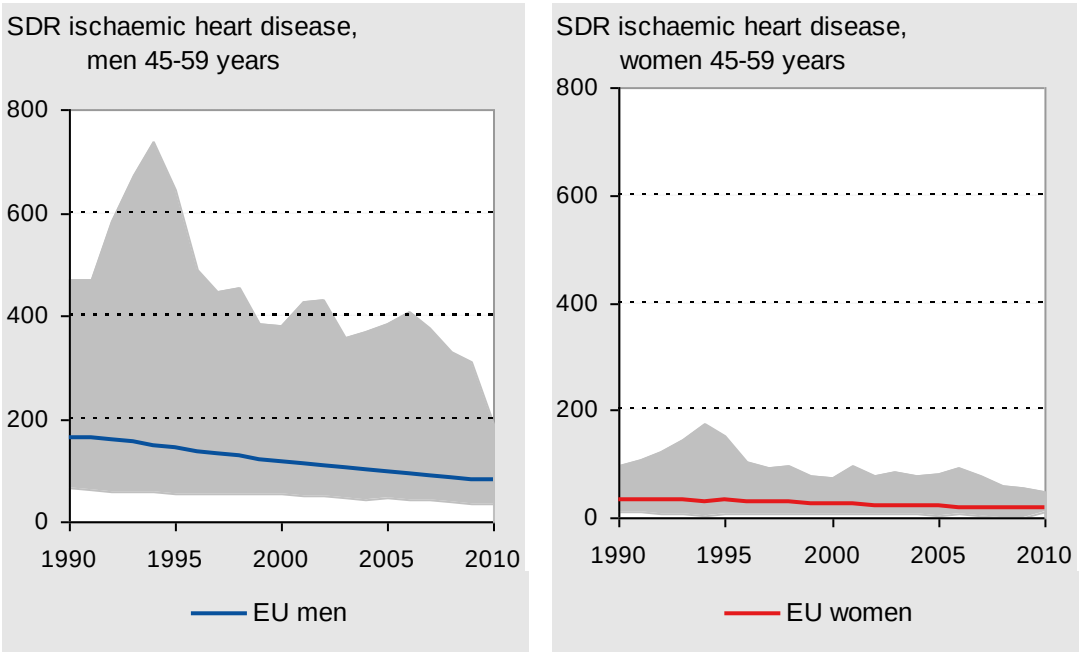
[a] Grey area reflects the range for the EU27 countries and Croatia, Iceland, Montenegro, Norway, Serbia, Switzerland and FYROM.

Figure 3-10: Trend in age-standardised mortality (SDR) for ischaemic heart disease for men and women aged 60-74 years, 1990-2010[a] (source: WHO-MDB 2012).



[a] Grey area reflects the range for the EU27 countries and Croatia, Iceland, Montenegro, Norway, Serbia, Switzerland and FYROM.

Figure 3-11: Trends in age-standardised mortality (SDR) for ischaemic heart disease for men and women aged 45-59 years, 1990-2010[a] (source: WHO-MDB 2012).



[a] Grey area reflects the range for the EU27 countries and Croatia, Iceland, Montenegro, Norway, Serbia, Switzerland and FYROM.

3.3.1.3 Cancer

Introduction

There are many forms of cancer, or malignant neoplasms. All cancers start because cells divide and grow out of control forming malignant tumours that can invade nearby parts of the body or spread to more distant parts of the body. Untreated cancers can cause serious illness and death.

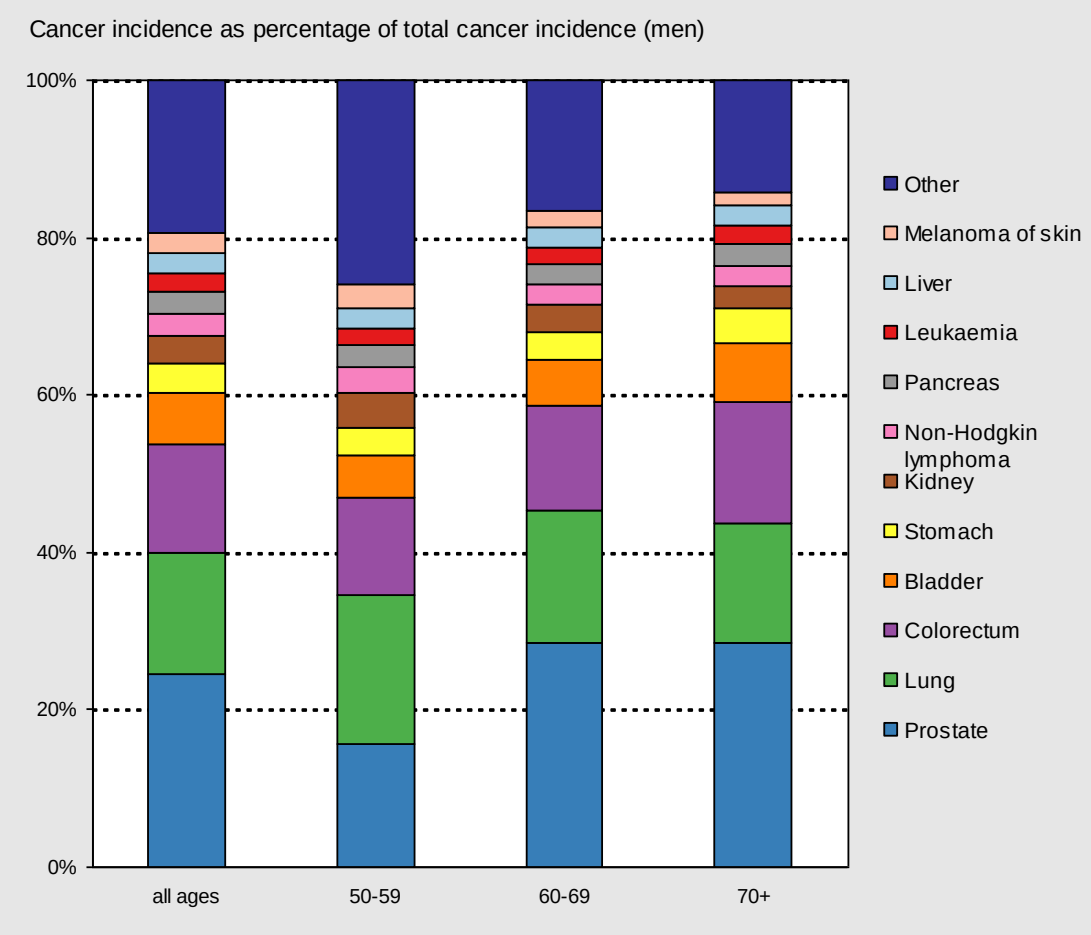
Risk factors for cancer include tobacco smoke, unhealthy diet, physical inactivity, harmful use of alcohol, obesity, exposure to asbestos or various types of radiation, specific bacterial or viral infections and genetic predisposition. In the EU countries participating in the first wave of EHIS about 25% of people aged 15+ reported that they smoke and about 16% reported that they are obese (2). Therefore, large benefits can be achieved by reducing tobacco use and reducing the prevalence of obesity through correcting an unhealthy diet and physical inactivity.

Morbidity

Breast, lung, colorectal and prostate cancers have the highest incidences

Of all cancer types, prostate, lung and colorectal cancer are responsible for highest incidence (new cases) in men (see Figure 3-12). Lung, colorectal and breast are responsible for the highest incidence in women (see Figure 3-13). The proportion of cancers due to prostate cancer increases with age, whereas the proportion due to breast cancer decreases with age (see Figure 3-12 and 3-13). It should however be noted that the figure presents the proportion of incidence at different age groups due to specific cancers and that the total number of people who get cancer increases with age as is shown in Figure 3-16.

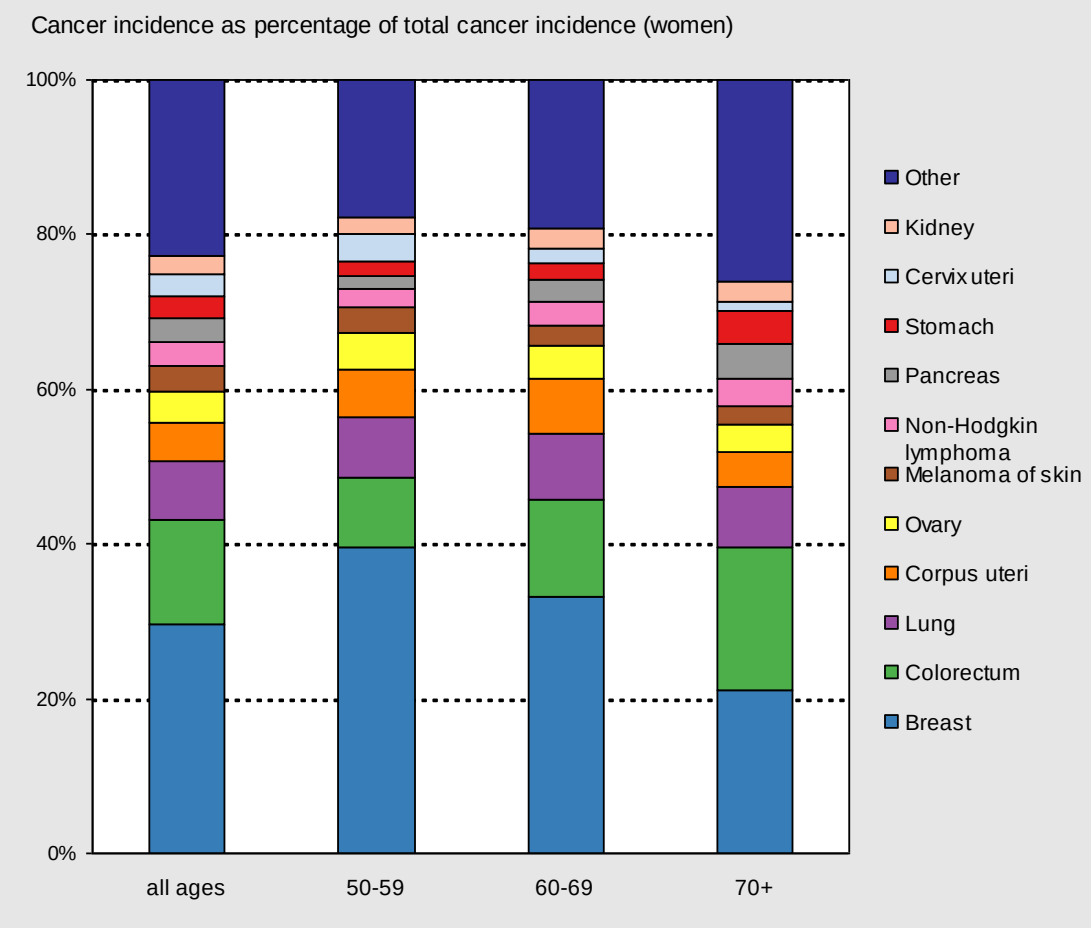
Figure 3-12: Cancer incidence for specific cancers as percentage of the total cancer incidence for men in 2008, by 10-year age groups (source: GLOBOCAN 2008).



Cancer incidence varies considerably among EU Member States

The annual number of new cancer cases (all cancers combined) varies from 160 per 100,000 in Greece to 326 per 100,000 in Denmark, with an average EU incidence of 264 per 100,000 (age-standardised rates). This means that each year 2.4 million EU citizens are diagnosed with cancer (73). In all EU countries, the cancer incidence is higher for men (see Table D-4 in appendix D). Also, the incidence of lung, breast, colorectal and prostate cancer varies considerably among EU countries. For example, lung cancer incidence is generally lower for men in northern Europe and higher for men in eastern and central Europe. For women, lung cancer incidence is generally higher in northern and central Europe and lower in eastern and southern Europe (see Table D-4, D-5, D-6, D-7 and D-8 in appendix D). See appendix C for more information on the comparability and the quality of the data used in this chapter.

Figure 3-13: Cancer incidence for specific cancers as percentage of the total cancer incidence for women in 2008, by 10-year age groups (source: GLOBOCAN 2008).



Cancer incidence increases with age

Age-standardised cancer incidence increases with age (see Figure 3-14). This is the case for all cancers combined and also for breast, lung, colorectal and prostate cancer (see Figure 3-15). Because the EU population is ageing, it can be expected that the absolute number of new cancer cases will also increase.

Figure 3-14: Age-standardised cancer incidence in the EU27 for all cancers combined by sex and by age groups 50-59, 60-69, 70+ (source: GLOBOCAN 2008).

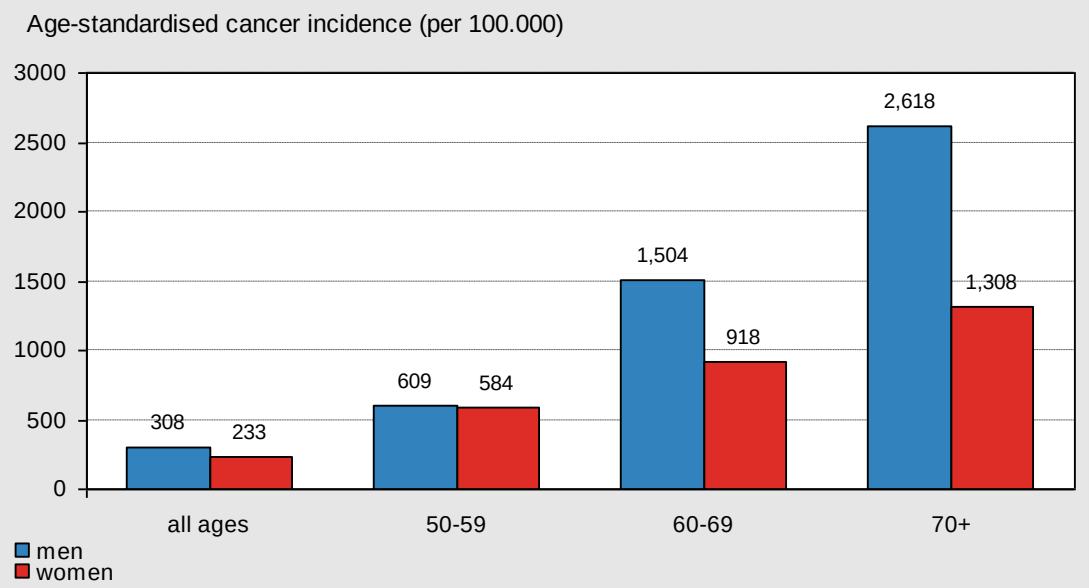
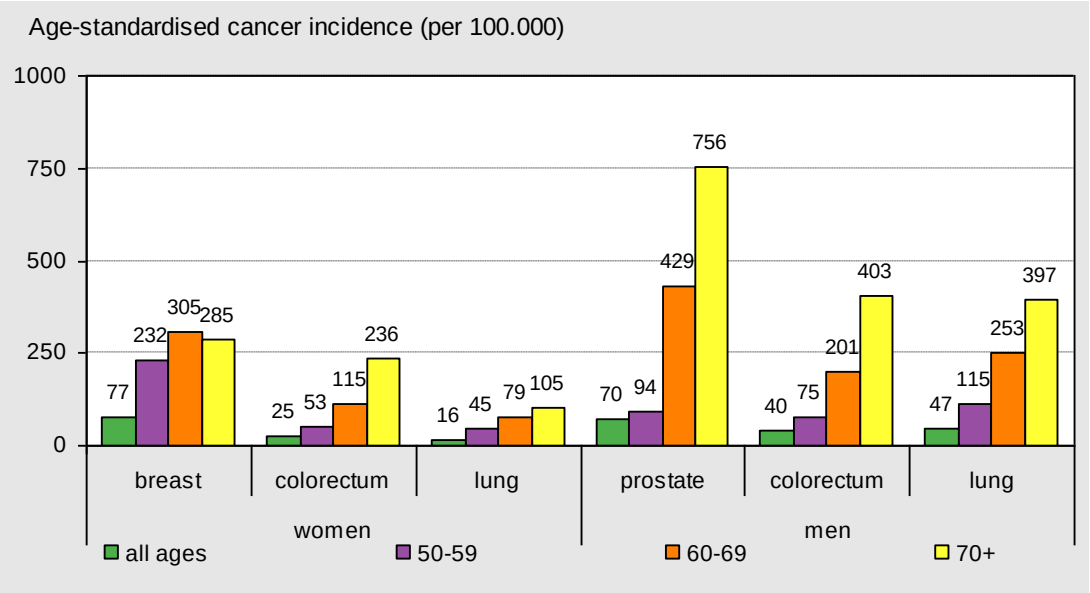


Figure 3-15: Age-standardised cancer incidence in the EU27 for breast, prostate, lung and colorectal cancer, by sex and by age groups 50-59, 60-69, 70+ (source: GLOBOCAN 2008).

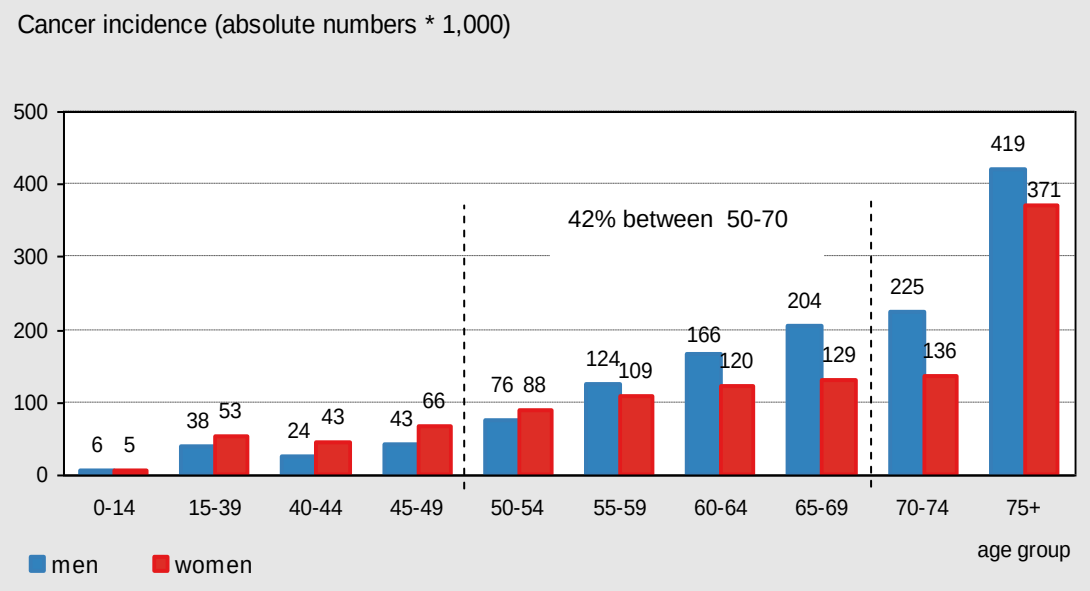


Each year one million EU citizens aged 50-70 are diagnosed with cancer

In the 50-59 year age group, the annual number of new cancer cases (all cancers combined) varies from 323 per 100,000 in Greece to 757 per 100,000 in France with an EU average of 597 per 100,000 (age-standardised rates). According to GLOBOCAN, this corresponds to almost 400,000 EU citizens, aged 50-59, who are diagnosed with cancer each year. In the 60-69 year age group, the annual number of new cancer cases varies from 660 per 100,000 in Greece to 1,511 per 100,000 in Denmark, with an EU average of 1,195 per 100,000 (see

Table D-4 in appendix D). According to GLOBOCAN, this corresponds to almost 600,000 EU citizens, aged 60-69, who are diagnosed with cancer each year. Hence, approximately one million people between 50 and 70 are diagnosed with cancer each year in the EU, which corresponds to 42% of all new cancer cases annually (see Figure 3-16).

Figure 3-16: Absolute number of new cancer cases per year in the EU27 by age group (source: GLOBOCAN 2008).



No fixed pattern of socio-economic inequalities for cancer

Many epidemiological studies have found an increased incidence for many cancers in lower socio-economic groups. However, some cancers have in some studies a higher incidence in higher socio-economic groups, for example, breast cancer in women (66). Cancer prevalence is currently not higher in lower socio-economic groups in Europe (66). This can perhaps be explained by differences in cancer survival. The probability of surviving the first five years after a cancer diagnosis is slightly higher in upper socio-economic groups (66).

Similarly, cancer mortality is not higher in lower socio-economic groups for all cancers for both men and women. Cancer mortality for all cancers combined is higher in lower educated men, but not in lower educated women. These patterns for all cancers combined are the net result of strongly diverging patterns for specific cancers, which are often related to earlier diverging smoking patterns decades earlier. For some cancers, 'reverse' patterns exist with higher death rates in upper socio-economic groups. Examples of this reverse pattern are prostate cancer for men and breast and lung cancer for women. For colorectal cancer, inequalities in mortality tend to be small in all EU countries. In men, excess cancer mortality in lower socio-economic groups is due to a higher mortality from lung cancer, as well as other

cancers including stomach and oesophageal cancer. The small socio-economic differences are probably temporarily, because among the younger birth cohorts, breast cancer mortality rates, for example, now tend to be higher among the lower socio-economic groups (66).

Cancer risk is lower among migrants from non-Western countries

Migrants from non-Western countries have a more favourable all-cancer morbidity and mortality compared with native European populations. However, there is considerable diversity in site-specific risk. Migrants from non-Western countries have a higher risk for cancers related to infections experienced in early life, such as liver, cervical and stomach cancer. On the other hand, they have a lower risk for cancers related to a Western lifestyle, for example, colorectal, breast and prostate cancer (74).

Mortality

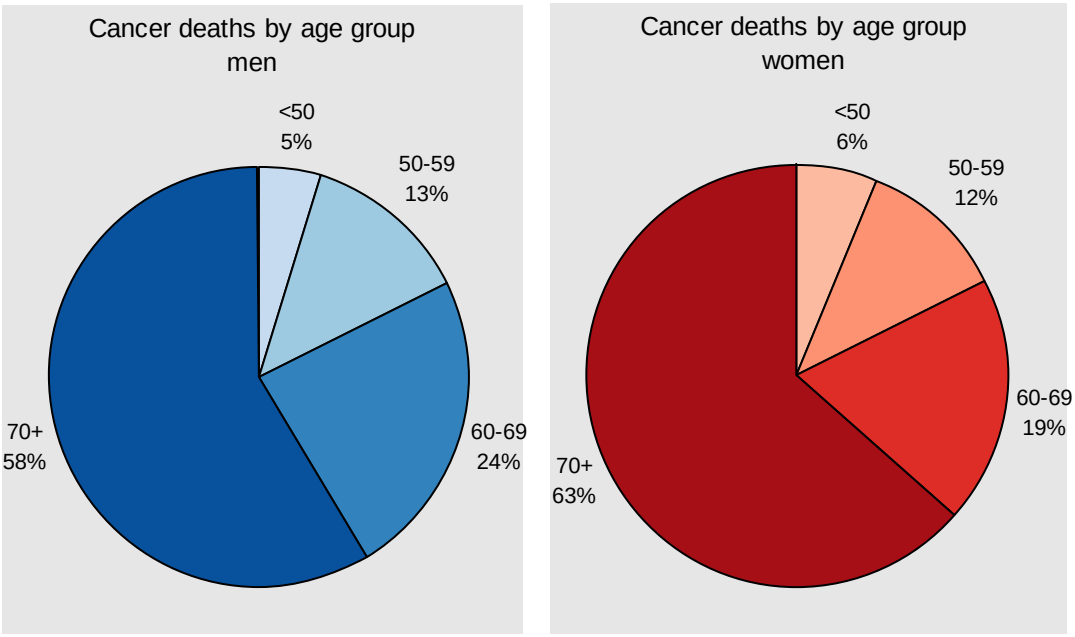
One-third of EU citizens who die from cancer are between 50 and 70 years old

In total about 1.2 million EU citizens die from cancer each year. The percentage of people who die from cancer increases until age 55-59 for women and 60-64 for men, after which it decreases. The majority of people dying from cancer are 70 years and over. However, a considerable proportion is between 50 and 70. Thirty-seven per cent of all men and 31% of all women who die from cancer (all cancers combined) in the EU are between 50 and 70 (see Figure 3-17) (2). In 2009, for the age group 50-59, 89,700 EU men and 62,600 EU women died from cancer. In the age group 60-69, 165,600 EU men and 102,700 EU women died from cancer. Cancer is the largest contributor to mortality in the age group 50-70.

Approximately 2 million productive life years lost due to mortality from cancer

Each year mortality from cancer between the ages 50 and 65 contributes to an estimated 1.7 million productive life years lost if the retirement age is set at 65. If the retirement age is set at 67 (the current retirement age in Norway the country with the highest current retirement age of the EU/EFTA), an estimated 2.3 million productive life years are lost. Because cancer is the largest contributor to mortality in this age group it is also the largest contributor to productive years lost.

Figure 3-17: Mortality in the EU due to all malignant neoplasms in various age groups as a percentage of the total number of deaths due to all malignant neoplasms in 2009 (provisional data) (source: Eurostat 2012, data processed by RIVM).



Age-standardised cancer mortality is decreasing in the EU

On average, the age-standardised mortality due to cancer has been decreasing in the EU since 1990 for age groups 60-74 and 45-59, and for both sexes. See Figure 3-18 and 3-19 for all cancers combined. An exception is lung cancer mortality in women, which is increasing in the EU. Apart from lung cancer in women and pancreatic cancer in both men and women, the decrease in mortality from common cancers in major European countries and the EU essentially reflects the decline in tobacco smoking in men and the continuing progress in cancer prevention, early detection and treatment (75). However, the absolute number of deaths from cancer is increasing (2). The main reason is the ageing of the population. Cancer is more common among elderly people and the proportion of elderly people in the population is increasing. When a correction is made for the age-distribution (age-standardised mortality rates), mortality decreases (75).

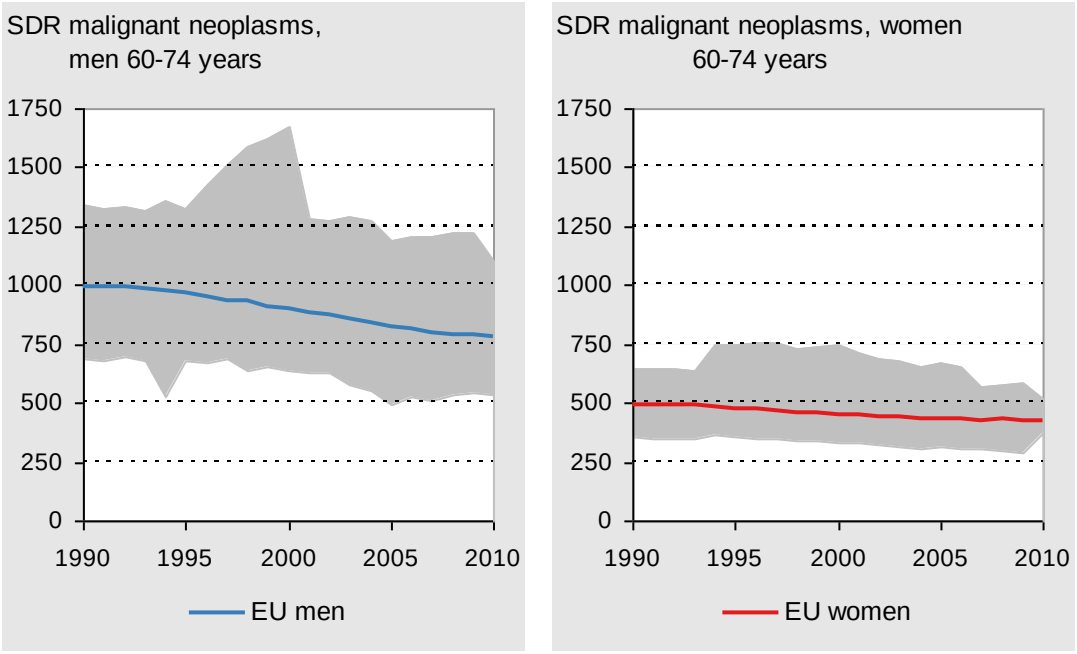
With advances in early detection and treatment and the consequent increase in survival, cancer is evolving into a chronic condition in many higher resource countries and the cancer prevalence is increasingly becoming an important measure for the planning of cancer services (76, 77). Longer life expectancy for those living with cancer with or without other co-morbidities results in more patients relying on prolonged and repeated medical and nursing resources. This in turn leads to progressively increasing health costs and burdens on public healthcare budgets.

Considerable variation in mortality among European countries

There is considerable variation in mortality due to cancer (for all cancers combined) among EU Member States, EFTA and Accession and Candidate countries. (See Figures 3-18 and 3-19 and Table D-9 in appendix D). The differences in death rates for cancer are, together with differences in the rates for cardiovascular disease, the main cause of the gaps in the life expectancy at birth among EU Member States that are over 11 years for men and over seven years for women in 2009 (2). In addition to the large variation among countries, there is also a large variation among regions within countries (71, 72).

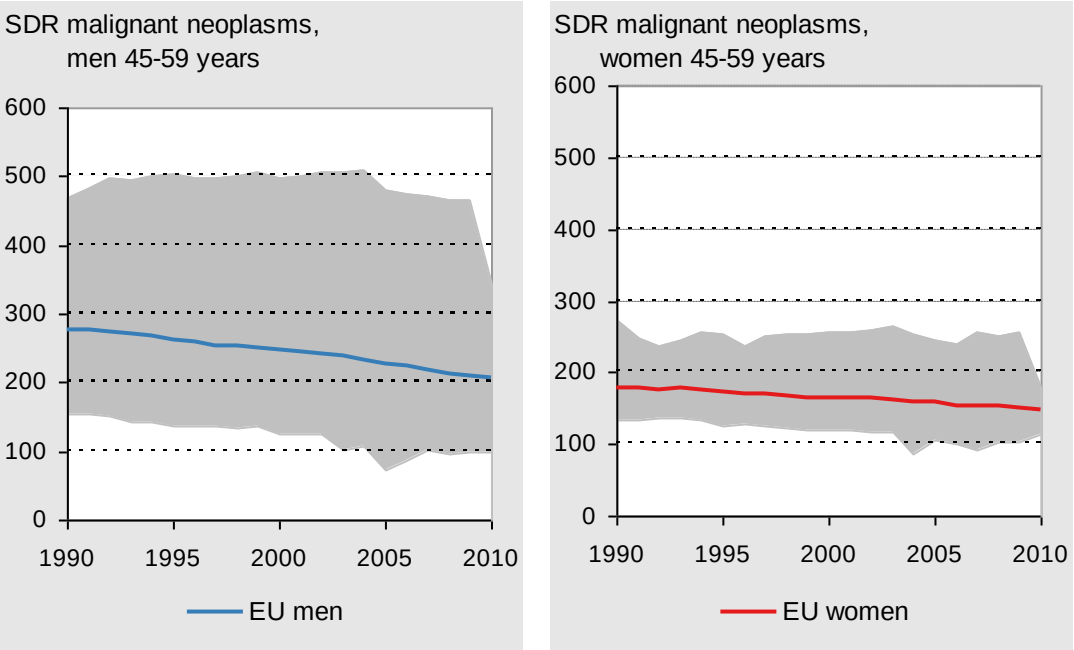
Mortality for European men is higher than for women. In 2009, 700,000 EU men and 544,000 EU women died from cancer. Lung cancer, responsible for 269,000 deaths (22% of total), was the most common cause of death from cancer. Colorectal cancer ranks second (147,000 deaths, 12%) and breast cancer ranks third (91,000 deaths, 7%).

Figure 3-18: Trends in age-standardised (SDR) mortality for all malignant neoplasms for men and women aged 60-74 years, 1990-2010[a] (source: WHO-MDB 2012).



[a] Grey area reflects the range for the EU27 countries and Croatia, Iceland, Montenegro, Norway, Serbia, Switzerland and FYROM.

Figure 3-19: Trends in age-standardised mortality (SDR) for all malignant neoplasms for men and women aged 45-59 years, 1990-2010[a] (source: WHO-MDB 2012).



[a] Grey area reflects the range for the EU27 countries and Croatia, Iceland, Montenegro, Norway, Serbia, Switzerland and FYROM.

3.3.1.4 COPD

Introduction

COPD (chronic obstructive pulmonary disease) is a common preventable and treatable disease that is characterised by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases. Exacerbations and comorbidities contribute to the overall severity in individual patients (37). COPD is part of a larger group of chronic lower respiratory diseases. We present prevalence data for COPD and mortality data for chronic lower respiratory diseases. Another chronic lower respiratory disease is for example asthma. Lung cancer is described in paragraph 3.3.1.3.

Smoking is the primary risk factor for developing COPD. In western countries COPD prevalence and mortality trends follow tobacco smoking behaviour in the population with some delay. Respiratory infections, exposure to various dusts, chemicals, vapours, fumes in

the workplace and indoor air pollutants are also important risk factors, especially in low- and middle-income countries. With more stringent laws related to the work place environment and the development and use of better stoves and heating devices, these exposures and their effect on COPD prevalence and mortality will diminish over time (78). In the EU countries participating in the first wave of EHIS about 25% of people aged 15+ reported that they smoke. Therefore, still large benefits can be achieved by reducing tobacco use.

Morbidity

Self-reported COPD prevalence varies considerably among EU Member States

In the European countries participating in the first wave of EHIS, the percentage of people who reported having COPD varied from 1.2 % in Malta to 6.2% in Turkey. In the majority of countries, self-reported prevalence is higher among women (see Table D-10 in appendix D).

The EHIS-based data may be influenced by reporting biases and sampling related biases and may not reflect the true prevalence of the disease in a country. In addition, COPD is often underdiagnosed. Differences in underdiagnosis and undertreatment might explain the different COPD levels among countries (37, 79). Epidemiological surveys using more comprehensive measurement instruments tend to find higher prevalence estimates than health interview surveys. See appendix C for more information on the comparability and the quality of the data sources used in this chapter.

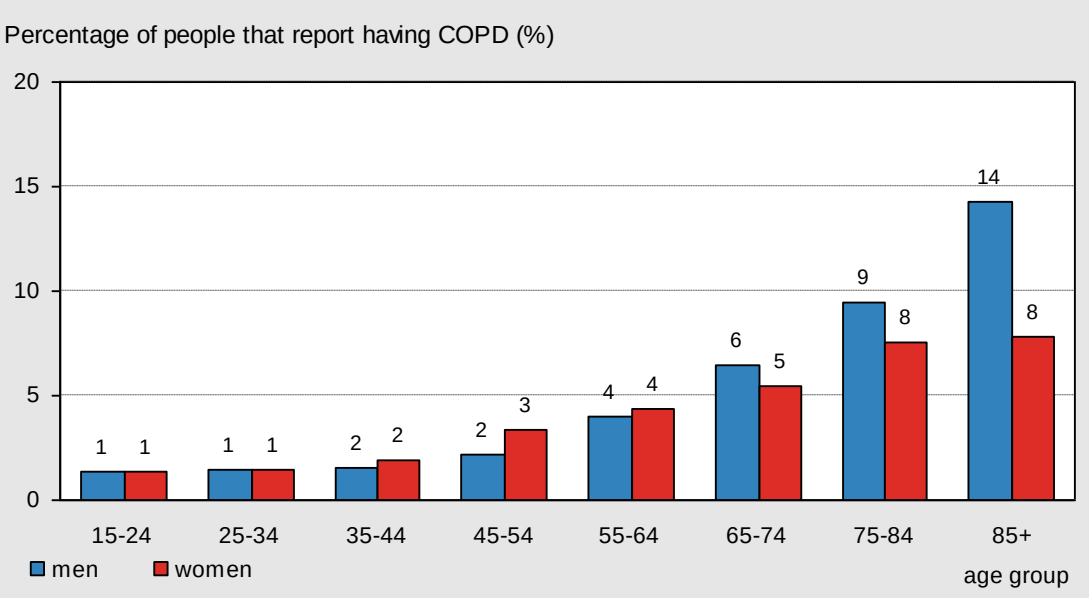
Also prevalence assessed in epidemiological studies reveals cross-national variation

A review of epidemiological studies in which COPD was assessed by spirometry, physicians reports, respiratory tests and models showed an even larger variation in COPD prevalence. In this review by Atsou et al. (2012) that included estimates from the Burden of Obstructive Lung Disease (BOLD) study, prevalence estimates ranged between 2.1% and 26.1% depending on the country, age group and methods used. The authors concluded that the wide range of prevalence across European countries does not correspond to real differences, but it remains difficult to determine which part of the variation is due to methodological issues and which part to countries' characteristics, such as differences in smoking rates (80).

COPD prevalence increases with age

Figure 3-20 shows that the average COPD prevalence for countries participating in EHIS increases considerably with age. This is the case for most European countries participating in EHIS and for both sexes (see also Figure 3-21 and Table D-10 in appendix D).

Figure 3-20: Average self-reported COPD prevalence by age for 16 EU countries participating in EHIS in 2008 (source: EHIS first wave, Eurostat 2012, data processed by RIVM).



An estimated five million EU citizens aged 55-74 reported having COPD

In the 55-64 age group, the percentage of people who report having COPD varies from 2.0% in Malta and the Czech Republic to 10.5% in Turkey (see Figure 3-21), with an unweighted average of 4.2% for the 16 EU countries that provided data. Based on the range in the EU, the total number of people aged 55-64 with COPD can be estimated at between 1.2 and 5.2 million, with an average of 2.6 million.

In the age group 65-74, the percentage of people who reported having COPD varies from 1.1% in Malta to 15.5% in Turkey (see Figure 3-21) with an unweighted average of 5.9% for the 16 EU countries that provided data. Based on the range in the EU the total number of people aged 65-74 with COPD can be estimated at between 0.5 and 3.8 million, with an average of 2.7 million.

COPD prevalence higher among lower educated people

The percentage of people reporting to have COPD is higher among people with a lower educational level. Figure 3-22 shows that in almost all countries participating in EHIS, the percentage of people who reported having COPD is higher among people aged 55-64 with a lower educational level. The same is true for people aged 65-74 (figure not shown).

Several studies support this finding of a higher prevalence among lower educated people (55, 80). The prevalence of smoking, the major risk factor for COPD, is also higher among people with a lower educational level.

Figure 3-21: Percentage of people who reported having chronic obstructive pulmonary disease (COPD) by age groups (45-54, 55-64, 65-74, 75-84) in various European countries in 2008 (source: EHIS first wave, Eurostat 2012).

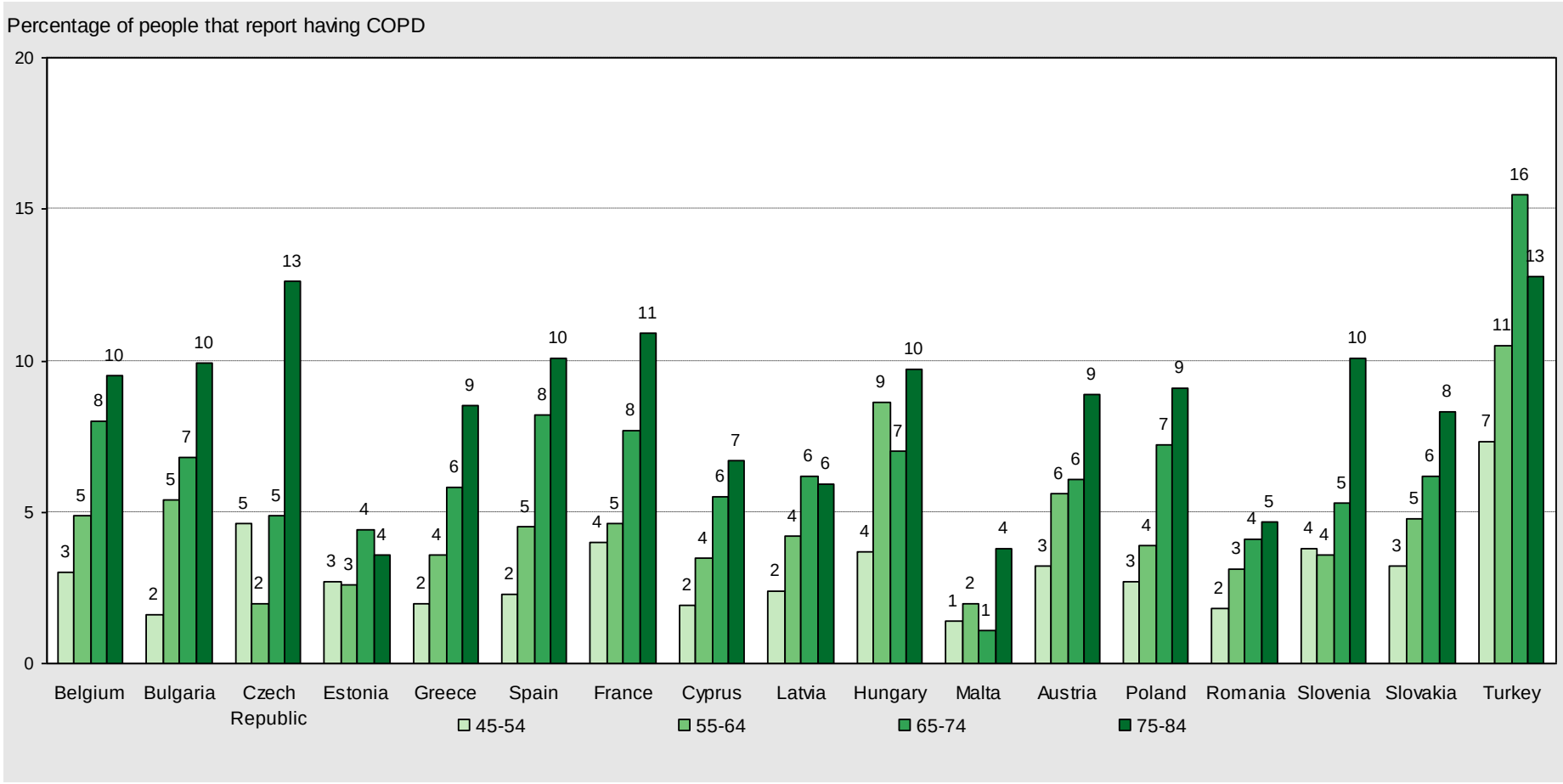
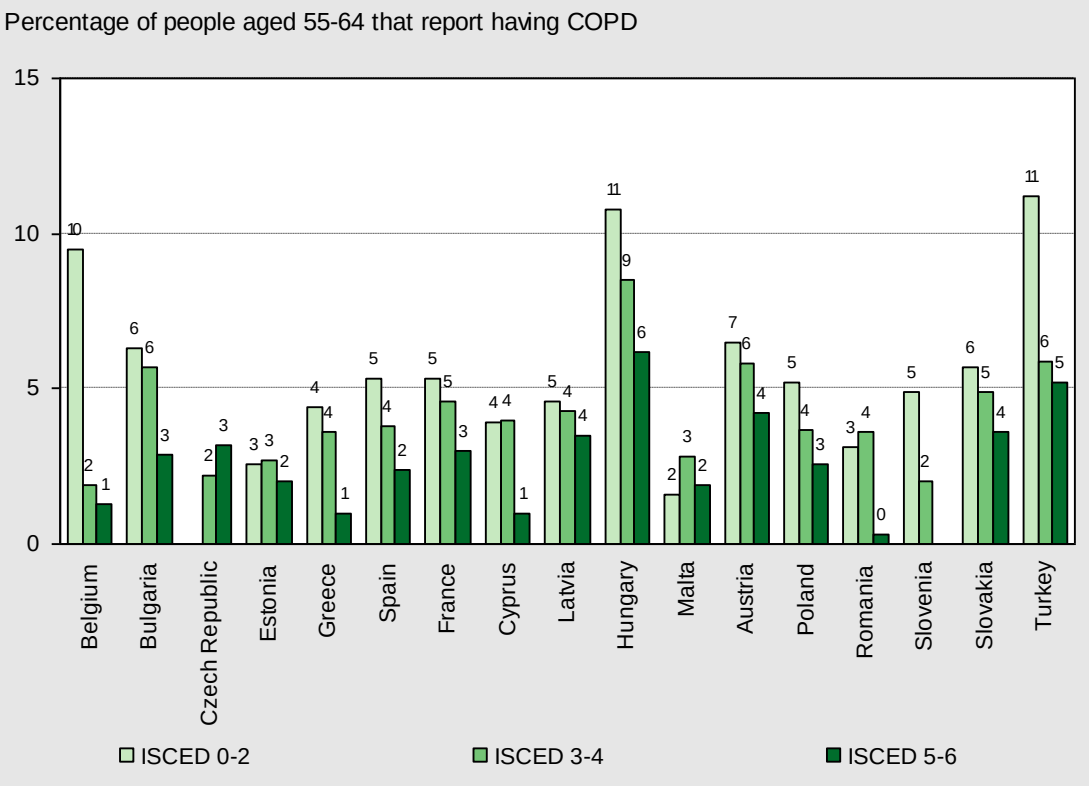


Figure 3-22: Percentage of people aged 55-64 who reported having chronic obstructive pulmonary disease (COPD) in various European countries by educational level[a] in 2008 (source: EHIS first wave, Eurostat 2012).



[a] ISCED 0 = Pre-primary education; ISCED 1 = Primary education or first stage of basic education; ISCED 2 = Lower secondary or second stage of basic education; ISCED 3 = Upper secondary education; ISCED 4 = Post-secondary non-tertiary education; ISCED 5 = First stage of tertiary education not leading directly to an advanced research qualification; ISCED 6 = Second stage of tertiary education leading to an advanced research qualification.

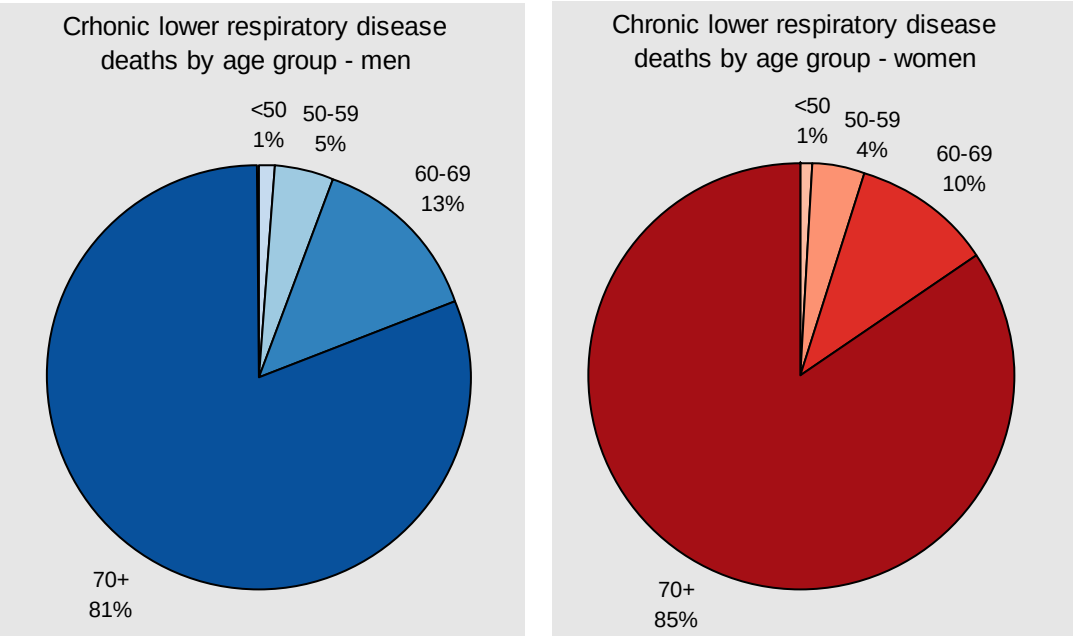
Mortality

16% of EU citizens who die from chronic lower respiratory disease are between 50 and 70 years old

In total about 160,000 EU citizens die from chronic lower respiratory disease each year. The majority of people who die from chronic lower respiratory disease are 70 years old or older. However, a considerable proportion is between 50 and 70. Eighteen per cent of all men and 14% of all women who die from chronic lower respiratory diseases are between 50 and 70 years old (see Figure 3-23) (2). Mortality for European men is higher than for women. In 2009, 4,313 EU men aged 50-59 and 2,519 EU women aged 50-59 died from chronic lower respiratory diseases. In the age group 60-69, 12,746 EU men and 6,657 EU women died from chronic lower respiratory diseases.

Each year mortality from chronic lower respiratory diseases between the ages 50 and 65 contributes to an estimated 80,000 productive life years lost if the retirement age is set at 65. If the retirement age is set at 67 (the current retirement age in Norway the country with the highest current retirement age of the EU/EFTA), an estimated 110,000 productive life years are lost. Underdiagnosis does not only affect the accuracy of COPD prevalence data but also COPD mortality data. In addition, although COPD is often a primary cause of death, it is more likely to be listed as a contributory cause of death or omitted from the death certificate entirely (37).

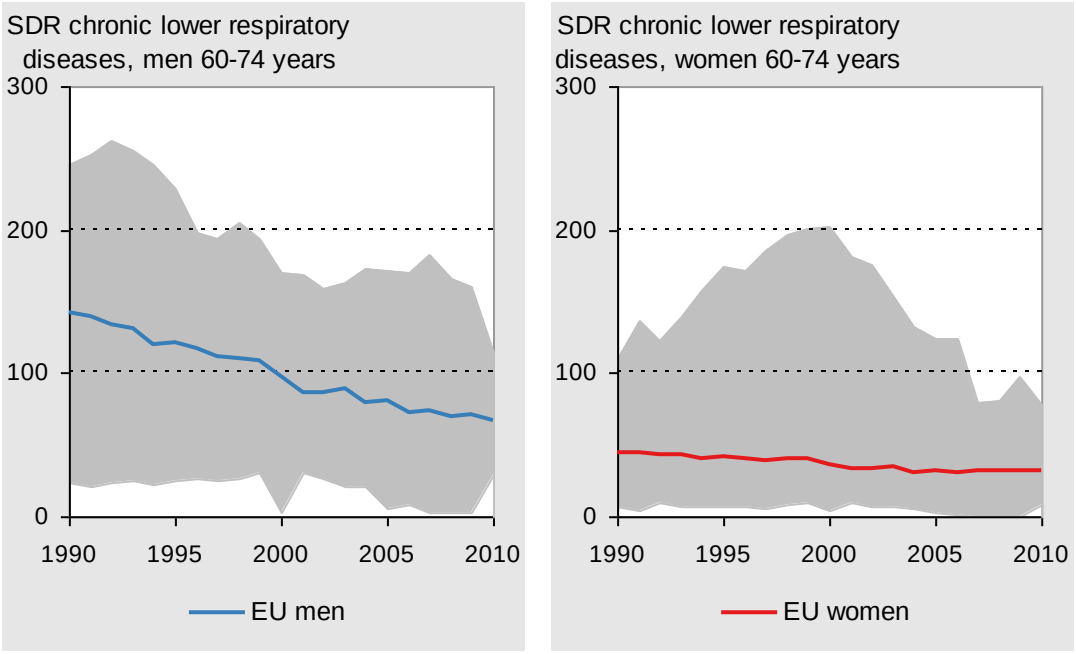
Figure 3-23: Mortality in the EU due to chronic lower respiratory diseases in various age groups as a percentage of total number of deaths due to chronic lower respiratory diseases in 2009 (provisional data) (source: Eurostat 2012, data processed by RIVM).



Age-standardised mortality for chronic respiratory diseases is decreasing in the EU, but absolute number of deaths are not decreasing

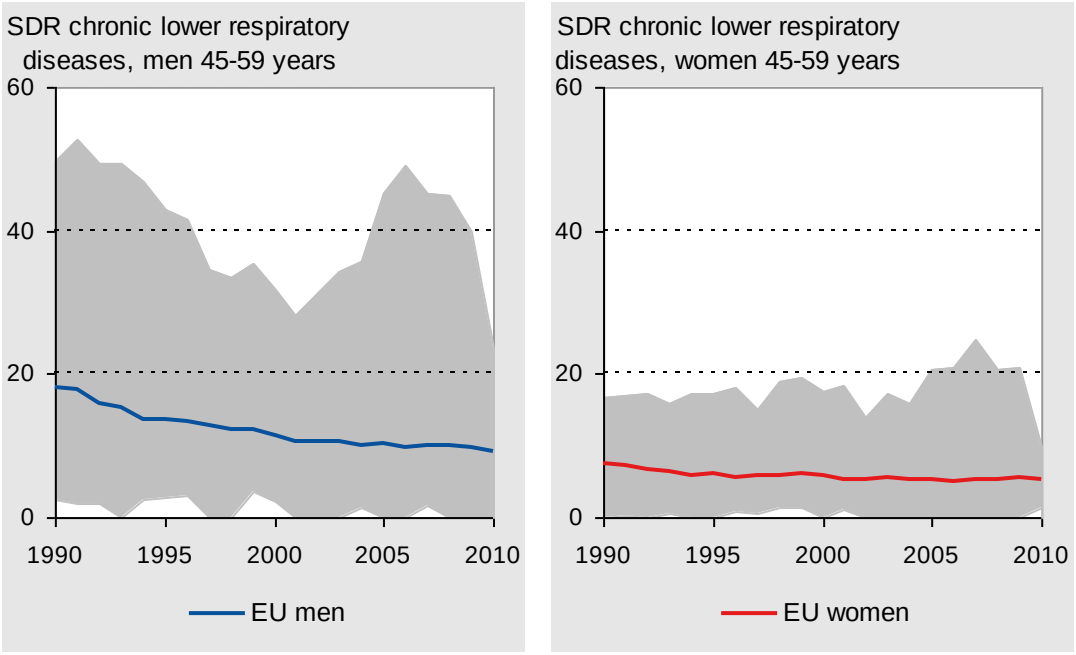
On average, the age-standardised mortality due chronic lower respiratory diseases has been decreasing in the EU since 1990 for age groups 60-74 and 45-59, and for both sexes. See Figure 3-24 and 3-25. However, in some countries, mortality due to chronic lower respiratory diseases has increased for women aged 45-59 since 2000 (e.g. Hungary, Slovakia and the Netherlands) due to increasing smoking prevalence among women in these countries in the past decennia. The absolute number of deaths due to chronic lower respiratory diseases is not decreasing. Particularly for people aged 80 years and over the number of deaths is rising, especially for women. This is probably due to the ageing population. A larger proportion of the population is living longer and is at risk for chronic medical disorders, such as COPD.

Figure 3-24: Trends in age-standardised mortality (SDR) for chronic lower respiratory diseases for men and women aged 60-74 years, 1990-2010[a] (source: WHO-MDB 2012).



[a] Grey area reflects the range for the EU27 countries and Croatia, Iceland, Montenegro, Norway, Serbia, Switzerland and FYROM.

Figure 3-25: Trends in age-standardised mortality (SDR) for chronic lower respiratory disease for men and women aged 45-59 years, 1990-2010[a] (source: WHO-MDB 2012).



[a] Grey area reflects the range for the EU27 countries and Croatia, Iceland, Montenegro, Norway, Serbia, Switzerland and FYROM.

Considerable variation in mortality from chronic lower respiratory disease in Europe

There is considerable variation in mortality due to chronic lower respiratory diseases among EU Member States, EFTA and Accession and Candidate countries. (See Figure 3-24 and 3-25, and Table D-11 in appendix D). In addition to the large variation among countries, there is also a large variation among regions within countries (71).

3.3.1.5 Depression

Introduction

This paragraph will focus on the ECHI indicator of depression prevalence as an indicator of mental (ill-) health and wellbeing. Depression is a major mental condition that is amenable to intervention. Of all psychiatric disorders, depression is responsible for the highest disease burden in DALYs in the WHO European region (81).

Morbidity

Self-reported depression prevalence varies considerably among EU Member States

In the European countries participating in the first wave of EHIS, the percentage of people who reported having depression in the past 12 months varied from 0.8% in Bulgaria and Romania to 5.6% in Belgium. In all countries, self-reported prevalence is higher among women (see Table D-12 in appendix D). Health interview survey-based data might result in an underestimation of depression prevalence, because many people with depressive symptoms do not seek professional help and they are therefore not diagnosed with depression. See appendix C for more information on the comparability and the quality of the data used in this chapter.

Prevalence of depression in epidemiological studies reveals cross-national variation

Epidemiological surveys using more comprehensive measurement instruments tend to find higher prevalence estimates than health interview surveys. In a meta-analysis of epidemiological surveys by Wittchen and Jacobi (2011), the rates of the prevalence of major depression in the past 12 months ranged from 1.0 to 10.1%. The authors estimated that on average 6.9% of EU citizens (corresponding to 30.3 million people) aged 14 and over have

suffered from depression in the last 12 months. The studies included in the analyses used quite different designs and methods, which hamper the cross-country comparability of their outcomes (82). The ESEMeD study (European Survey of the Epidemiology of Mental Disorders) in six European countries, however, is one of the few multi-site surveys using standardised mental health instruments (the Composite International Diagnostic Interview, CIDI) that are currently available. This survey also revealed notable cross-national variation in the prevalence of depression/mood disorders. The percentage of the population with mood disorders in the previous 12 months was lowest in Germany (3.6%) and the highest in France (8.5%) (83).

Depression is more prevalent among people aged 45 years and over

Figure 3-26 shows that the average depression prevalence for EU countries participating in EHIS is higher among people aged 45 years or more compared to young people. This is the case in almost all countries participating in EHIS (see Table D-12 in appendix D). However, the increased prevalence for higher age groups is less pronounced for men than for women and also less pronounced than for diabetes and COPD (see paragraph 3.3.1.1 and 3.3.1.4). In some countries, the prevalence of depression also increased after the age of 45, in other countries, the prevalence remained rather stable (see Figure 3-27).

Figure 3-26: Average self-reported depression prevalence by age for 14 EU countries participating in EHIS in 2008 (source: EHIS first wave, Eurostat 2012, data processed by RIVM).

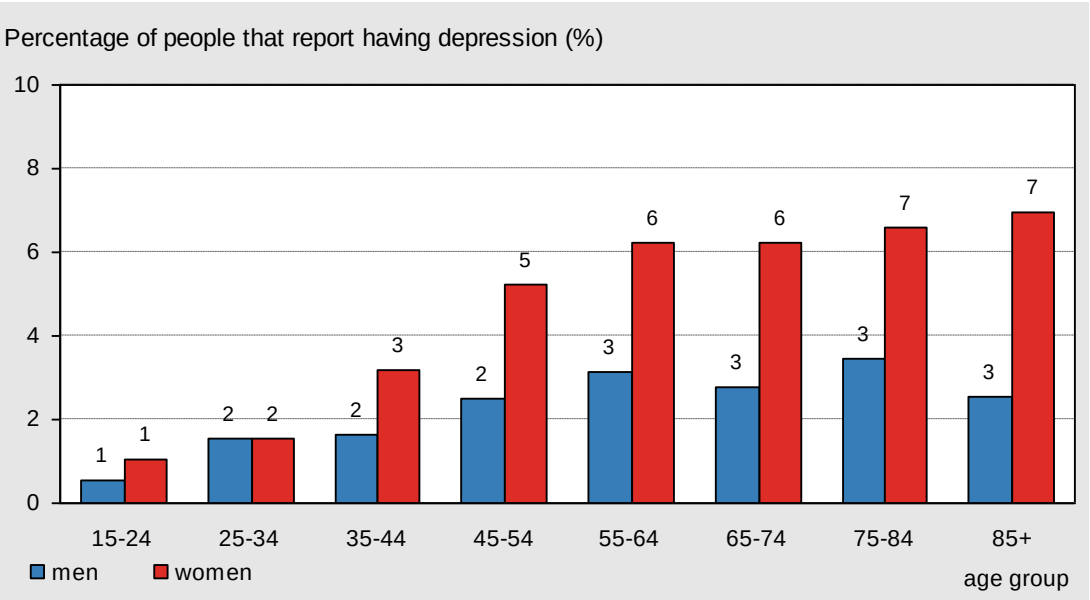
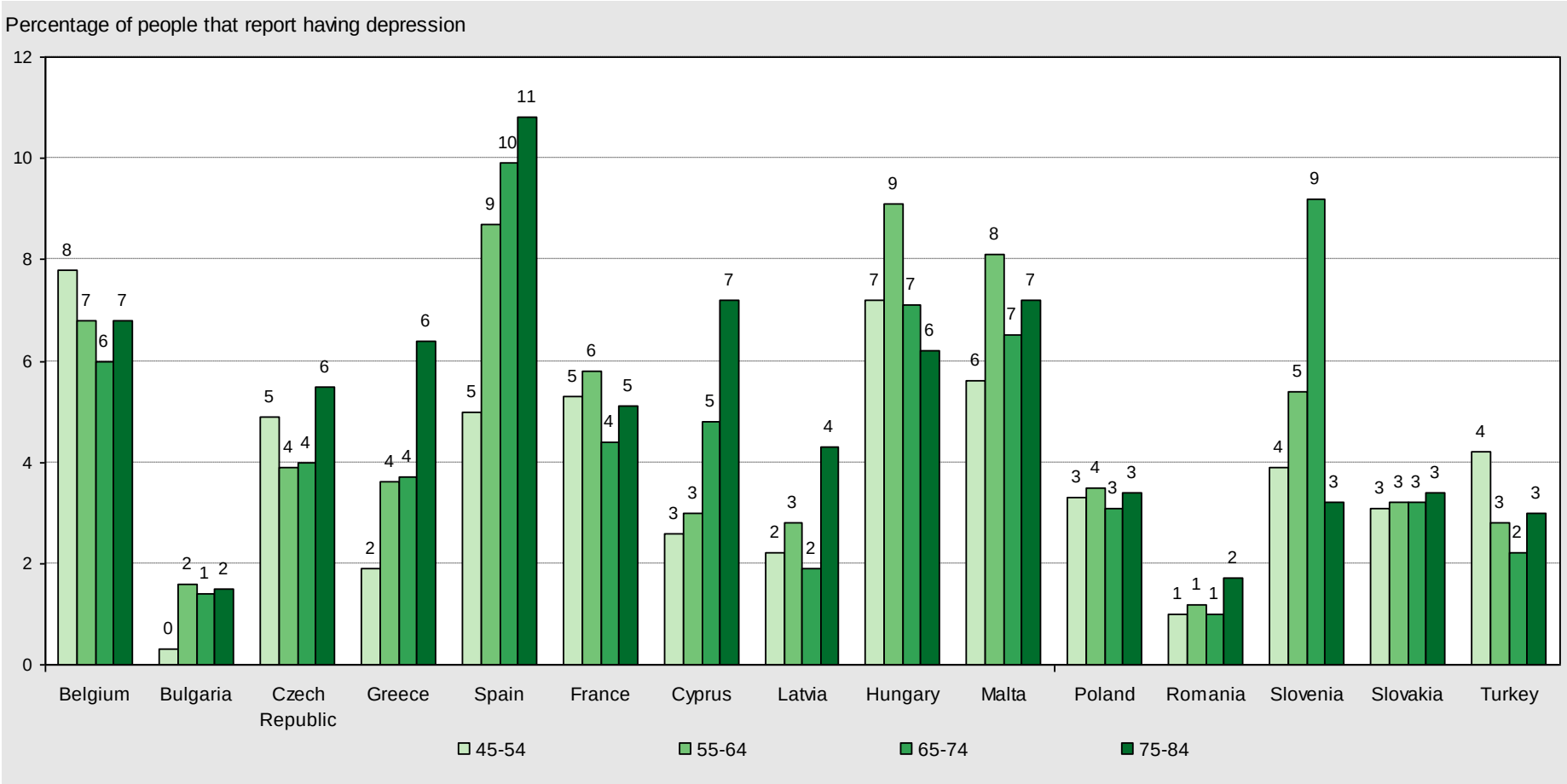


Figure 3-27: Percentage of people who reported having depression by age groups (45-54, 55-64, 65-74, 75-84) in various European countries in 2008 (source: EHIS first wave, Eurostat 2012).



An estimated five million EU citizens aged 55-74 report having depression

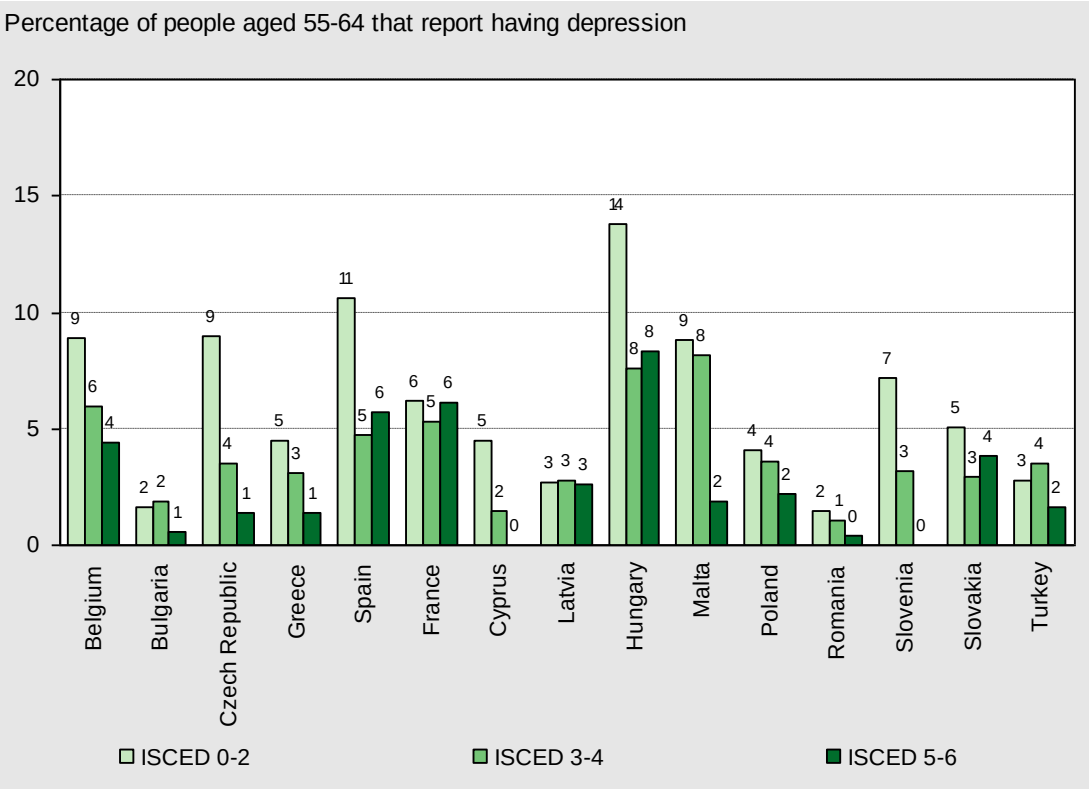
In the 55-64 age group, the percentage of people who reported having depression varies from 1.2% in Romania to 9.1% in Hungary (see Figure 3-27), with an unweighted average of 4.8% for the 14 EU countries that provided data. Based on this range, the total number of people aged 55-64 with depression in the EU can be estimated at between 0.7 and 5.5 million, with an average of 2.9 million. According to the review of epidemiological studies by Wittchen and Jacobi (2005), 11.3% (range 9-14.1%) of women aged 50-65 and 4.8% (range 0.3-7.1%) of men aged 50-65 suffered from depression in the last 12 months (84).

In the age group 65-74, the percentage of people who reported having depression varies from 1.0% in Romania to 9.9% in Spain (see Figure 3-27), with an unweighted average of 5% for the 14 EU countries that provided data. Based on this range, the total number of people aged 65-74 with depression in the EU can be estimated at between 0.5 and 4.6 million with an average of 2.3 million.

Depression prevalence higher among lower educated people

Mental ill health tends to be more prevalent in lower socio-economic groups (66). Figure 3-28 shows that in the majority of countries participating in EHIS, the percentage of people who report having depression is higher among people aged 55-64 with a lower educational level. The same is true for people aged 65-74 (figure not shown). In addition, the prevalence rates of depressive symptoms are significantly higher for immigrant and ethnic minority groups in about a quarter of the European countries (85).

Figure 3-28: Percentage of people aged 55-64 who reported having depression in various European countries by educational level[a] in 2008 (source: EHIS first wave, Eurostat 2012).



[a] ISCED 0 = Pre-primary education; ISCED 1 = Primary education or first stage of basic education; ISCED 2 = Lower secondary or second stage of basic education; ISCED 3 = Upper secondary education; ISCED 4 = Post-secondary non-tertiary education; ISCED 5 = First stage of tertiary education not leading directly to an advanced research qualification; ISCED 6 = Second stage of tertiary education leading to an advanced research qualification.

3.3.1.6 Neurodegenerative diseases

Introduction

Neurodegenerative diseases are characterised by progressive nervous system dysfunction. They include many different disorders that are often associated with atrophy of the affected central or peripheral structures of the nervous system. This section, however, is limited to dementia (Alzheimer's Disease), Parkinson's disease and multiple sclerosis, because these are the neurodegenerative disorders that are responsible for the highest disease burden in DALYs in the WHO European region (86).

Morbidity

Lack of comparable data on neurodegenerative diseases

Routinely updated and comparable sources of Europe-wide data on the prevalence of neurodegenerative diseases, such as dementia, Parkinson's disease and multiple sclerosis are quite scarce. Some information is available from epidemiological studies, but their comparability is limited.

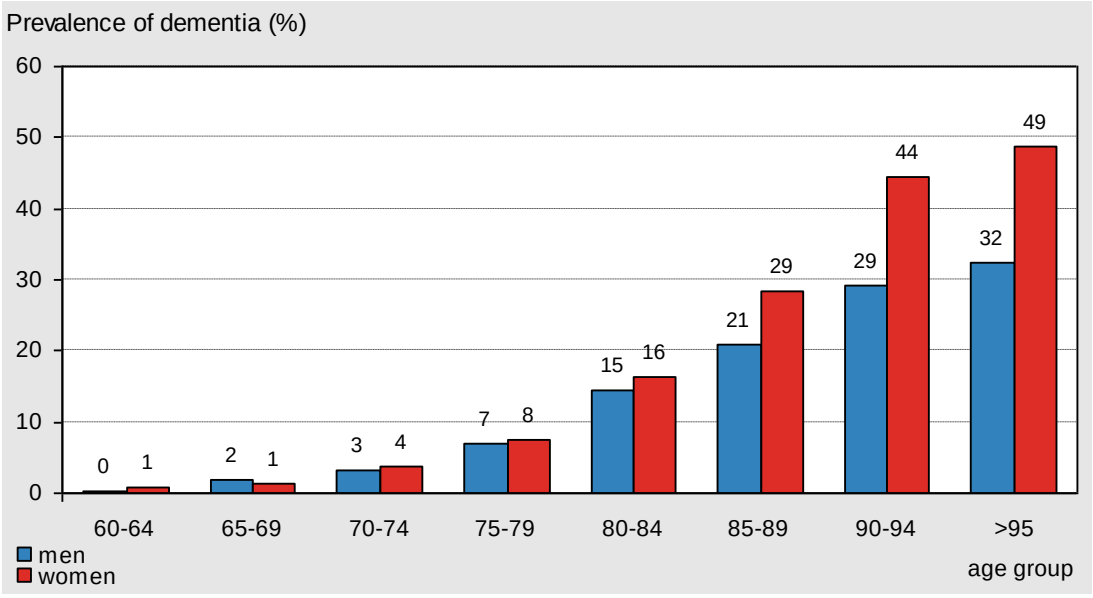
About 1.2% of people suffer from dementia

On average, about 1.2% of EU citizens have dementia. Based on this percentage, Alzheimer Europe estimates that 5.5-6.1 million citizens in the EU27 have dementia (87) (see Table D-13 in appendix D). Prevalence estimates in EU countries vary from approximately 0.8% in Slovakia, Malta and Ireland to approximately 1.5 % in Italy and Sweden. This variation is due to differences in the age-distribution of the population. Countries that are ageing more rapidly have a higher prevalence of dementia. See Table D-13 in appendix D for country-specific prevalence estimates.

Few people younger than 70 have dementia

The prevalence of dementia is higher in women and increases with age. More than 40% of women and 30% of men who are 90 years and older have dementia. However, under the age of 70 very few people have dementia (less than 2%) (88, 89) (see Figure 3-29). Therefore, changes in the retirement age in Europe will not significantly increase the number of people of working age that suffer from dementia.

Figure 3-29: Prevalence (%) of dementia by sex and age (source: Alzheimer Europe, 2009).



Incidence and prevalence of Parkinson's disease increases with age

Three reviews concluded that the incidence and prevalence of Parkinson's disease increases with age (90-92). Von Campenhausen et al. (2005) performed a systematic literature search to identify studies on the prevalence and incidence of Parkinson's disease in Austria, the Czech Republic, France, Germany, Italy, the Netherlands, Portugal, Spain, Sweden and the United Kingdom. Crude prevalence rate estimates ranged from 65.6 per 100,000 to 12,500 per 100,000 (0.07% to 12.5%) and annual incidence estimates ranged from 5 per 100,000 to 346 per 100,000. In the age groups 50-59 and 60-70, prevalence rates also varied considerably. For people aged 50-59, the prevalence ranged from 38 per 100,000 (0.04%) in one Italian study to 216 per 100,000 (0.22%) in a second Italian study. For people aged 60-69, the prevalence ranged from approximately 250 per 100,000 (0.25%) in a study in the United Kingdom to approximately 630 per 100,000 (0.63%) in a Spanish study. The authors concluded that the observed variations among the studies may be a result of environmental or genetic factors, but it might also be a consequence of differences in the methodologies or the age distributions of the study populations. The comparability of existing studies is limited. Muangpaisan et al. (2011) and Wirdefeldt et al. (2011) drew the same conclusions (90-92).

The prevalence of multiple sclerosis is higher in northern European countries

In a review of epidemiological studies, Pugliatti et al. (2006) estimated the prevalence rate of multiple sclerosis in Europe at 83 per 100,000 (0.08%). The estimated European mean annual incidence rate is 4.3 cases per 100,000. Prevalence rates are higher in northern countries and the female to male ratio is approximately 2.0. The highest prevalence rates were estimated for the 35-64 age group for both sexes and for all countries. The higher rates in northern countries can be ascribed to a better degree of disease ascertainment, but differences in environmental exposures or genetic susceptibility cannot be ruled out (93-95).

3.3.2 Generic and summary health measures

3.3.2.1 Healthy Life Years

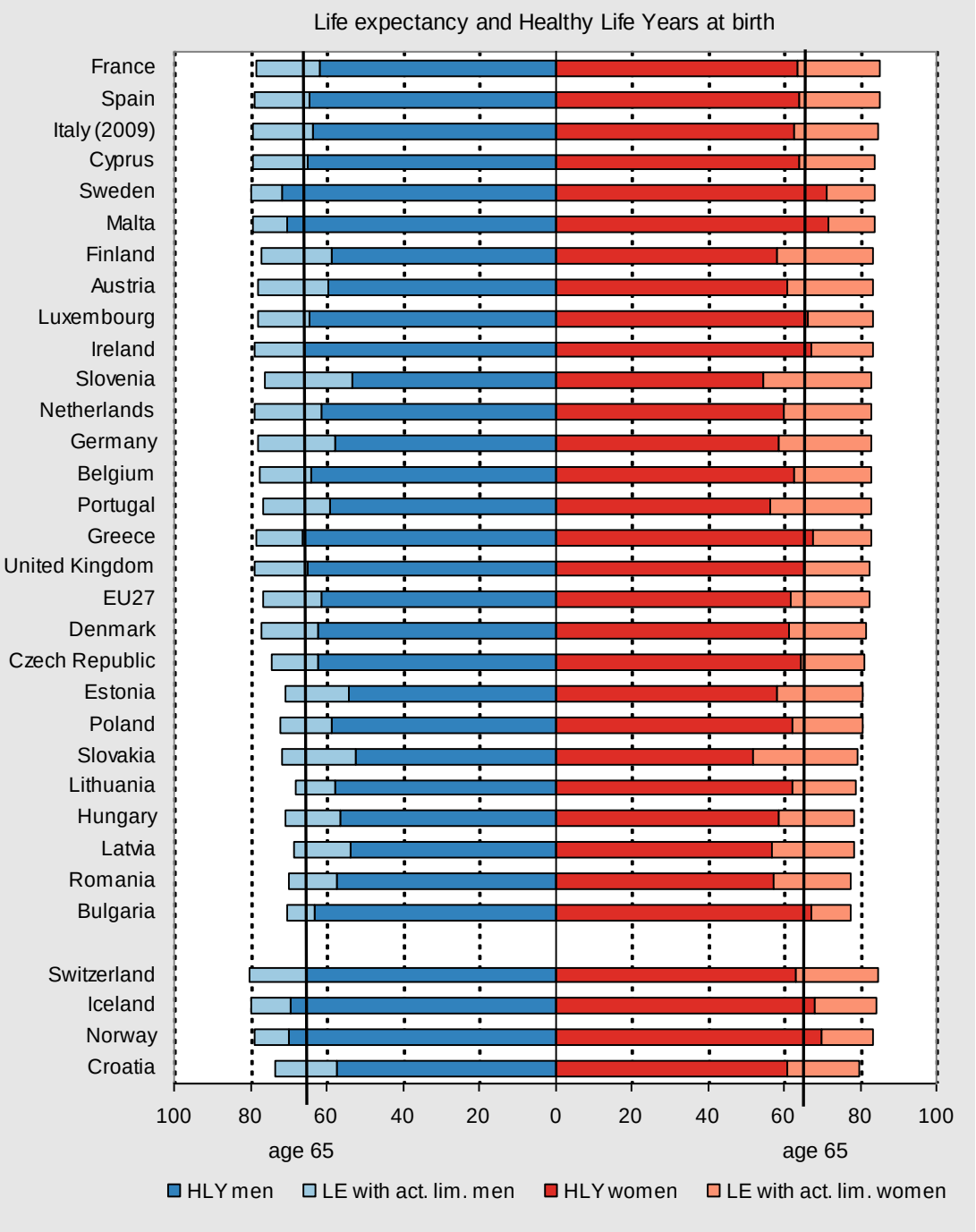
EU target: increase healthy life years by two years by 2020

The Healthy Life Years (HLY) indicator (also called disability-free life expectancy) measures the number of remaining years that a person of a certain age is expected to live without activity limitations. The emphasis of HLY is not exclusively on the length of life, as for life expectancy, but also on the quality of life. HLY is a solid indicator to monitor national health status in its quality as a productivity/economic factor. It is an important European policy indicator and was selected as part of the Lisbon Strategy (2000-2010) to assess the quality of life and functional health status of Europeans. In the European Innovation Partnership on Active and Healthy Ageing, the EU set an overarching target to increase the average number of HLYs in the European Union by two years by 2020.

Considerable variation in HLYs among European Union countries

Men born in the EU in 2009 can expect to live 61.3 years on average without activity limitations (HLY). Women born in 2009 can expect to live 62.0 years on average without activity limitations (see Figure 3-30). There is considerable variation among countries. Swedish men have the most HLY (71.7 years), while men in the Slovak Republic have the least (52.3 years). Malta has the highest HLY (71.6 years) for women and the Slovak Republic the lowest (52.1 years). For both sexes, the gap between the country with the highest and the lowest HLY is almost 20 years. In addition, there are few EU countries (Sweden, Malta, Ireland, Greece, Bulgaria) where people can expect to reach the age of 65 (the retirement age in most countries, see paragraph 4.3.1) without activity limitations. See appendix C for more information on the comparability and the quality of the data used in this chapter.

Figure 3-30: Life expectancy and Healthy Life Years at birth in various European countries by sex (source: EU-SILC 2010, Eurostat 2012).



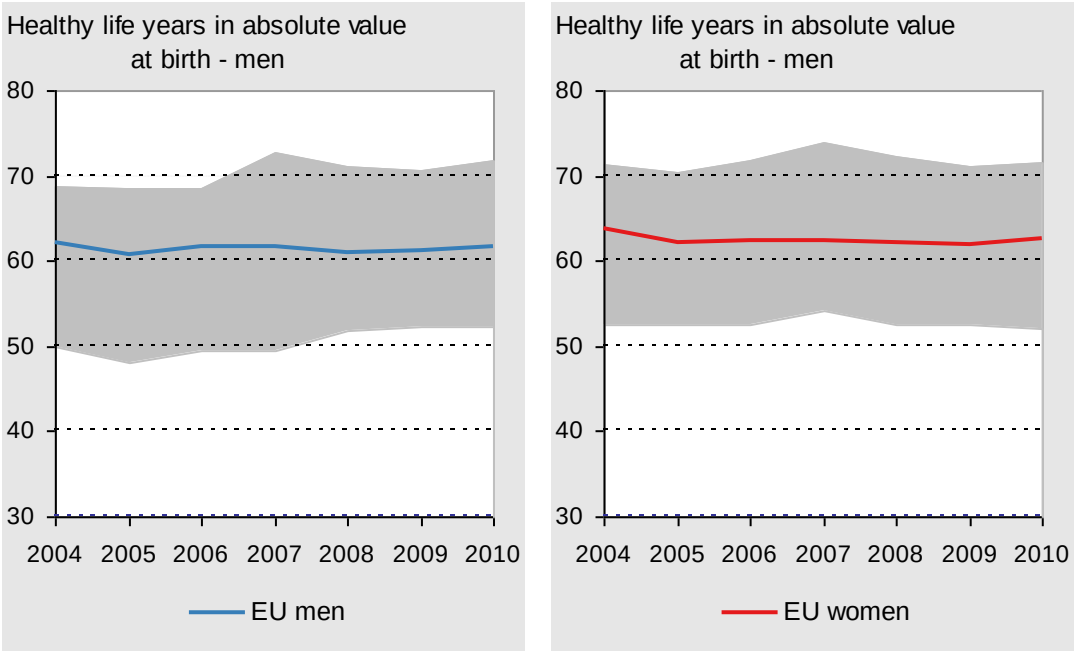
Compared to men, women live more years with activity limitations

Women live longer than men, but they also live more years with activity limitations than men. The number of HLYs of European men and women is about the same; the gap in HLYs between men and women is less than one year (see Figure 3-30). Since the HLYs are about the same for men and women, the main reason for women living more years with activity limitations is that women live six years longer than men on average (2). The average HLYs for EU men, 61.3 years, represents 80% of their life expectancy at birth, which is 76.7 years. The average HLYs for EU women, 62 years, represents 75% of their life expectancy at birth, which is 82.6 years. The gap between life expectancy and HLYs - the percentage of life that is healthy - also varies considerably among countries (see Figure 3-30).

By increasing the retirement age less people will reach their retirement free of disability

Although trends vary among EU countries and no long time series are available at the moment, the average number of HLYs for the EU has remained rather stable between 2005 and 2010 (see Figure 3-31). Therefore, an increase in the retirement age in European countries will probably mean that more people in Europe will not reach retirement age free of activity limitations. Since activity limitations are more prevalent among people with a lower educational level (source: Eurostat 2012 based on SILC 2010), this will particularly affect people in the lower socio-economic classes who also have a lower life-expectancy (66). On the other hand, higher educated persons live longer in good health before retirement and can expect to live longer after retiring (96).

Figure 3-31: Trends in Healthy Life Years at birth, for men and women, 2004-2010[a] (source: EU-SILC 2010, Eurostat 2012).



[a] Grey area reflects the range for the EU27 countries and Iceland, Norway, and Switzerland.

3.3.2.2 Self-perceived health

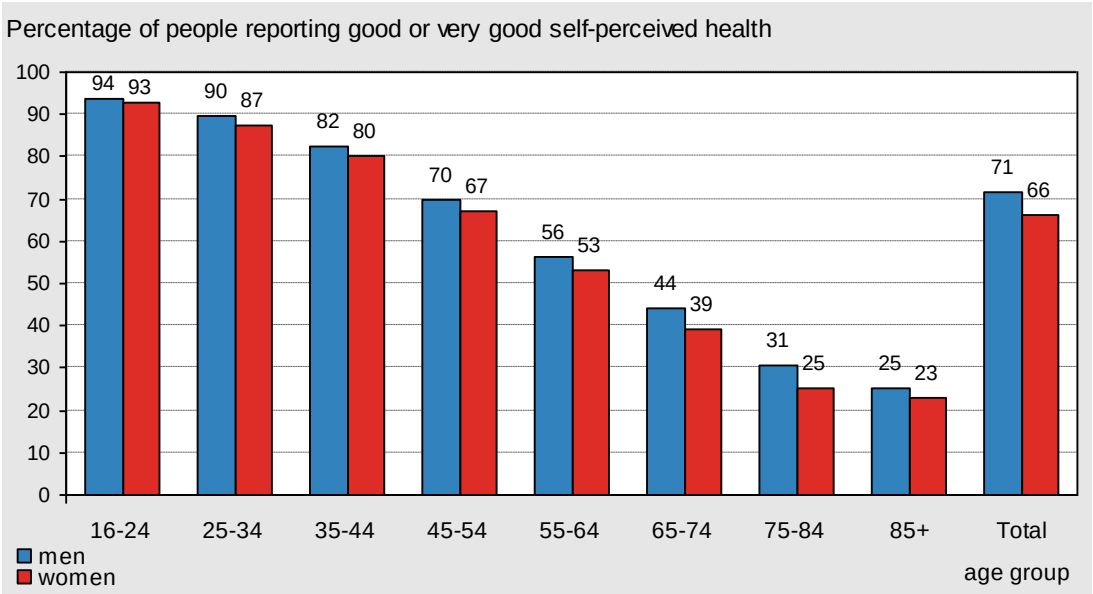
Two out of three EU citizens perceive their health as good or very good

Two out of three EU citizens report to that they perceive their health as good or very good. Women (66%) less often report a good or very good health than men (71%) (see Figure 3-32). The percentage of people who report having good or very good health varies considerably among EU Member States from 49% in Latvia to 84% in Ireland. See Table D-14 in appendix D for country-specific data by sex and age. See appendix C for more information on the comparability and the quality of the data used in this chapter.

The percentage of people who report having good or very good health decreases with age

The percentage of people who perceive their health as good or very good decreases with age. Among 55-64 year olds, approximately 55% report having good or very good health and 43% of 65-74 years olds do so (see Figure 3-32). Also, there is considerable variation among EU Member States in these age groups (see Figure 3-34 and 3-35). See Table D-14 in appendix D for country-specific data by sex and age.

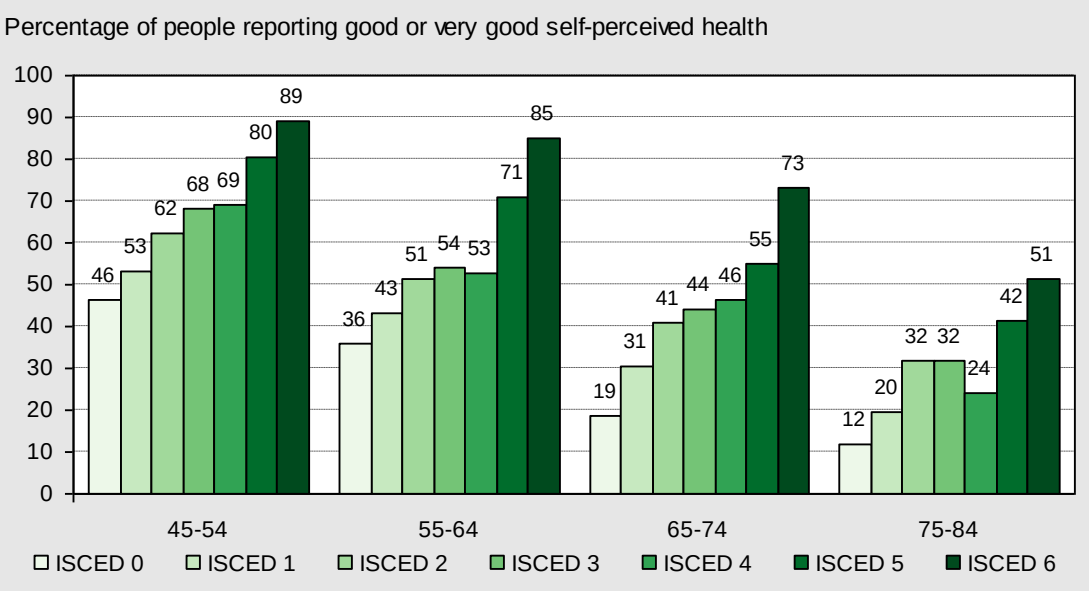
Figure 3-32: Percentage of people in the EU who report perceiving their health as good or very good in 2010 by sex and age (source: EU-SILC 2010, Eurostat 2012).



Percentage of people who perceive their health as good is lower among people with a lower educational level

People with a lower socio-economic status do not rate their health as positively as people with higher socio-economic status. The magnitude of inequalities in self-rated health also varies substantially among countries (97). In the EU SILC survey, the percentage of people who reported that they perceive their health as good or very good is lower among people with a lower educational level. This is true for almost all countries participating in EU-SILC and across age groups (see Figure 3-33). In addition, most migrants and ethnic minority groups have a lower self-perceived health compared to the majority population after controlling for socio-economic factors (98).

Figure 3-33: Percentage of people in the EU who report perceiving their health as good or very good in 2010 by age and education[a] (source: EU-SILC 2010, Eurostat 2012).

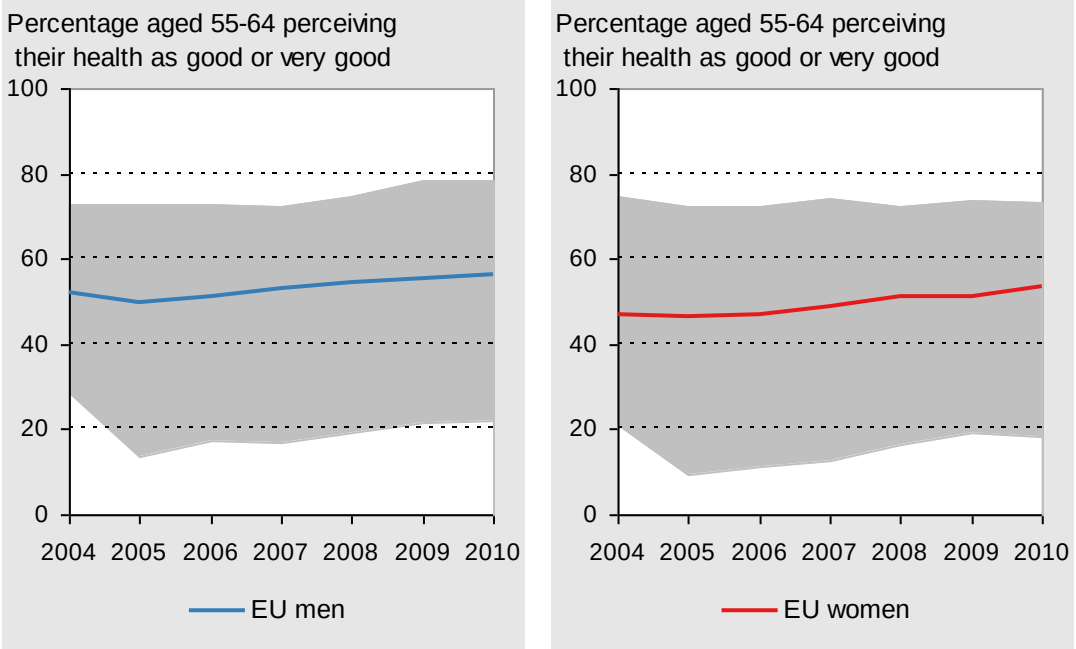


[a] ISCED 0 = Pre-primary education; ISCED 1 = Primary education or first stage of basic education; ISCED 2 = Lower secondary or second stage of basic education; ISCED 3 = Upper secondary education; ISCED 4 = Post-secondary non-tertiary education; ISCED 5 = First stage of tertiary education not leading directly to an advanced research qualification; ISCED 6 = Second stage of tertiary education leading to an advanced research qualification.

Percentage of people who perceive their health as good or very good increases slightly

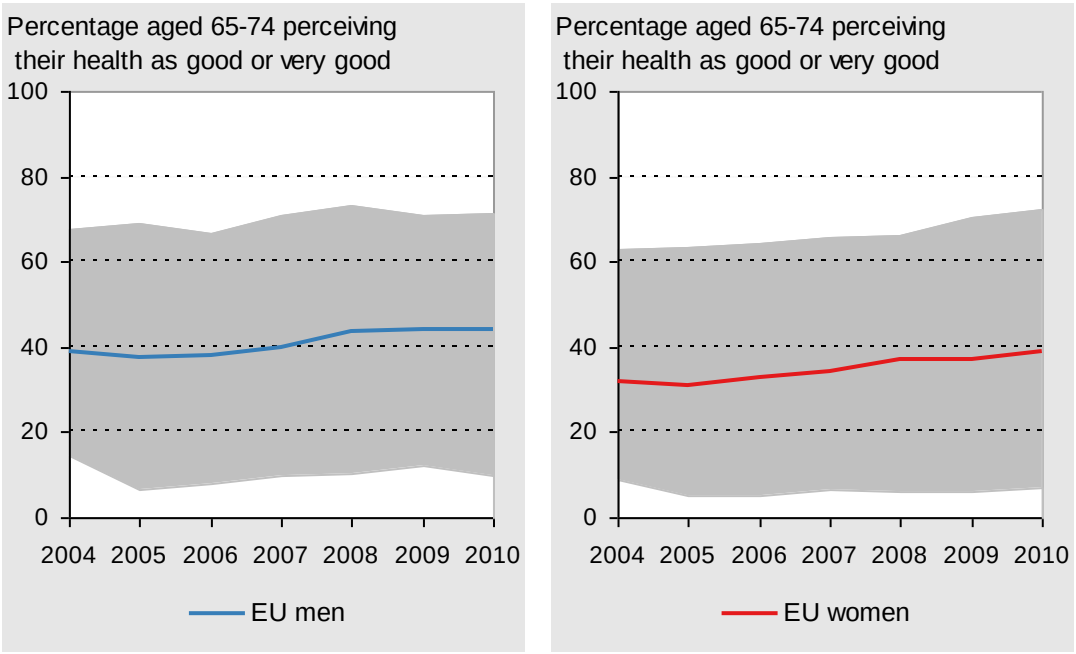
The percentage of people aged 55-64 and 65-74 who report that they perceive their health as good or very good increased slightly between 2004 and 2010. This is true for both sexes (see Figure 3-34 and 3-35).

Figure 3-34: Trends in the percentage of people aged 55-64 years in the EU who report perceiving their health as good or very good in 2004-2010 by sex[a] (source: EU-SILC 2010, Eurostat 2012).



[a] Grey area reflects the range for the EU27 countries and Iceland, Norway, Switzerland, Croatia and Turkey.

Figure 3-35: Trends in the percentage of people aged 65-74 years in the EU who report perceiving their health as good or very good in 2004-2010 by sex[a] (source: EU-SILC 2010, Eurostat 2012).



[a] Grey area reflects the range for the EU27 countries and Iceland, Norway, Switzerland, Croatia and Turkey.

3.3.2.3 Self-reported chronic morbidity

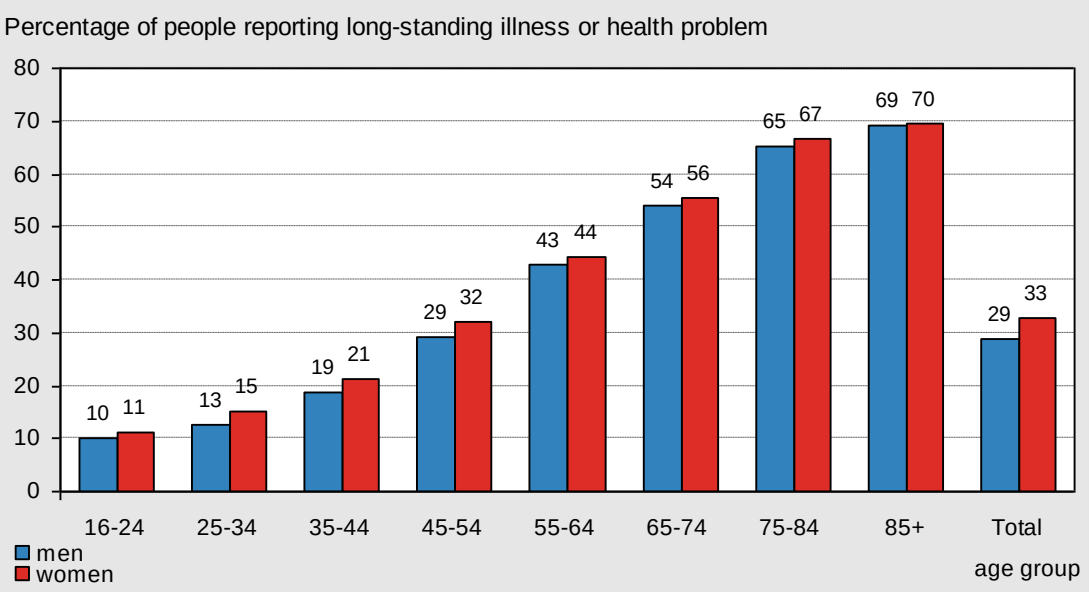
Almost one-third of EU citizens report having a chronic illness or health problem

Almost one-third of EU citizens report having a long-standing illness or health problem. Women (33%) report a chronic illness more often than men (29%) do (see Figure 3-36). The percentage of people who report having a long-standing illness varies considerably among EU Member States from 18.9% in Bulgaria to 44.4% in Finland. See Table D-15 in appendix D for country-specific data by sex and age. See appendix C for more information on the comparability and the quality of the data used in this chapter.

The prevalence of self-reported chronic morbidity increases with age

The prevalence of self-reported chronic morbidity increases with age. Among 55-64 year olds, 44% report having a chronic illness and among 65-74 year olds, 55% do so (see Figure 3-36). In these age groups, there is also considerable variation among EU Member States (see Figure 3-38 and 3-39). See Table D-15 in appendix D for country-specific data by sex and age.

Figure 3-36: Percentage of people in the EU who report having a long-standing illness or health problem in 2010 by sex and age (source: EU-SILC 2010, Eurostat 2012).



52 million EU citizens aged 55-74 report having a long-standing illness or health problem

In the age group 55-64, the percentage of people who report having a long-standing illness or health problem varies from 26.0% in Italy to 61.5% in Estonia with an EU average of 43.7%.

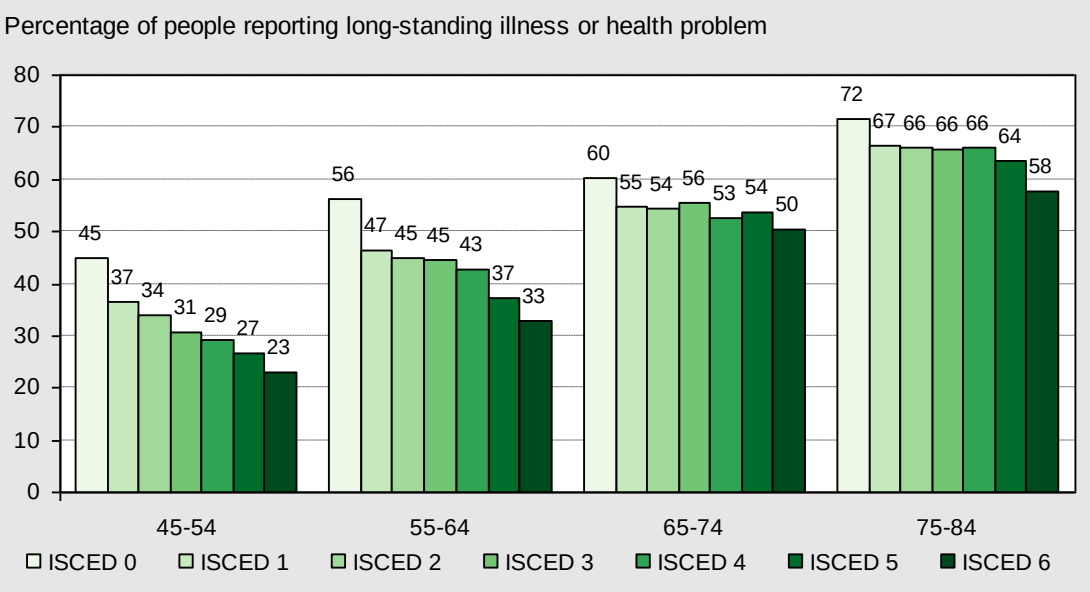
This means that 26.6 million EU citizens between 55-64 report having a long-standing illness or health problem.

In the age group 65-74, the percentage of people who report having a long-standing illness or health problem varies from 37.5% in Denmark to 79.9% in Estonia with an EU average of 54.8%. This EU average corresponds to 25.2 million persons aged 65-74 with a long-standing illness or health problem.

Prevalence of long-standing illness or health problem is higher among lower educated people

The percentage of people who report having a long-standing illness or health problem is higher among people with a lower educational level. This is true for almost all countries participating in EU-SILC and across age groups (see Figure 3-37).

Figure 3-37: Percentage of people in the EU who report having a long-standing illness or health problem in 2010 by age and education[a] (source: EU-SILC 2010, Eurostat 2012).

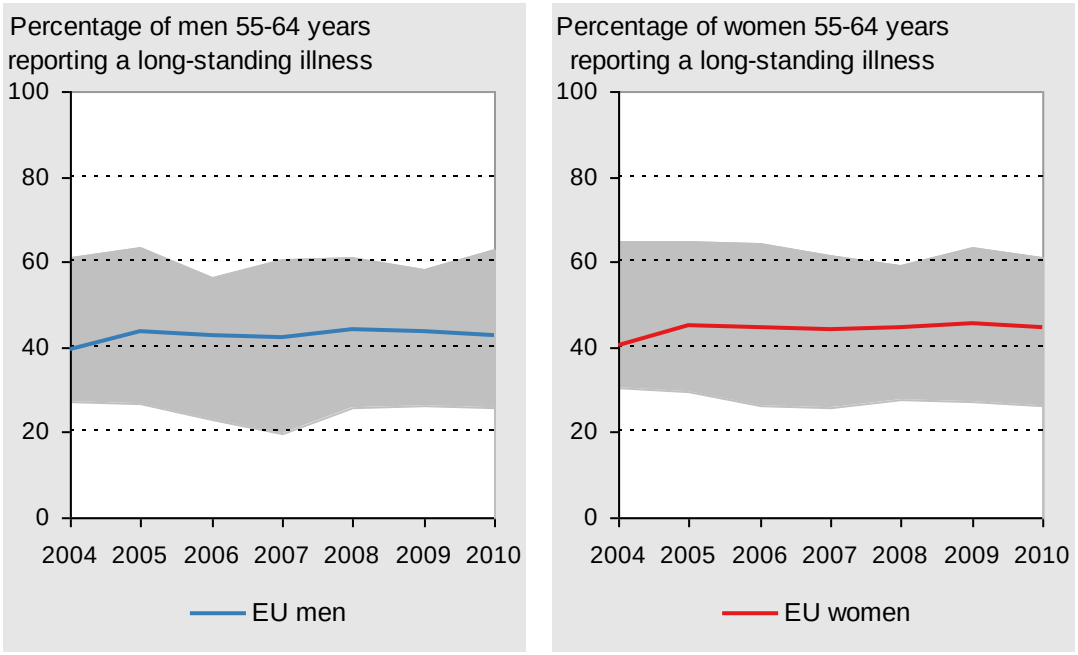


[a] ISCED 0 = Pre-primary education; ISCED 1 = Primary education or first stage of basic education; ISCED 2 = Lower secondary or second stage of basic education; ISCED 3 = Upper secondary education; ISCED 4 = Post-secondary non-tertiary education; ISCED 5 = First stage of tertiary education not leading directly to an advanced research qualification; ISCED 6 = Second stage of tertiary education leading to an advanced research qualification.

Percentage of people who report having a long-standing illness or health problem remains rather stable

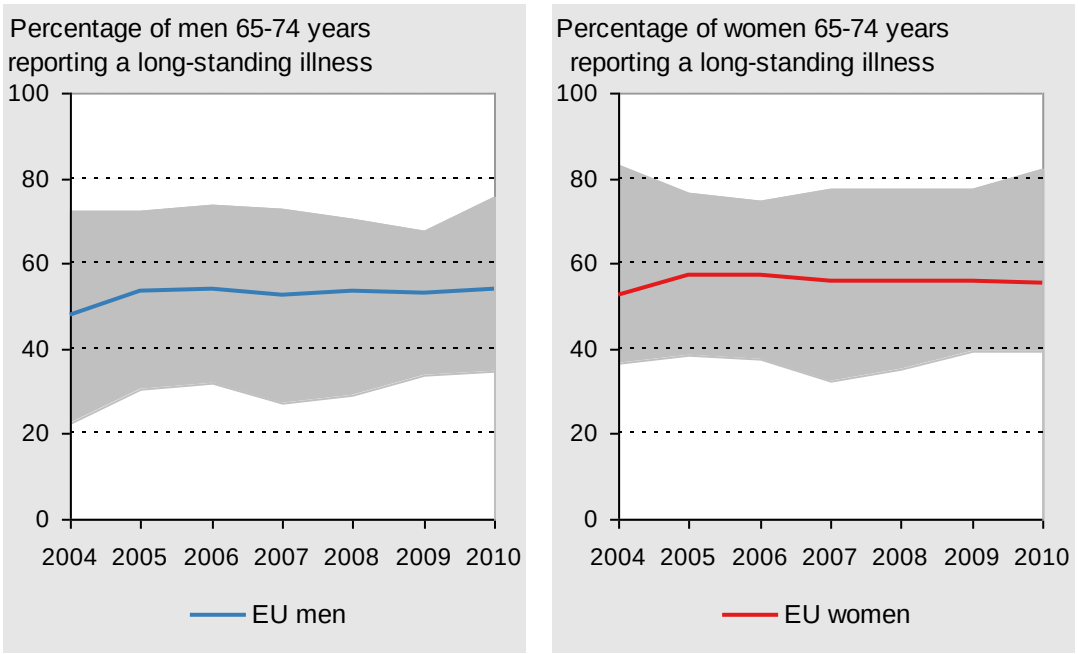
Between 2004 and 2010, the percentage of people who reported having a long-standing illness or health problem remained rather stable in the age groups 55-64 and 65-74 and for both sexes (see Figure 3-38 and 3-39).

Figure 3-38: Trends in the percentage of people aged 55-64 years in the EU who reported having a long-standing illness or health problem in 2004-2010 by sex[a] (source: EU-SILC 2010, Eurostat 2012).



[a] Grey area reflects the range for the EU27 countries and Iceland, Norway, Switzerland, Croatia and Turkey.

Figure 3-39: Trends in the percentage of people aged 65-74 years in the EU who reported having a long-standing illness or health problem in 2004-2010 by sex[a] (source: EU-SILC 2010, Eurostat 2012).



[a] Grey area reflects the range for the EU27 countries and Iceland, Norway, Switzerland, Croatia and Turkey.

3.3.2.4 Disease burden in DALYs

Disability Adjusted Life Years (DALYs) are a combination of years of life lost due to premature mortality and years of life lost because of a decreased quality of life caused by disease. DALYs make it possible to estimate the contribution of various health problems, including chronic diseases, to the overall disease burden in a given population.

WHO has estimated DALYs for all major diseases for EU countries in 2004 in their Global Burden of Disease study (86)[13]. WHO uses a category of NCDs (non-communicable diseases) that includes several groups of diseases. Among these, we identify 'the big four', i.e. cancers, diabetes, cardiovascular diseases and respiratory disease (COPD + asthma), in addition to a group of neuropsychiatric conditions including e.g. depression and Alzheimer's disease, as well as a group of other chronic diseases including visual and auditory handicaps, musculoskeletal diseases and chronic liver disease. It should be noted that the terms chronic disease and NCD are not identical. NCDs also include conditions that are not considered chronic (i.e. acute conditions), while chronic diseases may also include selected communicable diseases such as HIV/AIDS (86).

Percentage of disease burden due to chronic diseases is increasing

Between 2008 and 2030, the percentage of disease burden due to non-communicable diseases in the WHO European Region is projected to increase from 78 to 84%, with the percentage due to cardiovascular disease decreasing slightly and the percentage due to neuropsychiatric conditions and malignant neoplasm increasing (source: WHO-GBD 2004, see Figure 2-2 in Chapter 2 Background and policy context).

Non-communicable diseases are responsible for 82% of the total disease burden in the European Union

Table 3-2 shows that all NCDs, as defined by WHO, in 2004 comprise on average 81.6 % of the total disease burden in DALYs from all diseases in the 27 countries of the EU, with a range between 71.1 and 87.6% in individual EU Member States. The 'big four' make up

[13] The Institute for Health Metrics and Evaluation published new data from the GBD 2010 study on 14 December 2012. This provides regional estimates of deaths and DALYs (using a new method for calculation of DALYs) for the years 1990, 2005 and 2010. This will contribute to revisions for WHO global health estimates in 2013. New data visualisations from the IHME are available on: http://www.healthmetricsandevaluation.org/gbd/visualizations/regional

35.3% of all DALYs on average, with a range between 28.6 and 44%. Neuropsychiatric conditions make up between 20.0 and 35.6% of all DALYs, which is not much less than the 'big four'. The remaining set of 'other' NCDs (especially sense organ, musculoskeletal and digestive diseases) accounts for between 16.8 and 27.3% of all DALYs. Many of the diseases included in the neuropsychiatric and 'other' NCD groups are chronic as well.

Relative importance of chronic diseases varies considerably among EU countries

Among the diseases that make up the 'big four', it is clear that their relative importance of contributing to the total burden of disease varies considerably among the EU Member States. The range of percent of all DALYs is as follows: cancers 7.4-15.9%, diabetes 1.3-4.8%, cardiovascular disease 8.6-29.4% and respiratory disease 1.6-9.9% (see Table 3-2).

Table 3-2: Average, minimal and maximal contribution of disease groups to all DALYs in the EU27 in 2004 (source: WHO-GBD 2004, data processed by RIVM).

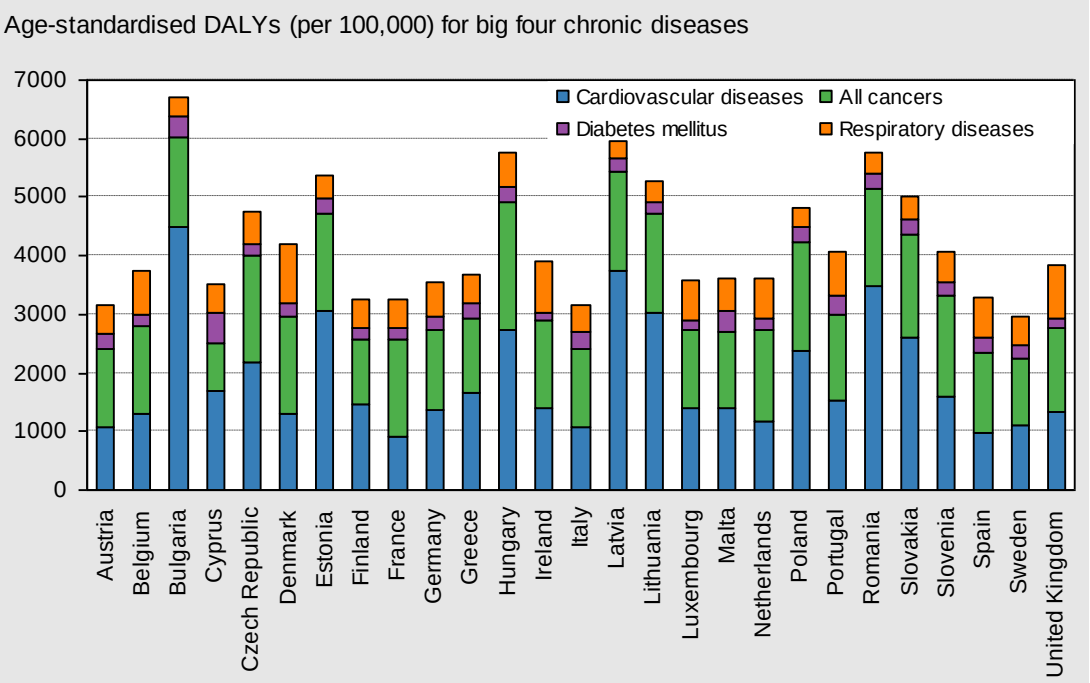
	Average % of all DALYs in EU27	Min % of all DALYs	Max % of all DALYs
All DALYs #	100	100	100
All NCDs *	81.6	71.1	87.6
*Big Four ** *	*35.3*	*28.6*	*44.0*
Cancers	12.6	7.4	15.9
Diabetes mellitus	2.1	1.3	4.8
Cardiovascular diseases	16.0	8.6	29.4
Respiratory diseases	4.7	1.6	9.0
Neuropsychiatric conditions	*26.5*	*20.0*	*35.6*
*Other NCDs ****	*19.8*	*16.8*	*27.3*
Injuries	11.5	6.3	20.8
Infectious & parasitic conditions	2.1	1.1	4.1
All other diseases	4.8	3.3	8.6

DALYs = Disability Adjusted Life Years (age standardised for men plus women combined)
* All NCDs = big four ** + Mental health (Neuropsychiatric diseases) + Other NCDs ***
** Big four = Cancers + Diabetes + Cardiovascular diseases + Respiratory Diseases
*** Other NCDs = Musculoskeletal diseases + Sense organ diseases (hearing and visual loss) + Digestive diseases (chronic liver diseases) and others

Disease burden in DALYs for the 'big four' chronic diseases varies considerably among EU Member States

The number of DALYs per 100,000 persons for the 'big four' chronic diseases varies considerably among EU Member States. Figure 3-40 gives the DALY estimates for men plus women for the 27 EU Member States for the year 2004. Many of the EU countries that joined the EU in or after 2004 have high DALY rates for cardiovascular diseases. DALY rates for cancer are high in those countries as well, but the differences with some 'old' EU countries, i.e. France, Denmark, Netherlands are relatively small. DALY rates for respiratory diseases are relatively high for the UK, Ireland, Denmark, Luxembourg, Portugal and Spain.

Figure 3-40: Disease burden in DALYs for 'big four' chronic disease in EU27 countries, all ages in 2004 (source: WHO-GBD 2004).



Disease burden due to the 'big four' chronic diseases varies considerably among men in EU countries

Although the major burden of the 'big four' chronic diseases is in elderly Europeans, there is still a significant disease burden occurring in the younger and working-age groups, i.e. 15 to 60-year-olds for both men and women (see also Figure 3-43).

Figure 3-41 shows the burden of the 'big four' chronic diseases among men aged 15-60 in the 27 EU countries and the high variability (about threefold) among Member States. The burden of cardiovascular diseases is the most important of the four. The burden of cancer is nearly always second in importance for European men, but nearly equals the burden of

cardiovascular disease in the countries where the total disease burden in men caused by the big four is the smallest.

Figure 3-41: Disease burden in DALYs for the 'big four' chronic diseases in the EU27 countries, men 15-60 years in 2004 (source: WHO-GBD 2004, data processed by RIVM).

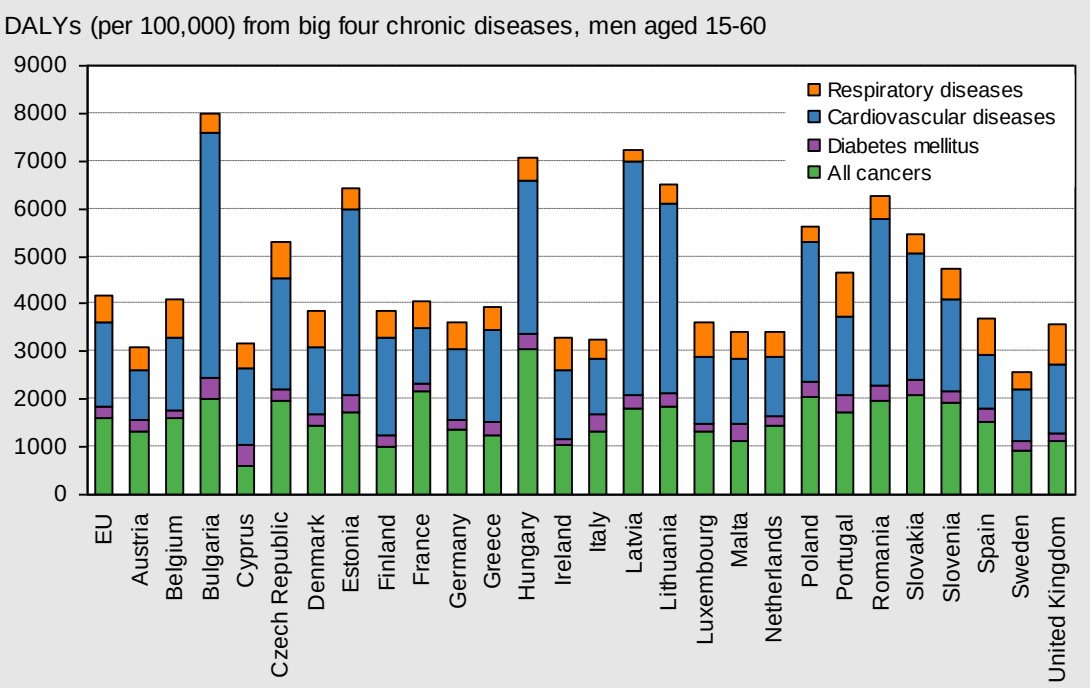
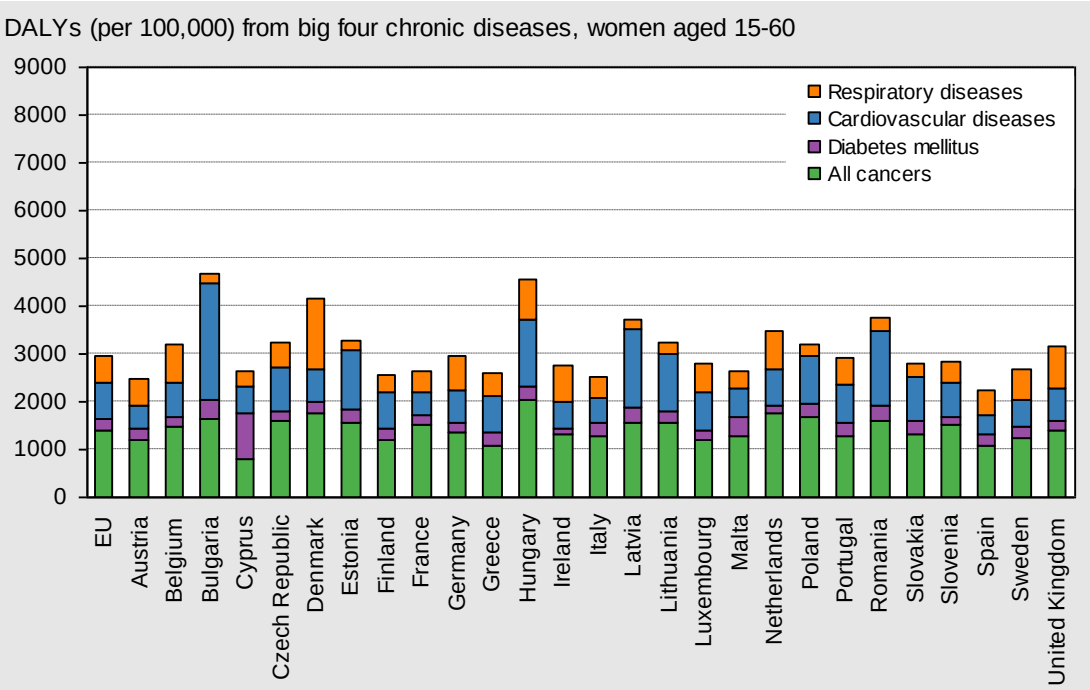


Figure 3-42: Disease burden in DALYs for the 'big four' chronic diseases in the EU27 countries, women 15-60 years in 2004 (source: WHO-GBD 2004, data processed by RIVM).



Less variation in disease burden for women than for men

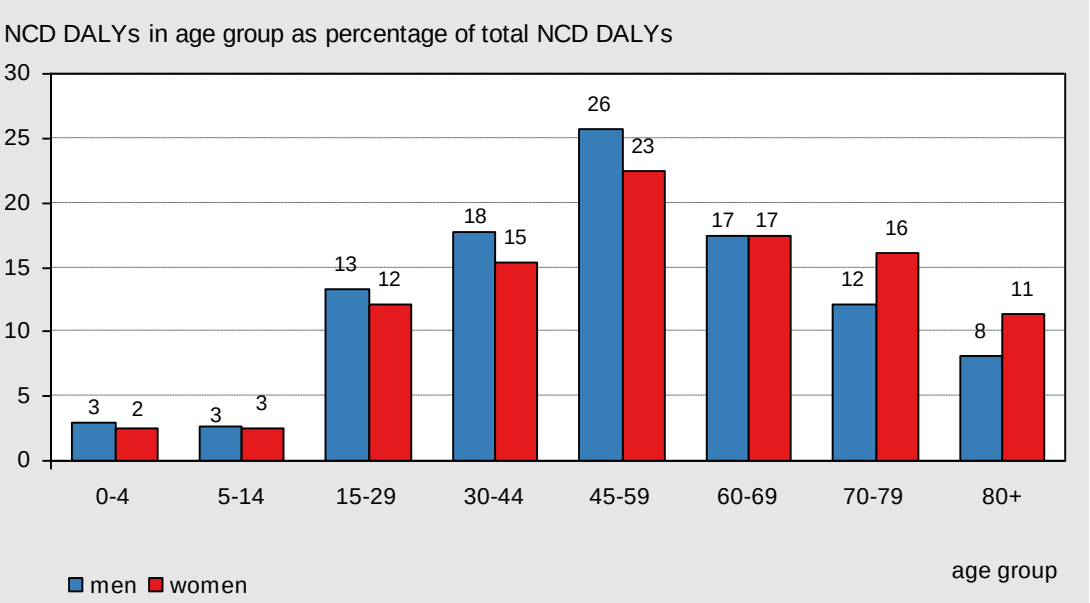
In all EU countries (except Sweden), the burden of the 'big four' chronic diseases is systematically lower for women of working age than for men, especially for cardiovascular diseases and to a lesser extent for cancer (see Figure 3-41 and 3-42). In addition, the variation in total disease burden for the 'big four' diseases in working-age women is much smaller than for men and hardly reaches a factor two. This is more or less true for each of the disease groups included in the 'big four' as well. For women, the burden of cardiovascular diseases is smaller than the burden of cancer in most EU27 countries. This contrasts with the situation for men, where the burden of cardiovascular disease is higher than for cancer.

Proportion of disease burden due to non-communicable diseases increases with age

In higher age groups, the proportion of the total disease burden due to NCDs is larger than in the younger age groups and reaches about 95% in people 60 years and older. The proportion of disease burden due to NCD is lower in the younger age groups because the proportion of disease burden due to accidents (external causes) is higher.

Although the proportion of disease burden due to NCD increases with age, the disease burden due to NCDs is also large in the age groups 45-59. About a quarter of all disease burden due to NCDs is in this age group (see Figure 3-43).

Figure 3-43: DALYs due to NCDs in various age groups as a percentage of the total NCD DALYs in the WHO European regions, projections for 2015 (source: WHO-GBD 2004).



Proportion of disease burden due to cardiovascular and respiratory diseases increases with age

The proportion of disease burden due to cardiovascular diseases and respiratory diseases increases with age. The proportion due to cancer increases until age 60-69 and decreases thereafter. Among younger age groups, injuries and neuropsychiatric conditions are responsible for the largest share of disease burden. Injuries cause a higher share of disease burden in men than in women (see Figure 3-44 and 3-45).

Figure 3-44: Percentage of disease burden (in DALYs) due to main disease groups in the WHO European region for men by age group, projections for 2015 (source: WHO-GBD 2004).

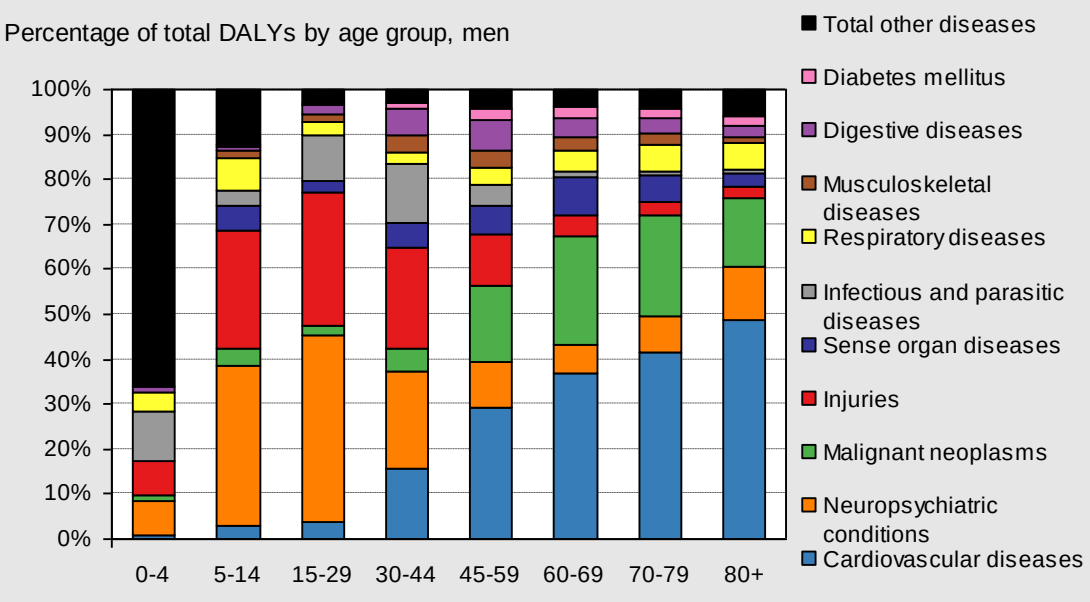
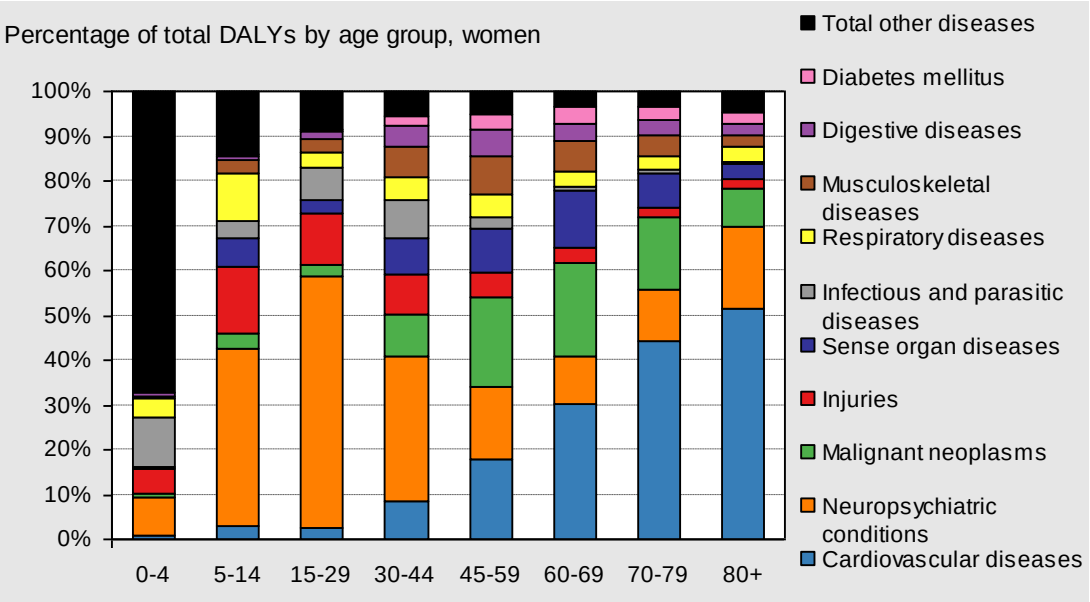


Figure 3-45: Percentage of disease burden (in DALYs) due to main disease groups in the WHO European region for women by age group, projections for 2015 (source: WHO-GBD 2004).



3.4 Conclusion and discussion

Conclusion

Substantial burden of chronic diseases in Europeans of retirement age

In conclusion, the burden of chronic diseases among older Europeans of retirement age is substantial and will increase due to population ageing and the remaining high prevalence of lifestyle risk factors. There are few EU countries where people can expect to reach the age of 65 (retirement age in many countries) without activity limitations due to health problems. In addition, each year approximately three million potential productive life years are lost due to premature mortality from cancer, cardiovascular and chronic lower respiratory diseases among older Europeans of working age (50-65 years). If the retirement age is increased, as proposed in several EU countries, the number of elderly workers with a chronic disease will increase, as well as the potential productive life years lost due to mortality from chronic diseases.

Discussion

Sustainable collection of European-wide comparable data on the prevalence of chronic diseases is lacking

The European Union needs to be prepared to monitor the changing burden of chronic diseases with accurate and timely chronic disease monitoring systems. However, in a report on the availability of data on the prevalence of chronic diseases in Europe that we prepared in parallel to this report (as part of a series of four reports to complement DG SANCO's work on chronic diseases), we concluded that a sustainable collection of European-wide comparable data on the prevalence of chronic diseases is still largely lacking (42). Therefore, the evidence base for supporting health policies by monitoring disease trends and making comparisons among countries is rather thin. The self-reported diabetes, COPD and depression prevalence from interview surveys like EHIS may be influenced by reporting biases and sampling related biases and may not reflect the true prevalence of the disease in a country (41, 99).

However, data on morbidity are available from a multitude of national sources: administrative sources (accidents at work and road traffic accidents), disease registrations (e.g. cancer), health care providers (e.g. hospital discharge registries or GP registries), legal notifications (e.g. infectious diseases), and specific research findings. These data sources have great value at the national level. However, the variability and differences in the data collection methods among these sources, that are due to the organisation of national health care systems, severely hamper the international comparability of these data. On the other hand, EHIS data suit the purpose of international comparison and benchmarking rather well because a common methodology is underlying the gathering of EHIS data. See appendix C for more information on the comparability of the data sources used in this chapter.

Policy recommendations

In short, we recommend the following actions for the EU and Member States:

- The EU and EU Member States should stimulate the use of effective interventions for the prevention and treatment of chronic diseases.
- The EU and EU Member States should use an integrated and intersectoral approach to combat the growing and unequally distributed burden of chronic diseases. Health should be an issue in all policies.
- EU Member States should learn from each other's experiences by an exchange of best practices.
- The EU and EU Member States should invest further in sustainable and harmonised data collections in the area of chronic diseases.
- The EU will take responsibility for improving current data in Europe by stimulating joint data collection and facilitating the central coordination of data harmonisation and quality control and the exchange of best practices in data collection.

Chapter 6 gives a more detailed description of these policy recommendations.

4 Relationship between chronic disease and economic activity

Iris van der Heide and Karin Proper

Key messages

Labour participation decreases considerably after the age of 50

Labour force participation in the European Union increases until the age of 50, and thereafter substantially decreases. Employment rates among elderly also vary considerably among the European countries with the highest rates in the Nordic countries.

Poor self-reported health, long-term illness and reduced wellbeing are associated with economic inactivity

From our review of cross-sectional studies, it appears that poor self-reported health as well as reduced wellbeing and self-reported longstanding illness are associated with economic inactivity. However, there are differences among the EU countries that may be due to the social and labour market situations and policies (including the official retirement age), possibilities for an early exit from work, and other factors in the social security systems of each country.

Poor health is a predictor for exit from work among older Europeans

Poor perceived health is a major predictor for (all types of) exit from paid work among older workers in Europe. Other health problems, including depression, limiting long-standing illness, chronic bronchitis, cardiovascular disease, musculoskeletal disorders and one or more chronic conditions also predict early exit from work among older persons. These results are based on our review of longitudinal studies that make it possible to draw conclusions about causality.

Factors other than health influence the elderly's labour force participation as well

Several factors other than health influence the labour force participation of elderly, such as the availability of pension-like social benefits, statutory retirement age, national economic situation, and the availability and levels of disability benefits.

There is limited evidence that unemployment among elderly Europeans has an effect on health

Although there is ample evidence that being without a job for a long period is associated with worse health, the evidence for the health effects of unemployment among older Europeans is limited. Therefore, it remains unclear to what extent and under what conditions unemployment influences (chronic) health conditions among older Europeans of retirement age.

Retirement seems to have both positive and negative health effects

Retirement (or early retirement) seems to have a positive effect on non-physical outcome measures including mental health, depression and perceived general health. On the other hand, there are contradicting results from literature on the effects of (early) retirement among older workers on stroke/CVD, (disease specific) mortality and physical functioning.

In short, we recommend the following actions for the EU and Member States:

- The EU and EU Member States should encourage the development and use of effective interventions to improve the work participation of people with a chronic disease who are at high risk for economic inactivity.
- EU Member States should learn from each other's experiences by an exchange of best practices.
- Both the EU and EU Member States should stimulate research to counteract the lack of evidence on the impact of economic inactivity on the health of older Europeans.
- The EU takes a coordinating and stimulating role to support the research efforts by individual Member States, for example by paying more attention to the areas that need more research in one of its research programs.

4.1 Introduction

To realise a sustained employability later in life, good health is important. Sustained employability is the extent to which a worker is able and willing to perform the (current and future) job (100). Sustained employability implies that workers have realistic opportunities and preconditions to perform their current and future work while maintaining good health and wellbeing (101). Good health is essential for sustained employability, while poor health has shown to be a risk factor for lower labour force participation rates and productivity levels (102).

In chapter 3, we saw that the burden of chronic diseases in Europeans of retirement age is substantial and will increase due to population ageing. Because good health is important for sustained employability, the expected increase in the number of people with a chronic disease has a potentially negative influence on labour participation. This can contribute to economic costs, both for society as a whole as well as for individuals. Whereas premature death due to chronic disease obviously has a direct influence on labour participation, the influence of living with a chronic disease on economic activity and the effect of economic (in)activity on health are less straightforward. Therefore, this chapter provides a closer look at the relationship between the health status of older Europeans of retirement age and their economic activity.

After a short overview of the methods used (paragraph 4.2), this chapter will first provide insight into the labour force participation of older European persons with or without a chronic disease or poor health (paragraph 4.3.1). Subsequently, we describe the literature on the causal relationship between ill health and (early) exit from paid work, and the reverse (the health effects of an (early) exit from work for older European persons) (paragraph 4.3.2). The general conclusions and discussion of the results are described in paragraph 4.4. The chapter ends with a summary of the policy recommendations based on the results.

There are distinct types of economic inactivity, such as unemployment, (early) retirement, work disability, or household care. If literature is available, a distinction will be made between the impact of ill health and subsequent health consequences for each type of aforementioned economic inactivity. This paragraph will also make a distinction between various health measures. These include self-perceived health, having a chronic disease, and (if information is available) identifying the specific chronic disease groups that are prioritised for this report (cancers, diabetes, cardiovascular disease, COPD (chronic respiratory disease) and depression, see chapter 1 Introduction). These diseases are important causes of the disease burden of Europeans of retirement age. However, other health problems, such as musculoskeletal disorders and other mental health problems are also quite common among the working population, including older workers, and may also cause (early) exit from work and subsequent economic inactivity. Therefore, we will also summarise the evidence on chronic diseases other than those prioritised for the present report. Finally, studies examining the relationship between leaving the labour market and disease-specific mortality are included.

4.2 Methods

In paragraph 4.3.1, we present the labour force participation of older European persons with or without a chronic disease or poor health. The prevalence data for this have mainly been based on data from grey and scientific literature. Data from a large European database, i.e. SHARE (Survey on Health and Ageing in Europe) have frequently been used in the literature (see Textbox 4.1). However, it should be considered that not all EU Member States, Candidate Countries, or EFTA Countries have been included in SHARE, such as Iceland, Serbia, Montenegro, Croatia, FYROM (Former Yugoslavic Republic of Macedonia), and Turkey. Therefore, we performed a separate search to identify studies with data for those countries. Furthermore, we consulted OECD and Eurostat websites (103, 104) to obtain objective information on (early) retirement and unemployment rates in European countries, e.g. based on the EU Labour Force Survey.

Since the labour force participation rates of older persons with poor health or a chronic disease (described in paragraph 4.3.1) are based on cross-sectional data, causality cannot be concluded. This is important, because it is suggested that there is a reciprocal causal relationship between poor health and economic activity with two reported hypotheses. The first, the causation hypothesis, states that poor health is caused by economic inactivity (e.g. unemployment), whereas the second, the selection hypothesis, states that poor health may increase the risk of becoming economically inactive (105, 106).

The information on labour force participation in paragraph 4.3.1 serves as a starting point for this chapter. The focal point of this chapter is paragraph 4.3.2, in which we will summarise the literature with respect to both hypotheses. Paragraph 4.3.2.1 gives a more detailed description of the literature on the impact of poor health or chronic disease on the labour force participation of European elderly (i.e. the selection hypothesis). The subsequent paragraph, 4.3.2.2 gives a more detailed description of the literature on the causation hypothesis, i.e. describing the health effects of exit from work among older European persons. The literature summarised in these paragraphs involves studies with a longitudinal design, which makes conclusions about causality possible. The literature review is based on a literature search for peer-reviewed studies and on additional information from grey literature, including European reports.

Textbox 4-1: Survey on Health and Ageing in Europe (SHARE).

Survey on Health and Ageing in Europe (SHARE)

SHARE was set up as a multidisciplinary and cross-national panel database of micro-data on health, the socio-economic status and social and family networks of more than 55,000 individuals, aged 50 or over, from 20 European countries. The first survey was performed in 2004, and 11 European countries contributed, which constituted a balanced representation of the various regions in Europe, ranging from Scandinavia (Denmark and Sweden) through Central Europe (Austria, France, Germany, Switzerland, Belgium, and the Netherlands) to the Mediterranean (Spain, Italy and Greece). A second wave of data collection, in 2006, represented SHARE's longitudinal dimension.

See for more information, the SHARE website: www.share-project.org

Literature search

We retrieved grey literature through personal databases and website searches, including the websites of WHO, the OECD, and Eurostat. Further, we checked the references of relevant studies, reports or reviews, including the recently published report on the 'Health of people at working age' which served as the basis for this chapter (43). The report provides a state of the art description of the health of EU people of working age and activities that are relevant to improving their health. It focuses on the following diseases: cardiovascular diseases, unipolar depressive disorders, musculoskeletal diseases, and accidental injuries at work. The report however, did not specifically focus on chronic diseases and older Europeans, but rather on the entire working-age population.

We conducted a search for scientific publications to address the hypotheses in both paragraph 4.3.2.1 (selection hypothesis) and 4.3.2.2 (causation hypothesis), in May 2012, using online databases (Medline, PsycINFO, Social SciSearch, and SciSearch). The key words used to identify relevant studies were: '(early) retirement', 'unemployment' with 'health' and the chronic diseases that are the focus of this report, i.e. cardiovascular diseases, diabetes, chronic respiratory disease, cancer, and depression. The literature search strategy is available upon request. The search provided us with nearly all longitudinal European studies published in English between 1992 and May 2012 on the relationship between health or chronic conditions and (early) retirement or unemployment of older workers. For the selection hypothesis (paragraph 4.3.2.1), eight studies from the literature search will be described and five additional studies from personal databases. For the causation hypothesis (paragraph 4.3.2.2), 15 studies from the search in scientific databases will be described and four additional studies from personal databases.

4.3 Results

4.3.1 Labour force participation of older Europeans with or without a chronic disease or poor health

Labour participation decreases considerably after the age of 50

Figure 4.1 shows that in 2011 the average labour force participation in the EU Member States increased until the age of approximately 50 years. Thereafter, the average labour force participation substantially decreased to 63% among those aged 55-59 and 31% among those aged 60-64 years. The average labour force participation for both age groups combined was 47%.

Labour force participation of older EU persons has increased over the past decade

The average labour force participation of those aged 55-64 years has increased from 38% to 47% between 2000 and 2011 (Figure 4-2).

Figure 4-1: The EU average employment rate (%) by age category in 2011 (source: Eurostat 2012, based on EU-LFS).

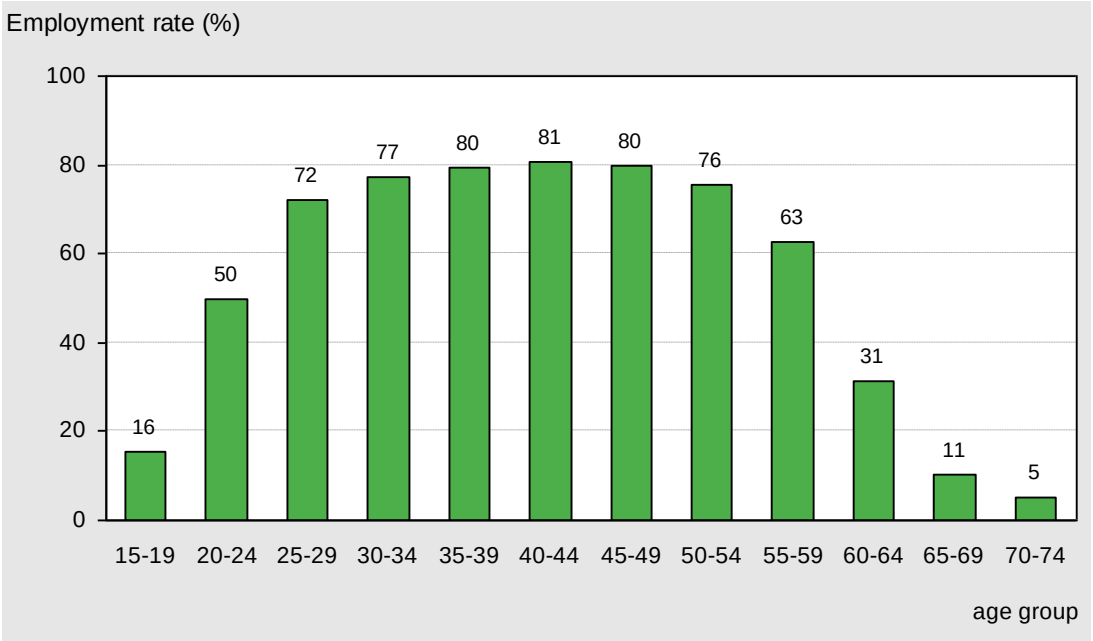
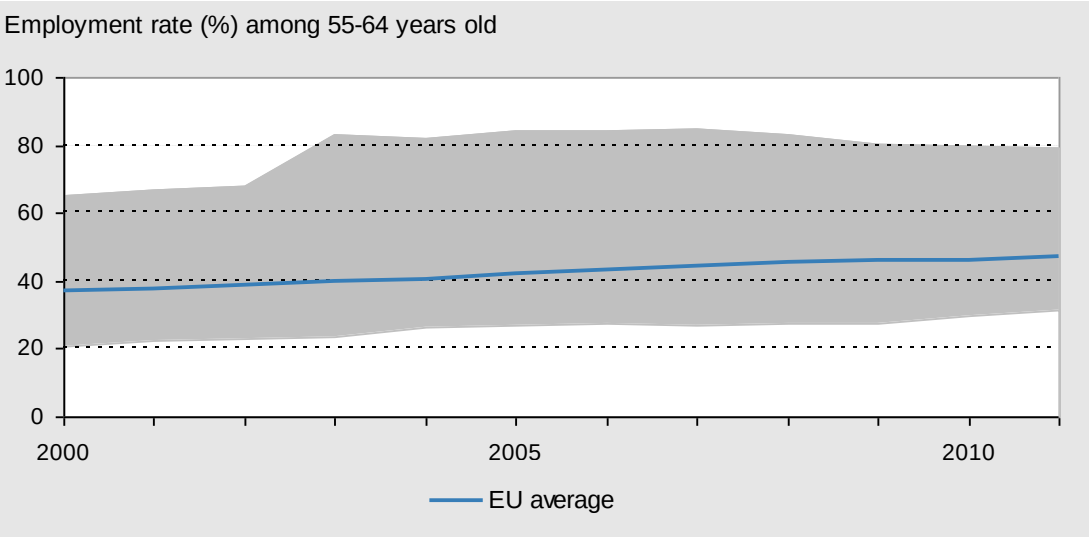


Figure 4-2: Trends in employment rate (%) of people aged 55-64 years from 2000 to 2011 in the EU [a] (source: Eurostat 2012, based on EU-LFS).



[a] Grey area reflects the range for the EU27 countries and Croatia, Iceland, Norway, Switzerland, the Former Yugoslav Republic of Macedonia and Turkey.

High employment rate of people aged 55-64 in Nordic countries

Figure 4.3 presents the labour force participation rates for people aged 55-64 years in each EU Member State and for several EFTA, Accession and Candidate countries, in 2011. It shows that the Nordic countries (Iceland, Sweden, and Norway) and Switzerland have a high proportion of people aged 55-64 years who are employed (>70%). This is in contrast to countries like Turkey, Slovenia, and Malta that have an employment rate among this age group of less than 33% (Figure 4-3). In most countries participation rates are increasing. However, health is not the only influence on the elderly's labour force participation. Several other factors are influential, such as the availability of pension-like social benefits, the national economic situation, and the availability and levels of disability benefits. For example, in 2010, the age of statutory retirement varied from 57 years of age to 67 years of age among European OECD countries, as presented in Table 4-1.

Figure 4-3: Employment rate (%) among people aged 55-64 years in each EU Member State and for several EFTA, Accession and Candidate countries in 2011 (source: Eurostat 2012, based on EU-LFS).

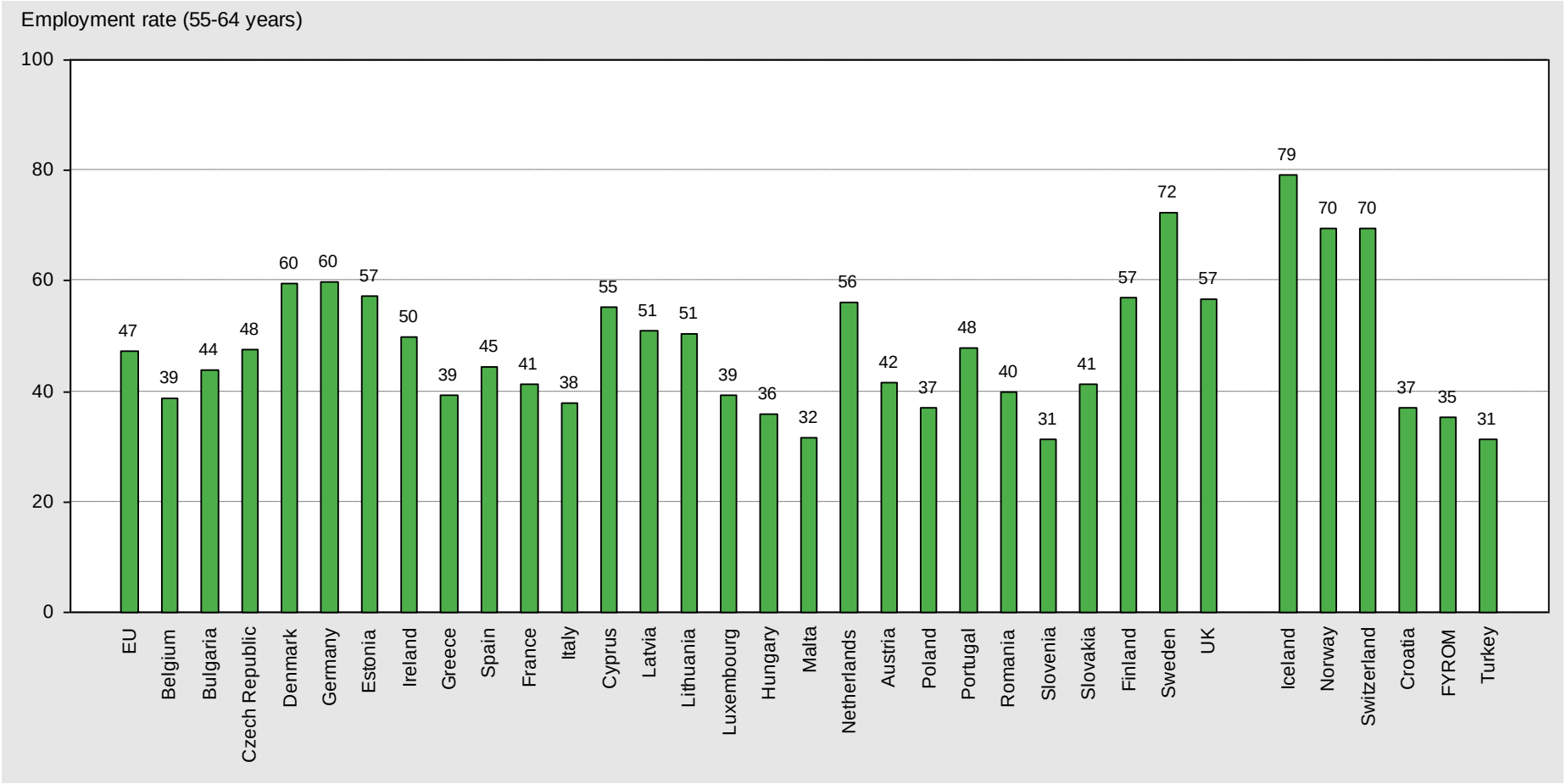


Table 4-1: Statutory retirement ages[a] in European OECD countries in 2010 and 2020 (source: OECD, 2011: Pensions at a glance).

	2010 *Men*	**2010** *Women*	**2020** *Men*	**2020** *Women*
Austria	65.0	60.0	65.0	63.0
Belgium	60.0	60.0	60.0	60.0
Czech Republic	61.0	58.7	62.2	63.3
Denmark	65.0	65.0	65.0	65.0
Finland	65.0	65.0	65.0	65.0
France	60.5	60.5	61.0	61.0
Germany	65.0	65.0	65.0	65.0
Greece	57.0	57.0	60.0	60.0
Hungary	60.0	59.0	64.5	64.5
Ireland	65.0	65.0	65.0	65.0
Italy	59.0	59.0	61.0	61.0
Luxembourg	60.0	60.0	60.0	60.0
Netherlands	65.0	65.0	65.0	65.0
Norway	67.0	67.0	67.0	67.0
Poland	65.0	60.0	65.0	60.0
Portugal	65.0	65.0	65.0	65.0
Slovak Republic	62.0	57.0	62.0	62.0
Spain	65.0	65.0	65.0	65.0
Sweden	65.0	65.0	65.0	65.0
Switzerland	65.0	63.0	65.0	64.0
United Kingdom	65.0	60.0	65.0	65.0

[a] In some countries the statutory retirement ages have recently been increased, for example in Poland, Finland and the Netherlands.

Lower labour participation rates among men with a severe health condition

Having a severe health condition was negatively associated with the labour force participation of men aged 50-64 in five of the 11 SHARE countries, i.e. in Austria, Belgium, Denmark, Germany, and Spain. This was the conclusion of Kalwij and Vermeulen in an analysis using data from SHARE's first release in 2004 (107). Among the five countries, there were variations in the participation rates of men with a severe (not specified) health condition compared to men who had never had a severe health condition (all other aspects being equal). The range of lower percentage points for those with a severe health condition was from 13 (in Germany) to 31 (in Austria). The association between a mild health condition and labour force participation was only significant in Germany with an 8% lower participation rate for a man with a mild health condition compared to a similar man without. The type of mild-severe condition was not specified, and can thus include a great diversity in health problems.

Employed people report a long-standing illness less often than unemployed

Across all age groups, the percentage of people who reported having a long-standing illness or health problem is lower among employed persons compared to unemployed, retired or other inactive persons (see Figure 4-4; based on SILC, 2010). The same picture appeared in a study by Alavinia and Burdorf that examined the cross-sectional associations of ill health and unemployment and retirement among 11,462 persons aged 50-65 years in 10 European countries using baseline data from SHARE (108). In this study, long-term illness was present in over 36% of the employed workers, 48% of unemployed workers, 50% of retired workers, and 44% of homemakers. Being employed possibly contributes to health, however, the percentages presented in Figure 4-4 also seem to support the finding that poor health can be a risk factor for lower labour force participation (102). When looking at the associations for various health problems, depression was the most important health problem associated with all types of exit from the labour force (Table 4-2). Stroke was strongly associated with early retirement, and diabetes was significantly related to early retirement and staying at home as a homemaker (108).

Figure 4-4: Percentage of EU population who reported having a long-standing illness or health problem in 2010, by age and activity status (source: Eurostat 2012, based on SILC 2010).

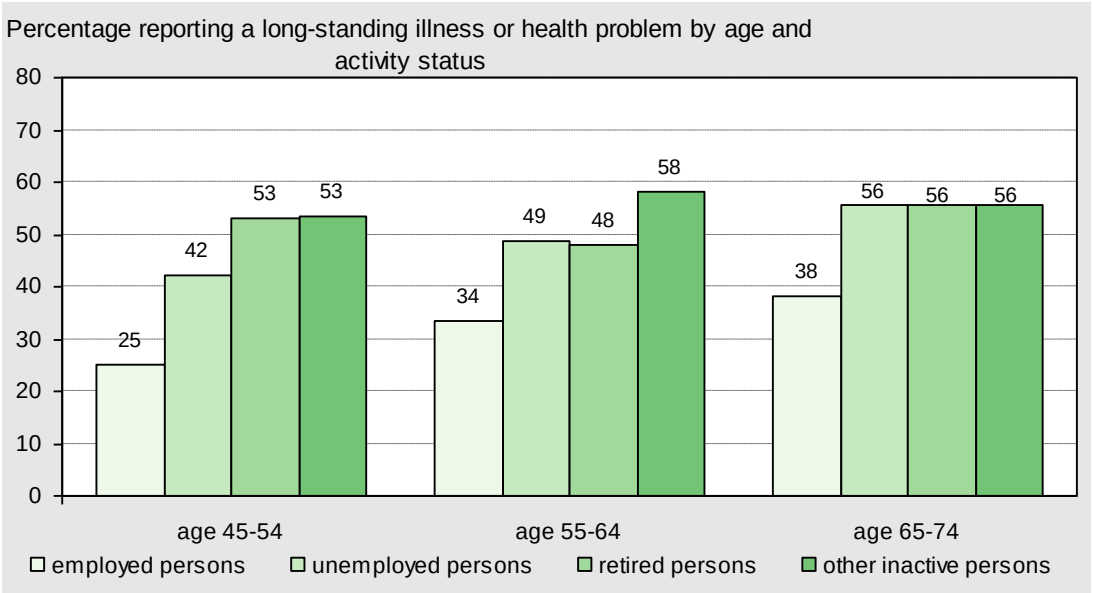


Table 4-2: Multivariate associations between specific chronic diseases and retirement, unemployment, and homemaker adjusted for self-perceived health, country, socio-demographic characteristics, and lifestyle factors (source: Alavinia and Burdorf, 2008).

Self-reported chronic disease	**Retired** *Odds Ratio (95%CI)*	**Unemployed** *Odds Ratio (95%CI)*	**Homemaker** *Odds Ratio (95%CI)*
Heart attack	1.17 (0.93-1.49)	0.96 (0.66-1.40)	1.20 (0.83-1.75)
Hypertension	1.05 (0.92-1.21)	0.92 (0.74-1.15)	1.11 (0.94-1.31)
Stroke	2.60* (1.66-4.07)	1.11 (0.53-2.32)	1.27 (0.65-2.47)
Diabetes	1.33* (1.05-1.68)	1.38 (0.99-1.93)	1.57* (1.14-2.17)
Chronic lung disease and asthma	1.21 (0.96-1.52)	0.96 (0.68-1.34)	0.80 (0.60-1.06)
Arthritis and osteoporosis	1.39* (1.18-1.65)	1.12 (0.87-1.44)	1.44* (1.20-1.72)
Not depressed	1.0	1.0	1.0
Moderately depressed	1.28* (1.08-1.52)	1.45* (1.15-1.82)	1.24* (1.05-1.47)
Heavily depressed	2.60* (1.37-4.94)	3.03* (1.53-6.21)	2.42* (1.23-4.73)

* $p<0.05$ (significant)

Poor self-perceived health is associated with retirement and unemployment in most EU countries

Alavinia and Burdorf (2008) (108) further explored the associations of poor perceived health and retirement and unemployment for each country separately. They found that self-perceived poor health was significantly associated with early retirement in seven of the 10 countries (Table 4-3). In six countries, perceived poor health was associated with unemployment, whereas in only three countries (Germany, Spain, and Greece) poor health was associated with being a homemaker (valid only for women). For long-term illness, the same associations were apparent. The strongest association for perceived poor health and retirement was seen in Sweden and Denmark and for unemployment in Switzerland and Italy. Further, the strongest association for perceived poor health and homemaker (in women) was apparent in Spain and Greece. It was striking that in Sweden, strong associations were found for self-perceived poor health and retirement, while no association was found for unemployment.

Table 4-3: Multivariate associations between poor health and early retirement, unemployment, and homemaker for 10 European countries, adjusted for socio-demographic characteristics and lifestyle factors (source: Alavinia and Burdorf, 2008).

	Retired	Unemployment	Homemaker (only in women)
Country	*Odds Ratio (95%CI)*	*Odds Ratio (95%CI)*	*Odds Ratio (95%CI)*
Sweden	4.16* (2.97-5.81)	1.07 (0.57-2.00)	1.38 (0.46-4.16)
Denmark	4.40* (2.62-7.52)	2.48* (1.31-4.68)	0.41 (0.4-4.00)
The Netherlands	1.33 (0.71-2.48)	2.82* (1.50-5.30)	1.45 (0.94-2.25)
Germany	2.46* (1.60-3.76)	2.55* (1.68-3.86)	1.89* (1.18-3.02)
Austria	1.67* (1.00-2.80)	1.48 (0.63-3.47)	1.38 (0.61-3.13)
Switzerland	1.64 (0.56-4.79)	3.99* (1.05-15.11)	0.66 (0.20-2.18)
France	1.07 (0.56-2.03)	1.20 (0.60-2.39)	1.18 (0.59-2.34)
Italy	1.45* (1.00-2.10)	3.77* (1.78-8.01)	1.48 (0.90-2.43)
Spain	2.00* (1.19-3.36)	2.05* (1.08-3.92)	2.39* (1.42-4.02)
Greece	2.21* (1.38-3.56)	1.81 (0.67-4.91)	2.05* (1.15-3.68)

* $p<0.05$ (significant)

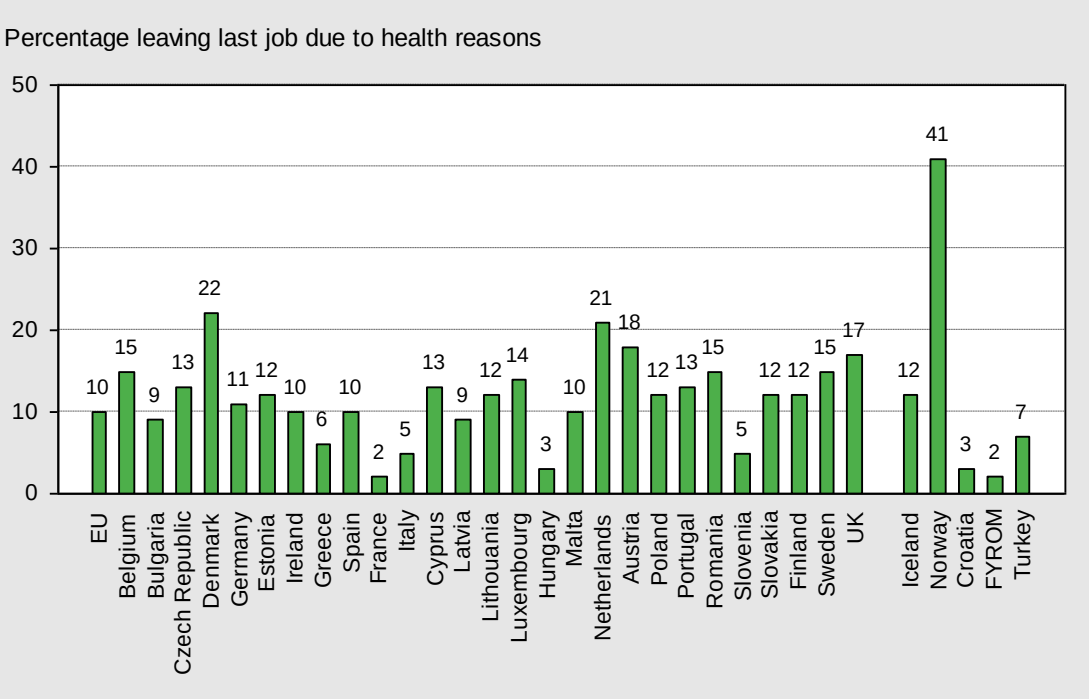
Reduced wellbeing is associated with an intention to retire from work in EU countries

Siegrist et al. (109) also used the 2004 first release of the SHARE data and explored the association between four indicators of wellbeing (self-reported health, depressive symptoms, quality of life, and number of reported bodily symptoms) and the intended retirement of persons aged 50 to 65 in 10 European countries. From their analyses, it appeared that all four wellbeing indicators were associated with an increased risk of intended early retirement after adjusting for all other variables, including age, sex, education, income, and quality of work. Data were not presented for each EU country separately, but the authors concluded that the odds ratios were consistent across the countries and could not be attributed to socio-demographic or socio-economic influences.

Poor health is major contributor to (early) exit from paid work

Poor health has been reported as a major contributor to (early) exit from work (110, 111). Based on data from the EU-LFS for 2009, 10% of working-age people (11% for men and 9% for women) left their job because of illness or disability (Figure 4-5). Especially men and people aged 45-54 years reported illness or disability most often as the reason they left their last job (18%). Among those aged 55 years and over, 13% reported illness or disability as the main reason for leaving their job (43). It should be noted that in countries with a high unemployment rate the role of health appears to be smaller in comparison with countries with a low unemployment rate, because far more people lose their jobs for reasons other than health (111).

Figure 4-5: Percentage of 'leaving the job' due to health reasons (source: Oortwijn et al., 2011 based on EU-LFS 2009).

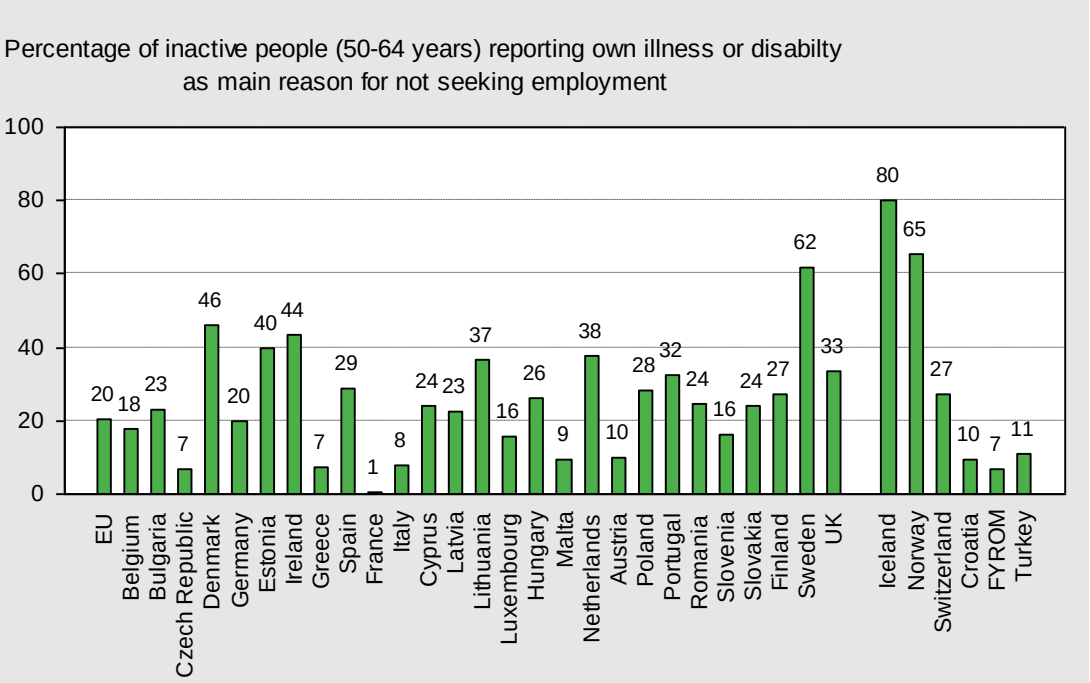


Poor health is also an important reason for not searching for work

EU-LFS data from 2011 shows that health is an important reason for not searching for work. On average, 20% of inactive people 25-64 years of age as well as 20% of inactive people 50-64 years of age indicated that illness or disability was the main reason for not seeking employment (Figure 4-6) (2). There are large differences across the EU countries. For example, the percentage of inactive people aged 50-64 who reported having an illness or disability as main reason for not seeking employment ranged from 1% in France to 80% in Iceland (Figure 4-6) and the percentage of working-age people reporting health as the main reason for leaving the last job ranged from 2% in FYROM and France to 41% in Norway (Figure 4-5). These differences may be explained by differences in the countries' social and labour market situations and policies, such as the official retirement age, possibilities for an early exit from work, and other factors in the social security systems (see also Table 4-1). It should be noted that health was defined in a general way, and not by specifying the type of health problem or chronic disease. Therefore, health problems may also involve musculoskeletal or work-related psychological disorders (e.g. burnout symptoms). These health problems are among the most frequent causes of work disability (112-115), but they are not specifically common among older workers.

Since many people report that poor health is a major contributor to (early) exit from work and their main reason for not searching for work, this suggests that health is important for labour participation. However, due to the cross-sectional design of the studies, no conclusions can be drawn about causality. Therefore, in the next paragraph we focus on longitudinal studies.

Figure 4-6: Percentage of inactive people (50-64 years) who reported own illness or disability as their main reason for not seeking employment in 2011 (source: Eurostat 2012, based on EU-LFS).



4.3.2 The relationship between health and economic inactivity

From the cross-sectional studies described in paragraph 4.3.1, it appeared that poor self-reported health as well as reduced wellbeing and self-reported longstanding illness are associated with economic inactivity in the EU countries. Paragraph 4.3.2.1 and paragraph 4.3.2.2 will use data from longitudinal studies to verify the selection hypothesis (i.e. poor health increases the risk of becoming economically inactive) and the causation hypothesis (i.e. economic inactivity causes poor health). In contrast to studies with a cross-sectional design, studies with a longitudinal design make it possible to draw conclusions about causality.

This paragraph summarises the main findings from paragraph 4.3.2.1 and 4.3.2.2 in two tables. Table 4-4 summarises the evidence we found for the effect of poor health on the economic inactivity among older European workers (selection hypothesis). Table 4-5 displays the evidence on the effects of economic inactivity on health for older European workers (causation hypothesis).

The findings hold only for a specific group in some cases, for example, workers from a certain profession or people having a specific chronic disease. Furthermore, the studies that we have summarised stem from various European countries for which there may be differences in the retirement age. The studies also differ with regard to sample size and methods used. Therefore, the outcomes presented in these tables should be interpreted with caution.

An important note should also be made regarding the interpretation of the findings of the studies included in the paragraph on the impact of economic inactivity on health (paragraph 4.3.2.1). Interpreting the findings is very difficult since most of the studies did not adequately take into account the fact that people with serious or chronic health problems before retirement are often not part of the study, since they have already left the labour market. Furthermore, when studies controlled for people with poor health at baseline, this might have influenced the outcome of the analysis on the effect of retirement on health. This might also have influenced the results as discussed in this paragraph.

Paragraph 4.3.2.1 and 4.3.2.2 provide more detailed information needed for an adequate interpretation of the findings presented in the tables. Furthermore, a previous report by Oortwijn et al. (24) provides findings from additional studies on the relationship between health and economic inactivity, however, these studies did not specifically look at older workers. Some of the studies included in the Oortwijn report are included in this review as well.

The effect of health on economic inactivity

Poor health predicts exit from work among older Europeans

Table 4-4 shows studies that point at various health-related predictors for economic inactivity among older workers. In summary, poor perceived health is a major predictor for (any type of) exit from paid work among older workers in Europe. Other health problems, including depression, limiting long-standing illness, chronic bronchitis, cardiovascular disease, musculoskeletal disorders and having one or more chronic conditions also predict early exit from work among older Europeans.

The included studies operationalise economic inactivity in various ways, however. To clarify this further, in our overview, we made a distinction between studies that report on the effect of health on either (early) exit from work, disability pension, (early) retirement or unemployment. Studies that report on (early) exit from work often made no clear distinction between retirement and unemployment, for example. Second, some studies reported work disability as an outcome, and this included receiving a disability pension, which does not automatically mean that the person is fully retired. Third, some studies reported on (early) retirement and included workers who did not receive a disability pension. The fourth category includes studies that reported on unemployment among older workers. Below, we describe the main results for the various operationalisations of economic inactivity separately.

Any type of exit from work

To briefly summarise the results with regard to (early) exit from work, self-perceived poor health was found to be a main predictor for exit from work (116) (117). In addition, having a long-standing illness or having three or more diagnosed conditions predict an early exit from work (117). In one study, however, no effect of early exit from work was found for self-reported physician diagnoses of asthma, arthritis or any heart problem (117).

Work disability

For work disability, which included receiving a disability pension, several health states (i.e. having a mental disorder, musculoskeletal complaints, or chronic bronchitis), at least one chronic condition and poor perceived health all seemed to be major determinants for work disability among the EU working-age population (43, 110, 118, 119). In contrast, inconsistent evidence was found for cardiovascular disease as a determinant for work disability (118) (120, 121).

Table 4-4: Summary of studies on the effect of health on economic inactivity.

Health measures	Relation-ship*	Type of economic inactivity	Study
		(Early) exit from work (not specified on reason)	
Poor perceived health	- -		Van den Berg et al., 2010 (116) Rice et al., 2011 (117)
Limiting long-standing illness	-		Rice et al., 2011 (117)
Having three or more chronic conditions	-		Rice et al., 2011 (117)
Self-reported physician diagnoses of asthma, arthritis or any heart problem	0		Rice et al., 2011 (117)
		Work disability (including disability pension)	
Mental disorder (including depression)	-		Karpansalo et al., 2005 (119)
Poor perceived health	- -		Van den Berg et al., 2010 (116) Karpansalo et al., 2004 (118)
Having at least one chronic condition (heart disease, stroke, diabetes, lung disease, asthma, arthritis or rheumatism and osteoporosis)	-		Van den Berg et al., 2010 (116)
Musculoskeletal complaints	- -		Lund et al., 2001 (110) Karpansalo et al., 2004 (118)
Chronic bronchitis	-		Lund et al., 2001 (110)
Cardiovascular disease	- 0 -		Siebert et al., 2001 (121) Arndt et al, 2005 (120) Karpansalo et al., 2004 (118)
		(Early) retirement (including non-illness based pension)	
Mental disorder (including depression)	- - - -		Maguire & O'Connell, 2007 (122) Weber et al., 2005 (123) Karpansalo et al., 2005; (119) Rodgers et al., 1998 (124)
Poor perceived health	- -		Karpansalo et al., 2004 (118) Van den Berg et al., 2010 (116)
Having at least one chronic condition (heart disease, stroke, diabetes, lung disease, asthma, arthritis or rheumatism and osteoporosis)	-		Van den Berg et al., 2010 (116)
Musculoskeletal diseases	- -		Rodgers et al., 1998 (124) Burke et al., 1997 (125)
Circulatory disease	-		Maguire & O'Connell, 2007 (122)
Cardiovascular diseases	-		Burke et al., 1997 (125)
Cancer	- -		Carlsen et al., 2008 (126) Maguire & O'Connell, 2007 (122)
		Unemployment	
Mental disorder (including depression)	- - -		Bildt et al., 2003 (127) Leino-Arjas et al., 1999 (128) Mastekaasa et al., 1996 (129)
Poor perceived health	- -		Van den Berg et al., 2010 (116) Schuring et al., 2007 (111)
Having a or at least one chronic condition (heart disease, stroke, diabetes, lung disease, asthma, arthritis or rheumatism and osteoporosis)	0 -		Van den Berg et al., 2010 (116) Schuring et al., 2007 (111)

* - refers to a negative effect of health on economic activity (decrease); 0 refers to no effect on economic activity

Early retirement

With regard to (early) retirement (including non-illness based pensions), depression seems to be a risk factor for (early) retirement as well as poor perceived health, having at least one chronic condition, a musculoskeletal disease, a circulatory disease, cardiovascular disease and cancer (116, 119, 124, 126). In addition, poor perceived health did not predict early retirement under the age of 55 years, but did thereafter (118). Reduced left ventricular function increased the risk of early retirement in people with cardiovascular disease (130) .

Unemployment

Mental illness is a significant predictor of unemployment in the EU working-age population. From their literature review, Oortwijn et al. (2011) found 10 longitudinal studies among European workers that examined the influence of poor health on the risk of becoming unemployed. Most studies focused on the general working age (25-65 years). Three studies reported a significantly increased risk of impaired mental health or psychological problems on future unemployment. Perceived health seems to play a more important role in unemployment than having a chronic disease (43, 116). Perceived reduced cognitive and physical function predict unemployment among people with coronary artery disease (131).

The effect of economic inactivity on health

Retirement may have both positive and negative health effects, but evidence for health effects of unemployment among older workers is limited

For the analyses of the relationship between economic inactivity among older workers and health, we made a distinction between (early) retirement and unemployment. In summary, (early) retirement seems to have both positive and negative effects on the subsequent health of older workers. Although there is ample evidence that being without a job for a longer period is associated with worse health, the evidence for health effects of unemployment in older Europeans is very limited. Table 4-5 shows the main results.

Table 4-5: Summary of studies on the health effects of economic inactivity among older European adults.

Type of economic inactivity	Health outcome	Relationship*	Study
Retirement			
	Mortality	0	Kalwij et al., 2010 (132)
		-	Bamia et al., 2008 (133)
		-	Quaade et al., 2002 (134)
		-	Kühntopf & Tivig, 2012 (135)
		0	Brockmann et al., 2009 (136)
		-	Morris et al., 1994 (148)
	Cancer	-	Behncke, 2012 (137)
	Chronic bronchitis or asthma	0	Westerlund et al., 2010 (138)
	Cardiovascular disease (stroke)	0	Westerlund et al., 2010 (138)
		-	Behncke, 2012 (137)
	Diabetes	0	Westerlund et al., 2010 (138)
		0	Behncke, 2012 (137)
	Mental health/depression	0	Behncke, 2012 (137)
		+	Mein et al., 2003 (139)
		+	Jokela et al., 2010 (140)
		+	Westerlund et al., 2010 (138)
		+	Mojon-Azzi et al., 2007 (141)
		+	Oksanen et al., 2011 (142)
	Perceived health	0[a]	Van Solinge et al., 2007 (143)
		-	Behncke, 2012 (137)
		+	Östberg & Samuelsson, 1994 (144)
		+	Mojon-Azzi et al., 2007 (141)
		+	Bonsang & Klein, 2011 (145)
		+	Westerlund et al., 2009 (146)
		+	Rijs et al., 2011 (147)
Unemployment			
	Mortality	-	Morris et al., 1994 (148)
		0	Kalwij et al., 2010 (132)
	Health satisfaction	-	Gordo et al., 2006 (149)

* + refers to a positive effect of economic inactivity on health; - refers to a negative effect of economic inactivity on health; 0 refers to no effect of economic inactivity on health

[a] Merely those who perceived retirement as involuntary showed decreases in perceived health

Early retirement

Four studies indicate that (early) retirement increases the risk of (disease-specific) mortality (133-135, 148) and two studies show no effect (132) (136). One study finds that retirement significantly raises the risk of developing cancer (137). Another study implies that retirement significantly increases the risk of being diagnosed with a severe CVD, although another study does not find a change in the risk for CVD as measured by self-reported angina, heart attack, or stroke (138). With regard to trends for self-reported chronic bronchitis or asthma, one study indicates no change due to retirement (138). Furthermore, there seems to be no relationship between retirement and diabetes. Based on the identified studies, it seems that retirement favourably influences general mental health, although some inconsistent results are found

with respect to the effect on depression. Two studies have examined the effect of retirement on mental health/functioning (139, 140) and four have looked specifically at the effect of retirement on depression (137, 138, 141, 142). Finally, several studies find that retirement leads to improvements in perceived health, although one study indicates the opposite (137, 141, 143-147).

Health effects of unemployment in older workers

Evidence with regard to the health effects of unemployment among older workers is quite limited. Concerning mortality, one study reports that men who experienced unemployment in the five years after being included in the baseline study are more likely to die during the next five and a half years than men who remain continuously employed (148). Another study concludes that unemployed or people that are not participating in labour force do not have a significant different mortality risk (132). Findings from one study suggest that job loss has a significant negative effect on health satisfaction among individuals older than 50 (149).

4.3.2.1 Impact of health on economic activity

In chapter 3 it became clear that chronic diseases can lead to premature mortality as a cause for early departure from the labour force. This paragraph will describe the impact of poor health, chronic diseases, and (if information is available) specific disease groups (such as cancers, diabetes, and cardiovascular and respiratory disease) on the exit from the labour market of older persons in European countries.

In the paragraph 4.3.1, cross-sectional data were used to describe the labour force participation of older EU persons, and to describe the associations with ill health. This paragraph will use data from longitudinal studies that verify the selection hypothesis (i.e. poor health increases the risk of becoming economically inactive).

Poor health and exit from work

People with poor perceived health leave the labour market more often than they continue to work

More persons aged 50 years and over with poor health leave the labour market (28%) than continue working (15%). This was concluded in a study with two years of follow-up using longitudinal SHARE data from 2004-2006 (43). The proportions of people with poor perceived health leaving the workforce due to (early) retirement, unemployment, and work disability were 22.8%, 33.9%, and 47.8%, respectively (Table 4-6). This conclusion is supported by data from the ECHP for 57,436 European persons aged 16 years and older that showed a higher proportion of workers with a less than good health leaving the workforce (36%) than continuing to work during the follow-up period (23%) (43). Retirement (44.8%) was the main reason for leaving the workforce for people with poor health, followed by unemployment at 31.3% and taking care of the household at 30.8%. No information was available about differences among European countries.

Table 4-6: Proportions of people with poor health who continued working or left employment based on SHARE (2004-2006) and ECHP (1994-1998) data (source: Oortwijn et al., 2011).

		Exit workforce			
Perceived poor health (%)	**Continued working**	**Retired**	**Unemployed**	**Work disabled**	**Taking care of house-hold**
Based on SHARE (≥50 years)	15.3%	22.8%	33.9%	47.8%	-
Based on ECHP (≥16 years)	23%	44.8%	31.3%	-	30.8%

Self-perceived poor health was the main predictor for exiting work

Van den Berg et al. (116) used the same SHARE dataset from 2004-2006 to investigate the relationship between poor perceived health and exit from work, but they also examined the impact of three other health measures among European workers. The three measures were: 1) having at least one chronic disease (heart disease, stroke, diabetes, lung disease, asthma, arthritis or rheumatism, and osteoporosis); 2) mobility problems reflecting limitations of mobility, arm or fine motor functions, and 3) instrumental limitations for subjects with limitations in one or more instrumental daily life activities. Although all four health measures were associated with any type of exit from work, self-perceived poor health was the most predictive measure for transitioning out of employment (see Table 4-7). When adjusting for

age, sex, educational level, and work and lifestyle factors, the odds ratios (ORs) varied from 1.40 to 1.78 for any type of exit from paid work. This means that people with instrumental limitations in daily activities had a 40% increased risk of exit from work and people with less than good perceived health had a 78% increased risk. In addition, the risk of leaving work increased by 63% for people with a chronic disease and by 37% for people with mobility problems. Differences in increased risks for exit from work due to health problems among the European countries were not reported, although considerable differences in the prevalence of exiting from paid work and pathways of exit were found among the countries.

Table 4-7: Relationship of four health measures and exit from work due to unemployment, retirement, and disability among 4,611 initially employed persons aged 50-63 years in 11 European countries during two years of follow-up in SHARE (2004-2006). Fully adjusted logistic regression analysis models (source: Van den Berg et al., 2010).

	Unemployed	**Retired**	**Disabled**	**Total exiting**
	Odds ratio (95% CI)	*Odds ratio (95% CI)*	*Odds ratio (95% CI)*	*Odds ratio (95% CI)*
Less than good perceived health	1.96* (1.32-2.92)	1.32* (1.01-1.72)	4.24* (2.71-6.62)	1.78* (1.45-2.20)
Chronic disease	1.30 (0.88-1.93)	1.28* (1.01-1.62)	2.62* (1.69-4.07)	1.63* (1.35-1.96)
Mobility problems	1.03 (0.69-1.54)	1.15 (0.91-1.46)	3.22* (2.06-5.03)	1.37* (1.13-1.65)
Instrumental limitations in daily life	1.31 (0.58-2.93)	0.99 (0.59-1.69)	2.98* (1.50-5.91)	1.40 (0.93-2.08)

* $p<0.05$ (significant)

Poor health, long-standing illness, inability to do daily life activities, and having three or more diagnosed conditions predict an early exit from work

Rice and colleagues (2011) (117) used the data from the English Longitudinal Study Ageing (ELSA) to identify specific symptoms and conditions that predict early retirement at the population level. Of the 1,693 workers aged 50 years and older, 18% moved out of employment during the four-year follow-up period. Of these, 63% went into retirement, 16% became permanently sick or disabled, 11% looked after their family or home, and 9% became unemployed. The following health variables were predictors of an early exit from work: fair or poor self-rated health, self-reported limiting long-standing illness, inability to do one or more activities of daily living or having three or more doctor-diagnosed conditions (Table 4-8). The findings regarding self-rated health suggest that poor health might not only force people to exit from work, but can also be a predictor of people's voluntary decision to exit from work. In a fully adjusted model, the risk for early exit from work was higher for those with symptomatic depression. Also, increased risks of early exit from work were seen for those with pain in the legs or foot, and shortness of breath (117).

Table 4-8: Age- and sex-adjusted risks for an early exit from work (2002-2006) (source: Rice et al., 2011).

Health measure		Odds ratio
Self-rated health	Fair or poor	2.14**
Self-reported longstanding limiting illness	Yes	1.73**
Activities of daily living	Difficulties	1.45
Instrumental activities of daily living	Unable to do 1 or more	1.96*
Self-reported physician diagnosis of…	Asthma	1.48
	Arthritis	1.15
	Any heart problem	1.32
Number of diagnosed conditions	3 or more	1.71*

* $p<0.05$; ** $p<0.01$ (significant)

Poor health and work disability

Musculoskeletal complaints are the main determinant for work disability among the EU working-age population

Oortwijn et al. (2011) (43) performed a literature review to summarise the existing research on the influence of poor health on an inability to work, the latter reflecting permanent disability as established by a disability pension scheme. They found 11 longitudinal studies that investigated a diversity of health problems, such as musculoskeletal complaints, depression, mental health problems, and cardiovascular complaints. Of those health problems, musculoskeletal complaints were the main disease determinant for work incapacity with relative risks (RR) varying from 1.4 to 3.3. For mental impairments or depressive complaints, the studies were less consistent with risks varying from 0.95 (not significant) to 3.8. All studies included in this review were of the general population in age groups such as 18-67 years or 25-64 years. However, there was one study from Germany that focused on construction workers aged 40-64 years (150). They found an increased RR of 1.6 (95% confidence interval (CI): 1.3-2.1) for work incapacity due to back complaints.

Chronic bronchitis and musculoskeletal disorders are important risk factors for a disability pension for Danish waste collectors and municipal workers

Although not specifically involving an older study population, Lund et al. (2001) (110) examined the effect of various health measures on leaving work for 2,918 waste collectors and municipal workers in Denmark. Chronic bronchitis and musculoskeletal disorders in the hips and knees were both significant risk factors for disability pensions (Table 4-9).

Table 4-9: Risk factors at baseline (1994) for disability pension/long-term sick leave among waste collectors and municipal workers in Denmark after three years of follow-up (source: Lund et al., 2001).

	Odds ratio	95% CI
Chronic bronchitis	3.68*	1.97-6.89
Musculoskeletal disorders, hips	2.72*	1.54-4.81
Musculoskeletal disorders, knees	1.91*	1.11-3.28

* $p<0.05$ (significant)

Inconsistent evidence for cardiovascular disease as a determinant for work disability

Of the studies reviewed by Oortwijn and colleagues, two examined the influence of cardiovascular disease on work disability (120, 121). Both studies were performed among German construction workers and found inconsistent results. Siebert and colleagues (2001) found ischemic heart disease as a significant determinant of work disability after 4.5 years of follow-up (RR 1.62). However, Arndt et al. (2005) found that cardiovascular diseases were not related to an increased risk for work disability using a follow-up period of 10 years (RR 1.09).

Older European workers with a poor perceived health are four times more at risk for leaving work due to work disability

Europeans ages 50-63 with a poor perceived health are about four times more at risk to leave their job due to work disability than people with good perceived health (adjusted for work and lifestyle factors) (43, 116) (Table 4-7). In addition Europeans with at least one chronic disease in a lifetime diagnosed by a doctor, including mobility problems and instrumental limitations, were about three times more at risk to leave work because of becoming disabled compared to people without those health problems (odds ratios varied from 2.62 to 3.22) (116) (Table 4-7). The chronic diseases included in this study were heart disease, stroke, diabetes, lung disease, asthma, arthritis or rheumatism, and osteoporosis.

The results are based on SHARE data among persons who were 50-63 years of age at baseline in 11 European countries.

Poor health and early retirement

Poor health is a predictor of early retirement

Oortwijn and colleagues (2011) (43) included six European longitudinal studies in their review that reported the relationship between poor health and early retirement. The countries included in each study were Finland (n=2), England (n=1), Denmark (n=2), and 11 EU countries (n=1). The definition of early retirement differed among countries with studies using an age range of 55-65 years or an age range of 50-59.5 years. Most studies used a general measure of (poor) health, which found poor health as a predictor of early retirement overall. The risks varied from 1.16 to 3.36, such that a worker in poor health was more likely to retire early than his or her peer in good health.

Older workers with depression are at an increased risk of early pension

In a study by Karpansalo and colleagues (2005) using data form the Finish Kuopio Ischaemic Heart Disease Risk Factor Study (KIHD), men aged 42-60 in the highest third of the depression score had an increased risk of non-illness based pension (RR: 1.86; 95% CI: 1.37-2.15) and disability pension due to mental disorders (RR: 2.74; 95% CI: 1.68-4.46) (119). Additionally, most depressed men had an increased risk of receiving a disability pension due to musculoskeletal disorders and cardiovascular diseases (Table 4-10). In another study, musculoskeletal disorders of the knee were not associated with early retirement (110).

Poor perceived health is predictor for early retirement due to mental illness and cardiovascular diseases

Karpansalo and colleagues (2004) (118) examined whether perceived general health was a predictor of early retirement using the same dataset as their study from 2005 (119) on the impact of depression among middle-aged men from eastern Finland. In this study, the authors examined the impact of perceived general health on disability pensions, including both regular disability pensions and individual early retirement pensions. A disability pension was applied if the worker became ill and the illness caused a disability that continued over 300 workdays. However, individual early retirement was a second type of illness-based disability pension that required a disability due to a chronic disease, minimum age of 56 years, and long work history (118). Poor perceived health at baseline was a predictor for both illness-based

and non-illness-based pensions after adjusting for potential confounders (Table 4-10). Poor self-assessed health was strongly related to receiving a pension due to mental illness (RR: 4.13, 95% CI: 2.04-8.37), as well as early retirement due to cardiovascular diseases (RR: 3.25, 95% CI: 2.02-5.23) (Table 4-10). In addition, poor perceived health did not predict early retirement under the age of 55 years, but did thereafter (RR: 2.55, 95% CI: 1.90-3.43) (118). Musculoskeletal disorders were the most frequently reported diagnostic reason for disability pensions (39.6%), followed by cardiovascular diseases (28.1%) and mental disorders (15.2%).

Table 4-10: Relative risk (RR) of early pensions (disability pensions and non-illness-based pensions) by depression score and self-assessed health (adjusted for potential confounders) (1984-2000) (source: Karpansalo et al., 2004, Karpansalo et al., 2005).

	Main reason for disability pensions and non-illness-based pensions			
	Mental disorders	**Musculoskeletal disorders**	**Cardiovascular diseases**	**Non-illness-based pension**
	RR (95% CI)	*RR (95% CI)*	*RR (95% CI)*	*RR (95% CI)*
Depression score				
III tertile	2.74 (1.68-4.46)	1.4 (1.01-1.95)	1.61 (1.12-2.32)	1.86 (1.37-2.51)
II tertile	1.32 (0.83-2.10)	1.17 (0.89-1.53)	1.07 (0.76-1.51)	1.04 (0.78-1.37)
I tertile	1	1	1	1
Self-assessed health				
Poor	4.13 (2.04-8.37)	2.83 (1.80-4.44)	3.25 (2.02-5.23)	3.36 (2.20-5.13)
Average	1.33 (0.89-1.99)	1.6 (1.23-2.09)	1.55 (1.11-2.16)	1.11 (0.86-1.44)
Good	1	1	1	1

Self-perceived poor health and having one or more diagnosed chronic diseases are risk factors for retirement

Self-perceived poor health is a risk factor for retirement based on data from both SHARE and the ECHP. Based on 2004-2006 SHARE data, people in poor self-perceived health had an increased risk of 1.32 (OR: 1.32, 95% CI: 1.01-1.72) to move into retirement compared to those who perceived their health as good (116) (see Table 4-7). In the ECHP, people aged 16 and over with poor perceived health had an increased risk of 2.30 for retiring (43). Also, ECHP data over the period 1994-1998, which focused on people aged 55 and over, showed that people with poor health had a higher risk of retiring the next year than their peers in good health (111).

In addition, based on SHARE, having at least one of the diagnosed chronic diseases (heart disease, stroke, diabetes, lung disease, asthma, arthritis or rheumatism, and osteoporosis), was also a significant risk factor with an increased risk of 1.28 (OR: 1.28, 95% CI: 1.01-1.62) for the transition into retirement, but mobility problems and instrumental limitations in daily activities were not (116) (see Table 4-7).

Musculoskeletal and cardiovascular diseases are the main cause of early retirement in the health sector

Table 4-11 presents the findings from several longitudinal European studies that investigated the health reasons for early retirement. In a study by Rodgers (124) among ambulance personnel and other health care staff in Northern Ireland, three quarters of the retirements were due to musculoskeletal disorders or injury (37% males, 52% females), circulatory diseases (25% males, 16% females) and mental disorders (14% males, 13% females) (see Table 4-11). The study population included people under 55 years of age and over 55 years of age, but there were no statistically significant differences in the causes of retirement between these age groups. A study by Burke et al. (125) among dentists in the United Kingdom confirmed the finding that musculoskeletal disorders were the main cause for early retirement among health care staff with a large majority (82.7%) over 50 years of age. For 30% of the premature retirees, musculoskeletal disorders were the most frequent cause followed by cardiovascular diseases (21%), and neurotic symptoms (17%).

Mental disorders are the main medical cause of illness-related retirement in educational professions

In two studies, mental disorders were found to be the most common reason for early retirement in schoolteachers and principals (Maguire and O'Connell, 2007; Weber et al., 2005) (see Table 4-11). Maguire and O'Connell (122) found mental illness (particularly depression and/or anxiety) as the most common reason for illness-related retirement among schoolteachers in Ireland. Almost half of the illness-related retirements (46%) were caused by mental illness, followed by cancer (19%) and circulatory diseases (14%). Ten per cent of the illness-related retirements were caused by musculoskeletal disorders (Table 4-11). Also, Weber and colleagues (123) found psychiatric/psychosomatic disorders were the main reason for early retirement among school principals in Bavaria, Germany; 45% of the cases were for these disorders, among which depressive disorders and exhaustion syndromes (burnout) dominated.

Table 4-11: Medical causes of illness-related retirement as reported in various studies (source: Rodgers, 1998, Burke et al., 1997, Maguire and O'Connell, 2007, Weber et al., 2005).

Study (Country)	Study population	Mental disorders	Cancer	Musculo-skeletal disorders	Circulatory / cardio-vascular
Rodgers, 1998 (124) (Northern Ireland)	Health service staff	13-14%	6-9%	37-52%	16-25%
Burke et al., 1997 (125) (UK)	Dentists	17%	-	30%	21%
Maguire and O'Connell, 2007 (122) (Ireland)	School teachers	46%	19%	10%	14%
Weber et al., 2005 (123) (Germany)	School principals	45%	9%	10%	19%

Cancer patients are at increased risk for early retirement

Carlsen et al. (2008) (126) examined cancer survivors and their risk for early retirement pension for those who were working at the time of their diagnosis. The study was performed among 44,905 Danes aged 30-60 years who were diagnosed with cancer and were compared to 211,562 randomly sampled cancer-free persons. The results showed that patients with cancer had an increased risk of 1.5 to 1.6 of taking early retirement compared to the controls. The observed risk factors for taking an early retirement pension were late age, manual job, physical and psychological comorbidity, low education and low income level (among others) (126).

Reduced left ventricular function and reduced cognitive function increase risk of early retirement in people with cardiovascular disease

Nielsen and colleagues (2004) (130) investigated whether a reduced left ventricular systolic function affects retirement after acute myocardial infarction (AMI). After four years of follow-up, 50% of the working patients with AMI were retired. The median age of the study population was 56 years, thus the sample included persons younger than 55 years. From adjusted regression analyses, it appeared that both moderately to severely reduced left ventricular systolic function (LVEF≤35%) as well as slightly to moderately reduced left ventricular systolic function (LVEF>35-50%) increased the risk of retirement about twofold compared with patients with better left ventricular function. These risks were even more pronounced among those with heavy physical demanding jobs (130).

A study from Sweden examined the influence of perceived cognitive function on unemployment and early retirement in patients with coronary artery disease (Kiessling and Henriksson, 2005) (131). The patients were under the age of 65 years, since that is the regular

age of retirement in Sweden. The mean age was 56.3 years (range 55.3-57.2). Both reduced perceived cognitive function and physical function/general health were significant predictors of early retirement or sick leave due to coronary artery disease (OR 1.59 and 1.46, respectively).

Poor health and unemployment

Mental illness is a significant predictor of unemployment in the EU working-age population

From their literature review, Oortwijn et al. (2011) found 10 longitudinal studies among European workers that examined the influence of poor health on the risk of becoming unemployed. Most studies focused on the general working age (25-65 years). In three of the ten studies, mental health problems were analysed for their value as a possible predictor of unemployment (127-129). Although the relative risks varied considerably between 1.16 and 7.75, all three studies reported a significantly increased risk of impaired mental health or psychological problems on future unemployment. The highest risk for unemployment (RR 7.75) came from a Finnish study of construction workers, who were aged 40-59 years (128). The remaining two studies included workers from the general working population of which one also included workers under 59 years of age (127).

Perceived health seems to play a more important role in unemployment than a chronic disease

In the ECHP, people aged 16 or over with a self-perceived poor health have an increased risk (1.43) of becoming unemployed compared to people who perceived their health as good (43). In an analyses using the longitudinal SHARE data, persons who perceived their health as poor were more than twice as likely to leave work and become unemployed compared to those with good self-perceived health (116). Chronic diseases, mobility problems and instrumental limitations in daily activities were not significantly associated with a transition into unemployment after adjusting for age, sex, and educational level (see Table 4-7). These findings may suggest that perceived health plays a more important role in unemployment than the presence of a chronic disease.

Large differences in the effect of poor health among countries due to disparate unemployment rates

Schuring et al. (2007) (111) used the ECHP data from the first five waves (1994-1998) to examine the effects of ill health on the selection process into paid employment and to examine the differences in employment transitions among European countries. The authors concluded that in most European countries, perceived poor health and a chronic health problem were risk factors for becoming unemployed. However, there were large differences among countries that could partly be explained by disparities in the national unemployment rates. The effects of health are stronger in countries with a lower unemployment rate, because in countries with a higher unemployment rate other reasons to lose a job are more important, such as compulsory redundancy. In addition, poor health was a more important determinant of becoming unemployed among those with a higher education than those with a lower education.

Perceived reduced cognitive and physical function predicts unemployment among people with coronary artery disease

The aforementioned study by Kiessling and Henriksson (2005) (131) among patients with coronary artery disease also showed that reduced perceived cognitive function (OR 2.06, 95% CI: 1.36-3.13) and physical function/general health (OR: 1.95, 95% CI: 1.26-3.04) significantly predicted unemployment, whereas emotional and social function did not.

4.3.2.2 The impact of economic inactivity on health

From the cross-sectional studies described in paragraph 4.3.1, it became clear that retirement and unemployment are associated with poor self-perceived health and self-reported chronic diseases in various European countries (108). In addition, the longitudinal studies described in paragraph 4.3.2.1 show that poor self-perceived health and several chronic diseases have a negative impact on the economic activity of elderly Europeans (selection hypothesis). This paragraph will address the causation hypothesis by describing longitudinal studies on the health effects of leaving the labour market at an old age (50 years or older) due to unemployment or (early) retirement.

We reviewed and described a total number of 19 longitudinal studies regarding the health effects of (early) retirement or unemployment. Most of the studies specifically considered (early) retirement. Only three relevant European studies reported on the health effects of leaving the labour market for reasons other than retirement (e.g. unemployment or work disability) among older European workers (age 50 and over). Details of the 19 included studies are presented in appendix E which describes the data source, study population, study year, operationalisation of the type of economic inactivity (i.e. retirement or unemployment), health measures, statistical analyses used, and results.

Health effects of (early) retirement

An important contribution to knowledge regarding the health effects of (early) retirement was made by Waddell and Burton (2006) (151). Their review provides evidence suggesting that early retirement can have either positive or negative effects on physical and mental health and mortality. The review led to conflicting results, and in addition, the evidence was mainly based on studies outside Europe, e.g. from the United States. The present review provides findings only from European studies and, in addition to the study by Waddell and Burton (2006), adds studies that were published after 2006.

Studies on the relationship between retirement and (disease-specific) mortality report an increased risk or no effect

Four studies indicate that (early) retirement increases the risk of (disease-specific) mortality (133-135, 148) and two studies showed no effect (132) (136). The studies were performed in multiple countries, which meant there was variation in the retirement ages of the study populations.

According to Morris and colleagues (1994), in a group of stable employed, middle-aged British men (45-64), retirement (at a mean age of 57 years) was related to an increased risk of all causes of mortality and specifically cardiovascular mortality (relative risk (RR): 1.81, 95% confidence interval (CI): 1.12-2.93) and cancer mortality (RR: 2.40, CI: 1.44-4.01), see Table 4-12 (148). The authors did not distinguish between retirement and early retirement.

Table 4-12: Relative risk of death (all causes and from cancer or circulatory disease) among middle-aged men within 5.5 years after follow-up (source: Morris et al., 1994).

	All cause of death			Cancer		Circulatory disease	
Employment status	*No of deaths*	*Age adjusted % survival for 5 years*	*Relative risk (95% CI) of death*	*No of deaths*	*Relative risk (95% CI) of death*	*No of deaths*	*Relative risk (95% CI) of death*
Continuously employed (n = 4412)	174	95.7	1.00	64	1.00	87	1.00
Unemployed not due to illness (n = 923)	68	93.3	1.47 (1.10 to 1.96)	27	1.59 (1.00 to 2.51)	36	1.64 (1.10 to 2.43)
Retired not due to illness (n = 479)	59	92.6	1.86 (1.34 to 2.59)	27	2.40 (1.44 to 4.01)	27	1.81 (1.12 to 2.93)

Bamia and colleagues (2008) drew the same conclusions based on data from the Greek EPIC study (European Prospective Investigation into Cancer Nutrition). Specifically, the authors found that early retirement (before the age of 55) was a risk factor for all-cause mortality including cardiovascular and cancer mortality in healthy persons, see Table 4-13. The authors distinguished between early retirement and retirement in their study, which seemed to nuance the finding that retirement increases the risk of cardiovascular mortality. Compared to those still employed, retirees had a 51% increase in all causes of mortality (p=0.002). The findings of this study were more evident for cardiovascular mortality (hazard ratio (HR): 1.73, 95% CI: 1.10-2.73) than for cancer mortality (HR: 1.40, CI: 0.92-2.13). Age influenced the relationship between retirement and mortality; each 5-year increase at the start of retirement was associated with a 10% decrease in all causes of mortality (p=0.003); for cardiovascular mortality this was 9%, and for cancer mortality 12% (p values not shown) (133). Bamia and colleagues measured if mandatory or voluntary retirement modified the results, but this was not the case.

In a Danish study by Quaade and colleagues (2002), the mortality in recipients of early retirement benefits (ages 60-66) was higher than the mortality for recipients who remained employed beyond the age of 60 (standardised mortality ratio (SMR): 0.88, CI: 0.86-0.90 for men and SMR: 0.72, CI: 0.70-0.75 for women) (134).

Table 4-13: Hazard ratios of death associated with retirement among healthy individuals (fully adjusted model), the Greek European Prospective Investigation into Cancer and Nutrition cohort study, 1994 - 2006 (source: Bamia et al., 2008).

Death by cause and retirement aspects	Hazard ratio	95% CI
Any cause		
Retired vs. employed at enrolment	1.51	1.16 to 1.98
Among retirees, mortality ratio for a 5-year increase in age at retirement	0.90	0.85 to 0.96
Disease of the circulatory system		
Retired vs. employed at enrolment	1.73	1.10 to 2.73
Among retirees, mortality ratio for a 5-year increase in age at retirement	0.91	0.82 to 1.00
Cancer		
Retired vs. employed at enrolment	1.40	0.92 to 2.13
Among retirees, mortality ratio for a 5-year increase in age at retirement	0.88	0.79 to 0.97
Accidents and external causes		
Retired vs. employed at enrolment	0.60	0.23 to 1.57
Among retirees, mortality ratio for a 5-year increase in age at retirement	0.88	0.65 to 1.20
Liver disease, renal failure, respiratory failure		
Retired vs. employed at enrolment	6.43	1.55 to 26.66
Among retirees, mortality ratio for a 5-year increase in age at retirement	0.92	0.73 to 1.18
All other causes		
Retired vs. employed at enrolment	1.34	0.60 to 3.04
Among retirees, mortality ratio for a 5-year increase in age at retirement	1.00	0.80 to 1.26

In a German study by Kühntopf and Tivig (2012) the life expectancy at the age of 65 was higher the later the retirement occurred (135) (see Table 4-14). This was based on microdata that included all German old-age pensioners (at least 65 years old) from 2003 to 2005. However, periods of disease influenced the finding, as did pension income. Taken together, the probability of dying before the age of 72 was 18.8%, the highest for men retired at 60 years and including at least a period of four months of disease, and 9.5%, the lowest for men who retired at age 64 with no period of disease.

Table 4-14: Probability of 65-year-old men dying before age 72 by retirement age and disease period (source: Kühntopf and Tivig, 2012).

Disease period	Retirement age					
	60 (%)	*61 (%)*	*62 (%)*	*63 (%)*	*64 (%)*	*65 (%)*
0 months	14.3	13.5	13.1	10.3	9.5	11.7
1-3 months	15.8	14.7	14.3	11.5	10.9	14.4
4+ months	18.8	18.0	16.9	13.6	13.3	18.3

Brockmann and colleagues (2009) showed that healthy people who retired early did not have a higher mortality risk than those who did not among old-age pensioners who left the labour market between 56 and 65 based on another German study (136). In a Dutch study by Kalwij and colleagues (2010) (132), early retirement (at age 62 to 64) did not affect disease-specific mortality (for cancer, cardiovascular disease or other disease) compared to people who remained employed during these years.

Retirement raised the risk of developing cancer in one study

One study found that retirement significantly raised the risk of developing cancer (137). Based on data from three waves of the English Longitudinal Study of Aging (ELSA), Behncke (2012) found that retirees (with a mean age of 60) had a 3.5 percentage point higher risk of being diagnosed with cancer than if they had stayed at work ($p<0.05$) (137).

No effects on chronic bronchitis or asthma in one study

One study by Westerlund and colleagues (2010) indicates no change due to retirement in trends for self-reported chronic bronchitis or asthma (138). The authors measured the effect of statutory retirement on respiratory disease (self-reported chronic bronchitis or asthma) (138). For this purpose, they used French GAZAL cohort data from 14,104 employees of a French national gas and electricity company.

Conflicting evidence for stroke

Two studies reported results on the effects of retirement on the risk for stroke and found conflicting results (137, 138). Based on data from employees of a French gas and electricity company, Westerlund and colleagues (2010) found no relationship between retirement and self-reported stroke. However, Behncke (2012) found that retirement significantly raised the risk of being diagnosed with stroke. Retirees had a 2.0 percentage point higher risk of being diagnosed with a stroke than if they had stayed in work ($p<0.1$). It should be noted that Bechncke and colleagues used a 90% level of significance, and thereby deviate from the standard levels of 95% or 99%. Furthermore, these two studies differed with respect to the outcome measure, since Westerlund and colleagues (2010) used a self-reported measure and Behncke (2012) used a specialist's diagnosis.

Conflicting evidence for (other) cardiovascular diseases

In addition to stroke, the studies of Westerlund and colleagues (2010) and Behncke (2012) investigated the effect of retirement on other cardiovascular diseases, including heart attack (myocardial infarction), angina and coronary heart disease. Behncke (2012) found that retirement significantly increased the risk of being diagnosed with a severe CVD (measured by angina, heart attack, stroke) (p<0.05). However, no significant effect was found in the single relationship between retirement and heart attack nor between retirement and angina, indicating that the relationship with CVD mainly reflects a higher risk for stroke (137). Heart attack was based on a doctor's diagnosis, and angina was assessed by both self-report and a doctor's diagnosis. Westerlund et al. (2010) did not find a change in the risk for CVD (measured by self-reported angina, heart attack, and stroke) (138).

No relationship between retirement and diabetes

There seems to be no relationship between retirement and diabetes. Westerlund and colleagues (2010) and Behncke (2012) both studied the effect of retirement on diabetes. Neither study found a significant relationship between retirement and diabetes (137, 138). Behncke used a doctor's diagnosis to assess diabetes and Westerlund used self-reports. In both studies, the type of diabetes was not specified.

Retirement is beneficial for mental health and depression

Based on the identified studies, it seems that retirement favourably influences general mental health (though based on one cohort) and depression, although some inconsistent results were found with respect to the effect on depression. Two studies examined the effect of retirement on mental health/functioning (139, 140) and four focussed specifically on the effect of retirement on depression (137, 138, 141, 142).

Improved mental health after retirement for London-based civil servants

Both Mein and colleagues (2003) and Jokela and colleagues (2010) found that mental health improved among retirees and declined among those who continued to work (139, 140). Both studies used data from the Whitehall II study of London-based civil servants, but not from the same waves (waves 3 and 4 for Mein and colleagues and waves 3 through 8 for Jokela and colleagues). Mein and colleagues characterised participants as still working as a civil servant or retired at the mandatory retirement age of 60 years. Their study indicates deterioration in mental health among those who continued to work (-0.88 points, CI: -1.68 to -0.09) and improvement among retirees (1.56 points, CI: 0.80 to 2.32). The adjusted difference in change in mental functioning between retirees and workers before and after mandatory retirement (in scores on The Short Form 36 General Health Survey (SF-36) with mean = 50 and standard

deviation = 10) was 3.16 points among men (95% CI: 1.91-4.41) and 2.12 points among women (CI: 0.16-4.08) (139). It must be noted that the improvement in mental functioning among retirees was restricted to those in higher employment grades. Jokela and colleagues (2010) confirmed the findings of Mein and colleagues (2003) for the relationship between statutory retirement (at age 60) and mental health (2.2 points improvement on the SF-36 (coded as t-scores), CI: 1.7-2.8) (140). In addition to the study by Mein and colleagues, Jokela and colleagues found that early voluntary retirement (before the age of 60) was also associated with 2.2 points in improvement in mental health (CI: 1.7-2.7).

Decrease in depression after retirement

Not only does general mental wellbeing seem to improve with retirement, retirement also seems to have a preserving effect, specifically on depression. The study by Westerlund and colleagues (2010) indicates that among French respondents retirement is associated with a 60% decrease in depressive symptoms (138). This finding was supported by a Swiss study by Mojon-Azzi and colleagues (2007), who found that retirement has a short-term positive influence on self-stated changes in the frequency of negative feelings such as depression or anxiety (OR: 1.9, CI: 1.1-3.2, p=0.02) (141). However, the study from Behncke (2012) found no effect of retirement on depressive symptoms (137). Both Westerlund and colleagues and Behncke used the Centre for Epidemiological Studies-Depression (CES-D) scale, which provides a subjective measure of depression (137, 138).

Whereas various studies used self-reports to measure mental wellbeing, Oksanen and colleagues (2011) studied changes in antidepressant medication use among Finnish public-sector employees across a period of nine years spanning their transition into retirement (142). Antidepressant medication use decreased among old-age retirees during the transition period (antidepressant use one year after versus one year before retirement = 0.77, CI: 0.68 to 0.88). In contrast, no change in antidepressant use was found during the preretirement or postretirement period. Statutory retirement was particularly beneficial for those with pre-existing health problems at work, since these respondents showed a greater decrease in antidepressant use after retirement.

Several other favourable health effects of retirement

In addition to the outcome measures for health as described so far, eight studies report on the effect of retirement on a variety of other outcome measures, including: (a) general health (137, 141, 144, 145, 152); (b) physical functioning (137, 139, 140); (c) mental and physical fatigue (138); and (d) cognitive function (137). In sum, retirement seems to lead to improvements with regard to perceived health, although one study indicated the opposite.

Furthermore, retirement seems to have a favourable influence on mental and physical fatigue, but the evidence for physical functioning is conflicting.

Mainly positive effect on perceived health

According to Östberg and Samuelsson (1994), subjective health improved after retirement in 22% and declined in 9% of female employees in Malmö (Sweden) (144). A positive effect of retirement on perceived health was also found in a Dutch study from Van Solinge and colleagues (2007) (152). In this study, the average perceived health improved during a period of six years, from age 57 to 63 (average), during which older workers made the transition to retirement, see Table 4-15 (152).

Based on Swiss data, Mojon-Azzi and colleagues (2007) examined whether retirement has a short-term influence on self-reported changes in general health status, and measured changes in general health status and satisfaction with general health (before and after retirement). The researchers controlled for sex, general health at baseline, highest level of education and occupational class. Retirement only led to an improvement in self-reported changes in general health (OR: 1.9, CI: 0.5-3.8, p=0.07) (141).

Bonsang and Klein (2011) used German data and found that voluntary retirement had a positive effect on satisfaction with health (Fixed Effects: 0.146, p<0.05). No significant effect was found for those who retired involuntary (145). The findings of these studies contradict with the study results of Behncke (2012), who found that retirees are 4.0 percentage points more likely to report lower self-assessed health (p<0.05) (137).

Rijs and colleagues (2011) compared retirees with a non-retiree control group and found that overall there was no significant effect for retirement on perceived health. However, when stratified by age groups and receipt of a disability pension, respondents who retired at the age of 59 or 60 and received no disability pension perceived their health as better after retirement (OR: 5.43, CI: 1.17-25.26, p=0.03). This was not found for those who retired at ages 55-58 or 61-64 (147).

Table 4-15: Changes in perceived health between 1995 (before retirement) and 2001 (after retirement) (N = 778) (source: Van Solinge, 2007).

Health measure	1995 Before retirement	2001 After retirement
Perceived health		
How would you describe your general state of health? (%)		
(very) good	82	86
not good/not bad	14	11
(very bad)	4	3
Average value of perceived health (1 = very good 5 = very bad)	1.9	1.8

Suboptimum perceived health decreases after retirement

Suboptimum health seems to decrease up to seven years after retirement compared to the prevalence of suboptimum health before retirement, as described in the study by Westerlund and colleagues (2009) (146). Overall, retirement corresponded with a drop in the prevalence of suboptimum health from 19.2% (CI: 18.5-19.9) in the year before retirement to 14.3% (CI: 13.7-14.9) in the year after retirement. Those who retired before the age of 55 (not on health grounds) benefited more from retirement than those who retired at the age of 55 or beyond. High physical and psychological job demands seemed to increase the health benefit from retirement.

Conflicting findings on physical functioning

Findings regarding the effects of retirement on physical functioning are varied. Mein and colleagues (2003) report no significant differences in physical functioning between working and retired participants in their study (139). However, Jokela and colleagues (2010) found that statutory retirement (at age 60) and early voluntary retirement were associated with 1.0 (95%CI: 0.6-1.5) and 1.1 (95% CI: 0.8-1.4) SF-36 points higher for physical functioning, respectively (140). They also found that associations between retirement and health were dependent on age at retirement, reasons for retirement and length of time spent in retirement. In the same year, Behncke and colleagues (2012) report that retirees had more problems with activities of daily living ($t=1.42$; $p<0.01$) and walking ($t=0.25$; $p<0.01$) than those who stayed at work.

Decrease in mental and physical fatigue after retirement

Westerlund and colleagues (2010) studied the relationship between retirement and mental and physical fatigue. They concluded that retirement was associated with a decrease in both mental fatigue (odds ratio (OR) one year after versus one year before retirement: 0.19, 95% CI: 0.18-0.21) and physical fatigue (OR: 0.27, CI:0.26-0.30) (138).

No effect of retirement on cognitive functioning

Another relevant health outcome measure, especially in view of dementia and Alzheimers disease, is cognitive functioning. Behncke (2012) found no significant effect of retirement on problems with cognitive functions (137).

Health effects of unemployment among older workers

Literature regarding the health effects of unemployment concentrated mainly on the effects for young or middle-aged adults. Far less evidence is available for the health effects of unemployment among older workers. Our literature search led to three longitudinal studies that reported on the health effects of unemployment among older individuals, for reasons other than retirement. These studies focussed on mortality (132, 148) and health satisfaction (149).

Conflicting results for the effect of unemployment on mortality

Concerning mortality, Morris and colleagues (1994) report that men who experienced unemployment in the five years after being included in the study at baseline were more likely to die during the following five and a half years than men who remained continuously employed (relative risk: 2.13, 95% CI: 1.71-2.65) (148). Kalwij and colleagues (2010) concluded that unemployed or those not participating in the labour force did not have a significantly different mortality risk for cancer, CVD or other diseases compared to individuals who remained employed during the three years preceding statutory retirement. In their study, the authors used the data from the 1989-2007 Panel Study of the Netherlands (Inkomens Panel Onderzoek (IPO), CBS 2009) and the 1997-2008 Causes of Death registry (CBS 2009).

Unemployment has a negative effect on health satisfaction

Findings from Gordo and colleagues (2006) suggest that job loss has a significant negative effect on the health satisfaction of individuals older than 50 (149). Their findings were based on the German Socioeconomic panel.

Unemployment has a negative impact on health in younger age groups

Although little knowledge exists on the health effects of unemployment among older (and chronically ill) workers, various reviews have been published on the health effects of unemployment in younger age groups. Work and (long-term) unemployment can be considered as major social determinants of differences in health outcomes (153). Empirical studies increasingly demonstrate that there seems to be a relationship between unemployment and health (154-158). In the report, 'Working for equity in health: the role of work, worklessness and social protection in health inequalities', evidence was reviewed on the health effects of being unemployed. In short, it was found that unemployment seems to be harmful for health and is related to higher mortality, poorer general health, longer illness,

poorer mental health, as well as higher rates of medical consultation, medication use and hospital admission (159).

Conclusions in this report were often based on the extensive review by Waddell and Burton (156). Waddell and Burton note that the health effects of unemployment are partly mediated by socio-economic status, pre-existing poverty and financial anxiety. Individual factors such as gender, family status, age and education may also modify the relationship between unemployment and health. Subsequently, the study of Waddell and Burton implies that there is conflicting evidence that unemployment is associated with altered health-related behaviour. The authors concluded that more research is needed to understand to what degree unemployment harms health.

4.4 Conclusion and discussion

Conclusion

Poor perceived health and chronic disease are predictors for exiting work: weak evidence for reverse effects

Based on our review of European longitudinal studies, we conclude that poor perceived health and certain chronic diseases are predictors of various forms of early exit from paid work among older Europeans. Retirement may have both positive and negative health effects, but the evidence for health effects of unemployment among older workers is limited. Although there is ample evidence that being without a job for a longer period is associated with a decline in health for the average working population (25-65 years), evidence for the health effects of economic inactivity on older Europeans is limited, complicated and varied. Therefore, it remains unclear to what extent and under what conditions retirement or unemployment influence (chronic) health conditions in the elderly and in what direction.

A review by Waddell and Burton also concludes that early retirement can have both positive and negative effects on physical and mental health and mortality. Early retirement may be a consequence of health problems, redundancy or a voluntary exit from the work force. The multiple reasons for early retirement may not only have a varied financial and social impact, but also a distinct impact on health after retirement. The authors conclude that workers in lower and middle socio-economic groups, i.e. those who are compulsorily retired or who face

economic insecurity in retirement, are the ones who experience negative effects on their health and wellbeing most often. The authors suggest that more long-term research is needed on the adverse versus beneficial effects of (early) retirement for older workers (156).

Discussion

Variation in study methods and design complicates drawing firm conclusions

The weakness of the existing evidence is caused by the limited number of studies and the variation in findings. For example the conclusions on the effects of retirement on health and on the effects of specific chronic diseases on economic activity are based on a limited number of individual studies. The variation in findings may be due to differences in research methods, in follow-up periods (from 1-23 years) and the study population, i.e. the general population versus occupation specific groups. Or the weakness may be due to differences in the definitions and measurements of retirement, health outcomes under study or statutory and early retirement ages in multiple European countries. Furthermore, various individual and contextual characteristics seem to affect the relationship between retirement and health. Factors such as age, education, income, lifestyle and health at baseline may affect both the decision to retire as well as later health outcomes. Some studies have either not taken these characteristics into account, or have studied only specific characteristics, as illustrated in appendix E. More methodologically harmonised research seems essential in this area.

Many factors influence the impact of economic inactivity on health

A number of factors can influence the potential health effects of retirement or early retirement. It has been suggested that the degree to which people can control the moment of their transition from work to retirement plays an important role in their health after retirement (152). Those who retire for other reasons than health, e.g. because of reorganisation or on a non-voluntary basis, perceive their health after retirement as poorer than those who retire voluntarily (152). Furthermore, the confluence of retirement with other stressful events, expectations regarding retirement, and insecurity or fear have all been suggested to influence health after a transition to retirement as well (152). In addition, it is suggested that lifestyle changes following retirement might affect a retiree's mental and physical health status (137). It is reasonable to assume that unemployment at an older age might also lead to lifestyle changes. These lifestyle changes might function as a mechanism in the relationship between economic inactivity at older age and the prevalence or the course of chronic diseases. Changes in physical activity levels are an example. For a better understanding of the impact

of economic inactivity on health, more insight into these underlying factors and mechanisms is important.

Incomplete evidence base to inform health policy

Most of the European studies that we found focus on disability and early retirement. Few studies, if any, have looked at the relation between chronic disease or poor health and unemployment of older European persons, i.e., most studies focused on the general working population. However, the relation between health and unemployment might differ with age. In addition, most of the studies we found reported on the effect of self-reported poor general health on economic activity and vice versa. Little evidence is available that focuses on specific chronic diseases among older persons, such as cardiovascular diseases, diabetes, chronic respiratory disease, cancer, and depression. Different diseases may have a very different impact on labour participation.

Another complicating factor is the fact that many studies use data from the SHARE survey, to which 11 EU-countries contributed during the first survey, or data from studies that involved a single country, which was generally a western EU country and/or again part of the SHARE data collection. Therefore, central and eastern European countries, as well as southern European countries are underrepresented in this analysis. This is of particular concern because in chapter 3 we saw that the disease burden due to the major chronic diseases cardiovascular disease and cancer is greatest in some central and eastern European countries and clearly higher in their retirement-age populations.

The studies discussed in this chapter indicate that chronic conditions can lead to economic inactivity. However, much less is known on how chronic conditions might influence people's careers and how working conditions contribute to or impair optimal functioning of workers with a chronic disease.

Policy recommendations

In short, we recommend the following actions for the EU and Member States:

- The EU and EU Member States should encourage the development and use of effective interventions to improve the work participation of people with a chronic disease who are at high risk for economic inactivity.

- EU Member States should learn from each other's experiences by an exchange of best practices.
- Both the EU and EU Member States should stimulate research to counteract the lack of evidence on the impact of economic inactivity on the health of older Europeans.
- The EU takes a coordinating and stimulating role to support the research efforts by individual Member States, for example by paying more attention to the areas that need more research in one of its research programs.

Chapter 6 gives a more detailed description of these policy recommendations.

5 Interventions to improve social participation

Manon Savelkoul and Antonia Verweij

Key messages

Limited evidence for recommendations on best interventions to improve social participation

There is only limited research evidence to formulate recommendations regarding the best interventions to improve the social participation of people with a chronic disease. Systematic reviews/meta-analyses on the effectiveness of interventions to improve social participation in people with a chronic disease are scarce. To improve evidence for interventions to increase social participation, we need studies with a longer follow-up, and more methodologically robust evaluations.

Multidisciplinary interventions are most effective

Based on the scarce information that is available, multidisciplinary interventions for patients diagnosed with cancer, mixed physical (cardiorespiratory combined with resistance) training for stroke survivors, and occupational multidisciplinary therapy for COPD patients are most effective for improving social participation. Two out of three of these effective interventions for social participation are multidisciplinary.

More research is needed on interventions focusing on work environment and multimorbidity

Although the work environment has an important role in improving the work participation of employees with chronic diseases, the effects of interventions to improve work environments do not seem to be sufficiently integrated in reviews or even analysed in individual studies to date. We also found no recent integration of studies evaluating the effects of interventions on the social participation of patients with coexisting chronic conditions. Multimorbidity, however, is common in chronic diseases. Work-directed interventions and interventions to increase the social participation of people with coexisting chronic conditions need more attention.

Social participation effects of home-based ICT-enabled interventions need to be established

Home-based ICT-enabled interventions (electronic tools for helping patients remotely) are important innovative instruments for chronic disease management. However, no systematic reviews or meta-analyses of the effects of these innovative interventions on social participation could be selected for our review. Telecommunications (e.g. as used in telehealthcare programmes), hold promise for releasing people with chronic diseases from illness-imposed isolation. However, in the absence of an explicit evidence base, further research is needed to precisely clarify the role of innovative ICT-enabled interventions for improving the social participation of people with chronic diseases.

In short, we recommend the following actions for the EU and Member States:

- To increase research evidence, EU and Member States' policy makers should use incentives to ensure that chronic disease-related interventions are adequately evaluated and include social participation outcome measures.
- EU and EU Member States should particularly stimulate the evaluation of innovative home-based ICT-enabled interventions for their effects on social participation.
- Both the EU and EU Member States should stimulate research to counteract the lack of evidence for social participation effects by directing more attention to the areas that require more research (e.g. 'work-directed' interventions and interventions for people with coexisting chronic conditions) in one of their research programs.
- The EU and EU Member States should stimulate the exchange and implementation of best practices through the development of an EU-wide best practice database.

5.1 Introduction

The long-term physical and psychological effects of chronic diseases may cause impairments that diminish social participation. First, there is reasonable evidence on the negative impact of chronic disease on labour participation as is indicated in chapter 4. As the EU population ages rapidly and the number of people with chronic diseases continues to rise, a scarcity in the labour force is foreseen. The prevention of work disability is - apart from economic advantages - also essential from an individual point of view, because employment is an important component of quality of life (160).

Policy-makers often target economic variables such as greater labour productivity, but these should not be the main criteria for evaluating specific strategies in chronic disease management (48). People with a chronic illness not only experience restrictions in their ability to work, but are also often restricted in their broader daily lives, e.g. their ability to leave home and engage in social life and leisure activities (156, 157). Social life and leisure activities are important in people's lives in addition to being able to work (160). Besides, social activities like volunteering or providing informal care are economically valuable (161), especially in an ageing society (162, 163). Working as a volunteer may also help people to obtain paid employment (161). This makes social participation in a broader sense, which besides obtaining or retaining paid employment, involves participation in other social activities like going out, meeting friends and working as a volunteer, important. Our concept of social participation is represented by the ability to fulfil social roles (see Textbox 5-1). Consequently, social participation in this chapter is conceptualised as the ability to participate in education and employment, work as a volunteer, provide informal care, or take part in recreational and other activities in social groups like the family, friends, neighbours, or others.

Textbox 5-1: The concept of social participation.

Social participation

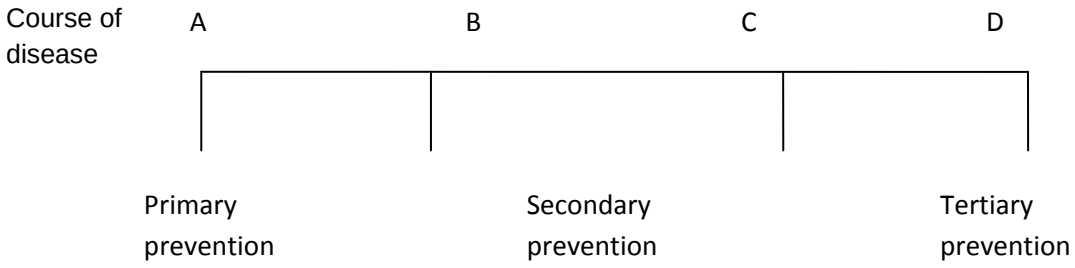
Since the publication of the International Classification of Functioning, Disability and Health (ICF) (164), the concept of participation has become a subject of interest (160). The ICF (165) presents participation domains that indicate social roles like 'interpersonal interactions and relationships', 'major life areas' (education and employment), and 'community, social, and civil life' (e.g. recreation) in addition to activities of daily living.

Before the publication of the ICF in 2001, Fougeyrollas et al. (1998) contributed to the advancement of knowledge about the concept of participation with their Disability Creation Process (DCP) model. In the DCP model, participation is defined as the accomplishment of, or engagement in daily activities and social roles (166). These activities and roles are grouped in 12 categories. Half the categories relate to social roles and include 'responsibilities' (e.g. voting), 'interpersonal relationships' (e.g. having social contacts with neighbours), 'community life' (e.g. taking part in activities of social groups), 'employment', 'education' (e.g. doing practical course work), and 'leisure' (e.g. taking part in outdoor recreation like hiking) (166, 167).

Our concept of social participation, is represented by the domains and categories for social roles in both the ICF and DCP model.

Healthy ageing is often seen as a strategy to cope with the expected consequences of chronic diseases. The focus lies on preventing disease and disability (primary prevention). This is one pathway to improve social participation. However, many EU citizens already suffer from a chronic disease and the subsequent negative impact on labour (see chapters 3 and 4) and broader social participation. Therefore, the focus of this chapter is how to improve the social participation of people in European societies who are already diagnosed with a chronic disease or will be in the future. Interventions that focus on the treatment and relief of functional, mental and social consequences of chronic diseases may lead to higher social participation among people with a chronic illness. Such interventions are part of tertiary prevention (Figure 5-1).

Figure 5-1: Prevention and stages of disease (168).



A-B	Period of increased risk
B	First observable pathophysiological changes of increased risk
C	First changes perceivable by patient
D	Course can no longer be influenced

Primary prevention is directed at the prevention of illnesses by removing the causes. The target group for primary prevention is people who are healthy with respect to a target disease.

Secondary prevention aims at identifying a disease at an early stage so that it can be treated. This makes an early cure possible (or at least prevents further deterioration). The target group for secondary prevention consists of people who are already ill without being aware of it, or those who have an increased risk or a genetic disposition for a disease.

Tertiary prevention is directed toward people who are already known to suffer from an illness. This is therefore a form of care. Tertiary prevention includes activities intended to cure, ameliorate or compensate for the disease. For example, avoiding complications or preventing the progress of a disease would be classed as tertiary prevention.

Main question

The main question of this chapter is what interventions are effective for improving the social participation of people who have a chronic disease. Eurofound and EU-OSHA have gathered information on good practices of initiatives to improve the social participation of people with a chronic disease (see paragraph 2.2.1 on the EU policy context). However, they did not specifically include the criterion of effectiveness as assessed in controlled studies comparing an intervention to usual care or a placebo intervention in their selection of case studies. The EU-OSHA report 'Work-related musculoskeletal disorders: Back to Work' is an exception and focuses on the retention, reintegration and rehabilitation of workers with musculoskeletal disorders. The report contains a literature review on the effectiveness of work-related interventions for people with musculoskeletal disorders (28).

For actually achieving improved social participation, an intervention should both work in practice and be effective. Therefore, in this chapter, we address the question of what interventions are effective for improving the social participation of people who have a chronic disease by reviewing the international literature. In this literature review, we identified systematic reviews and meta-analyses that include controlled trials and compare an intervention to usual care or a placebo intervention. The focus is on people aged 50 years and older with chronic diseases including diabetes, cardiovascular disease, cancer, COPD, and depression, as is outlined in chapter 1 (Introduction).

Outline of this chapter

The methodology of the literature review is outlined in paragraph 5.3. After describing the methods, we will report the results in paragraph 5.4. The conclusion and discussion of the results are described in paragraph 5.5. We conclude this chapter with a summary of the policy recommendations based on the results. As an introduction to European interventions for chronically ill people, the following paragraph (5.2) provides information about the European context of developments in the management of chronic diseases (paragraph 5.2.1) and of interventions to retain, rehabilitate and reintegrate people with chronic diseases in(to) work (paragraph 5.2.2).

5.2 Context

5.2.1 The management of chronic diseases

Chronic illnesses require a complex response over an extended period of time with coordinated input from a wide range of health professionals and access to essential medicines and monitoring systems. All of this must be optimally embedded within a system that promotes patient empowerment. Yet, healthcare is still largely built around an acute, episodic model of care that is ill-equipped to meet the requirements of those with chronic health problems (169). Therefore, a redesign of health care services is needed (see also the fourth priority action area in the WHO European Action Plan for the Prevention and Control of NCDs described in paragraph 2.2.2), especially because many patients suffer from several chronic conditions at the same time.

Redesign of health care: strategies and interventions

Given the need to redesign health services, policy-makers across Europe are searching for interventions and strategies to tackle chronic disease. Strategies and interventions that policy-makers can use are (48):

a. New provider qualifications and settings;
b. Disease management programs;
c. Integrated care models.

a. New provider qualifications and settings

New provider qualifications and settings have been set up since the late 1990s. New provider qualifications include physician training to coordinate activities and the development of new professions such as nurse practitioner, community nurse, liaison nurse, case manager, and family caregiver. New settings are collaborative models such as group practices, medical polyclinics and nurse-led clinics that are more patient oriented.

b. Disease management programs (DMPs)

Many European countries have introduced DMPs. DMPs are a means of coordinating care by focusing on the whole care process, with care organised and delivered according to scientific evidence and actively involved patients. DMPs are care models for individual chronic diseases. Key elements are shown in Textbox 5-2.

Textbox 5-2: Disease management programs: key elements (170).

Key elements of disease management programs:

- Comprehensive care: multidisciplinary care for the entire disease cycle;
- Integrated care, care continuum, coordination of the various components;
- Population orientation (defined by a specific condition);
- Active client-patient management tools (health education, empowerment, self-care);
- Evidence-based guidelines, protocols, care pathways;
- Information technology, system solutions;
- Continuous quality improvement.

c. Integrated care models

As chronic conditions rarely present alone, several countries are experimenting with new models of health care delivery - comprehensive integrated care models or provider networks that can achieve more integrated and comprehensive services. DMPs focusing on a single disease have increasingly come under pressure. Concepts of integrated care often include social workers in addition to health care workers, while DMPs are normally limited to health care workers. However, the concepts of integrated care and disease management are similar in some respects.

A recently published Epposi White Paper sets out key policy recommendations for the practical implementation of integrated care systems in Europe (171).

Self-management support

A component of DMPs and integrated care models may be self-management support. Self-management support includes patient education, the collaborative use of a wide range of behavioural-change techniques to foster lifestyle change, the adoption of health-promoting behaviours, and skill development across a range of chronic conditions (172). Self-management support expands the role of healthcare professionals from delivering information and traditional patient education to include helping patients build confidence and make choices that lead to improved self-management and better outcomes. Patients are being trained in problem solving, goal setting, and the use of evidence-based standardised interventions in chronic conditions. Self-management support may be delivered through standardised, programmatic interventions (172).

Home-based information and communication technology (ICT)-enabled interventions

Home-based ICT-enabled interventions (electronic tools for helping patients remotely) are important innovative instruments in the management of chronic diseases. Examples are a number of technologies described as ‘teleassistance’, ‘tele(home)care’, ‘teleconsultations’, ‘telehealth’, ‘telemedicine’, ‘telemonitoring’, and ‘telenursing’. These technologies encompass phone, internet, and/or videoconference communication between patients and health care providers, which may all be part of the strategies and interventions described above. Usually, electronic transfer of patient information delivered from a distance by the patient or a patient device, and personalised feedback from healthcare professionals who exercise their skills and judgement in the giving of tailored advice to the patient are elements of this approach to disease management. Specific content varies and may include education, assisted planning, emotional support, pragmatic advice, and automated monitoring with specialised equipment (173, 174).

Examples of applications of ICT-enabled interventions are described below.

- Telehealthcare can be applied in COPD management. Telehealthcare is distance healthcare. For COPD, this involves data communication, e.g. patient oxygen saturation or breath sounds delivered to the health caregiver, usually a doctor or nurse, who then processes the information and responds with illness management feedback (174).

- ICT-based care is provided for the management of diabetes by teleconsultation, for example (175, 176).

    - Asynchronous teleconsultation is a form of telemonitoring including patient-caregiver communication (monitoring and delivering feedback) via email, phone, automated messaging systems, other equipment with no face-to-face contact, or the internet. To improve the reliability of monitoring, clinical data such as a glucose level or insulin dose may be sent and analysed automatically. To enhance disease control, feedback can be given via computer-generated reminders when values are alarming (175, 176).

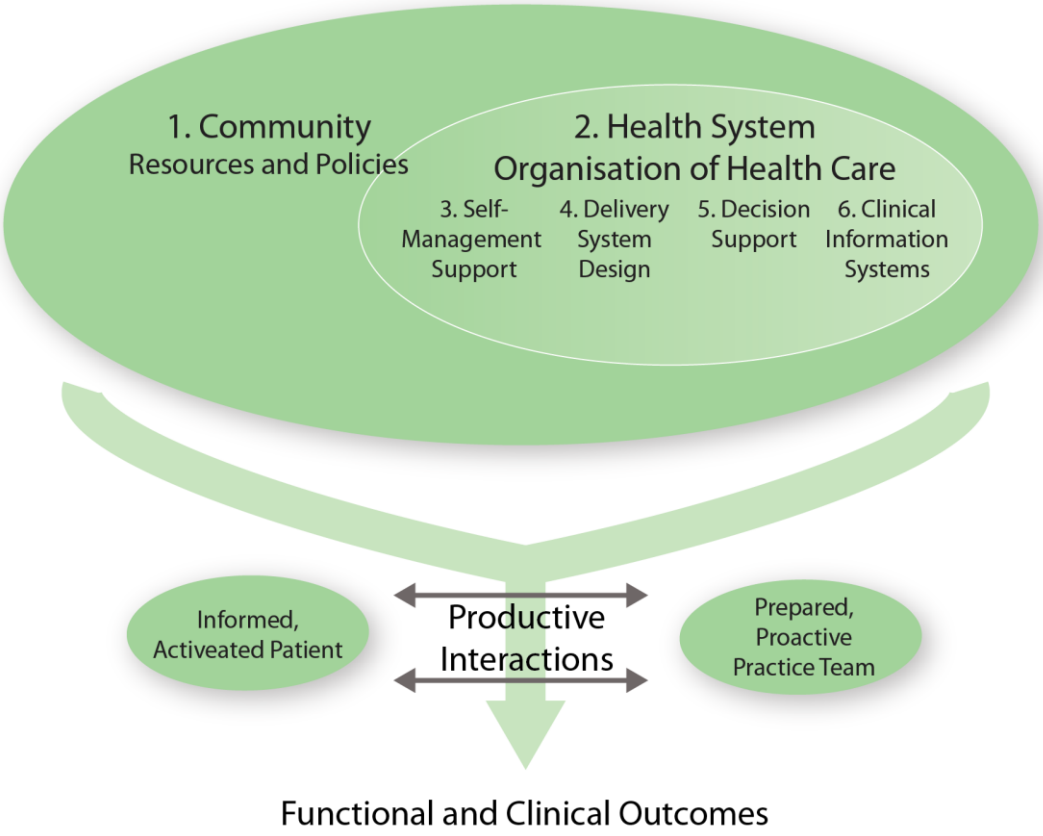
    - Synchronous teleconsultation (videoconferencing) involves real-time face-to-face contact (image and voice) via videoconferencing equipment (television, digital camera, videophone, et cetera) to simultaneously connect caregivers and one or more patients, usually for instruction. Videoconferencing may be used for ulcer treatment, patients discharged from the hospital but who still need care, injections and blood sugar control, or general diabetes management (169, 170).

Basis for redesigning health care services

The redesign of health care services as described above, has been guided by approaches taken by the United States health maintenance organisation, Kaiser Permanente, the Evercare model developed by UnitedHealth Group, and the Chronic Care Model (CCM) developed by Edward Wagner (48). The CCM, in particular, is frequently used as a basis for redesigning health care services. It is comprised of four interacting components that are key to providing good care for chronic illness: self-management support, delivery system design, decision support and clinical information systems (177) (Figure 5-2). These are set in a health system context that links an appropriately organised delivery system with complementary community resources and policies.

In the CCM both the patient and his/her healthcare providers need to be facilitated to fulfil their role in the management of the patient's condition. The patient is considered a vital actor in the management of his/her illness, who sets his/her own treatment goals together with a multidisciplinary team of healthcare providers. These healthcare providers support the patient's self-management and manage the condition proactively, starting from the goals they have agreed upon with the patient and encompassing the total chain of care.

Figure 5-2: Chronic Care Model (Wagner et al., 1999).



5.2.2 Retention and return-to-work interventions

In Europe, there are many initiatives to help retain people with a chronic illness in work, promote rehabilitation and reintegration into work following a serious health event, and support people who are on long-term sick leave to return to work. In addition to several EU level policies and initiatives and various EU Member State policies and initiatives (see also paragraph 2.2.1 on the EU policy context and the overview provided by Oortwijn and colleagues (2011) (24)), many company-level policies and initiatives can be identified.

For the last category, the following interventions can be identified (24):

a. Interventions to help retain people with a chronic illness in work;
b. Interventions to promote people's rehabilitation and reintegration into work following a serious health event;
c. Interventions to support people who are on long-term sick leave to return to work.

a. Interventions to help retain people with a chronic illness in work

Interventions to help retain people with a chronic illness in work can be roughly divided into two important types:

- Work(place) adjustment to retain the chronically ill employee in his/her current employment position;
- Redeployment of chronically ill employees who can no longer do their original job as a result of their chronic illness in the same company.

Work (place) adjustment measures are often included in the disability management policy of individual companies as a result of national anti-discrimination legislation.

Redeployment is often also included in the disability management policy of individual companies as an option to retain an (chronically) ill employee when he/she can no longer perform his/her current employment tasks. The inclusion of redeployment in company policies is often not voluntarily done, but it is part of national legislation (24).

b. Interventions to promote rehabilitation and reintegration into work following a serious health event

Interventions to promote people's rehabilitation and reintegration into work following a serious health event include return-to-work coordinators, rehabilitation programs, and psychological interventions. Rehabilitation programs (e.g. for cardiac rehabilitation) can be based on a bio-psychosocial model and consist of exercise training, educational counselling, risk factor modification, vocational guidance, psychological intervention, relaxation, and stress management training (24).

c. Interventions to support people who are on long-term sick leave to return to work

Interventions to support people who are on long-term sick leave to return to work are aimed at people who have been on a sick leave for six weeks or more and who need support to get back into work (vocational rehabilitation). Specific examples of a vocational rehabilitation intervention are training in work accommodations and feelings of self-confidence and self-efficacy in managing work-related problems, cognitive behavioural therapy (focusing on changing behaviour in certain situations by altering the thoughts that are associated with the particular situation), ergonomic work-site visits and the presence of a return-to-work

coordinator, adjustment latitude (adjustment of work conditions like tasks, work pace, workplace pace and working-time), and multidisciplinary rehabilitation (physical rehabilitation of workers combined with psychological, behavioural and educational interventions) (24).

5.3 Methods

Literature review

We conducted a review of the literature to find interventions that help people with chronic diseases to remain socially active. An information specialist in conjunction with the researchers searched for relevant systematic reviews, meta-analyses, and reviews of systematic reviews / meta-analyses in MEDLINE, EMBASE, SciSearch, Social SciSearch, and PsycINFO. Since all interventions that focus on the treatment and relief of functional, mental and social consequences of chronic diseases may lead to higher social participation, we not only searched for reviews of specific interventions described in chapter 5.2 (like nurse-led clinics, disease management programs, integrated care, or work rehabilitation), but also used general descriptions of an intervention in our search strategy (like intervention, program, treatment). Additional details on the search strategy and information on the procedure for literature selection are described in appendix F. Selection criteria are explained in Table 5-1.

The search strategy identified 1,199 publications. We screened all titles and abstracts of the retrieved publications to determine whether the study was suitable for inclusion. This led to 68 publications for which the whole text was studied for potential relevance. Based on our selection criteria, we selected seven publications for inclusion in this chapter. Most of the publications that were not selected did not meet the selection criteria regarding outcome variables or study design (see Table 5-1). Screening the references in relevant publications yielded another 21 possible relevant publications of which no publications could be selected for inclusion in this chapter based on our selection criteria. An extra literature search in the Cochrane Database of Systematic Reviews yielded another four relevant publications meeting our selection criteria. Consequently, 11 publications were included in our literature review.

Table 5-1: Criteria for inclusion of publications.

1. Study population	- Patients have one or more of the following chronic diseases: cancer, cardiovascular disease, COPD, depression, or diabetes. - Patients between 50-70 years are (part of) the study population.
2. Study design	- Systematic review / meta-analysis (description of a systematic search strategy in international databases, with papers systematically extracted according to inclusion and exclusion criteria, and quality assessment of included studies), published in 2005 or later and including randomised controlled trials (RCTs), non-randomised controlled trials (controlled clinical trials, CCTs), and/or controlled before-and-after studies (CBAs) comparing an intervention to usual care or a placebo intervention. - A review of systematic reviews / meta-analyses, including systematic reviews / meta-analyses as described above.
3. Interventions under study	- All types of intervention, including models for managing chronic diseases like new provider qualifications and settings, disease management programs, and other strategies based on integrated chronic care models (see paragraph 5.2.1). - Interventions to help retain people with a chronic illness in work or promote rehabilitation and reintegration into work after a serious health event or long-term sick leave (see paragraph 5.2.2). - Organisation- or company-level initiatives (no EU level or national policies). - Patient-, care-, or provider of service-oriented interventions (not family- / caregiver-oriented).
4. Outcome variables	- Social participation including participation in education and employment, working as a volunteer, providing informal care as well as participation in recreational and other activities in social groups like the family, friends, neighbours, or others.

5.4 Results

5.4.1 Intervention types

From the descriptions in the selected publications, we identified nine types of interventions (see Table 5-2 and Appendix G). Most of these include elements of new provider qualifications and settings, disease management programs, and integrated care models (as described in paragraph 5.2.1), or of retention and return to work interventions (see paragraph 5.2.2).

The types of interventions identified are:

- Multidisciplinary interventions (physical exercise, psychological, psychosocial, educational, behaviour change, and/or vocational (encouragement to return to work) components);
- Psychological interventions (counselling, e.g. cognitive behavioural therapy, patient education or training in coping skills, all provided by a qualified professional);
- Medical interventions (e.g. function-conserving approaches);
- Physical training;
- Liaison workers (with multidimensional roles like providing support, education and information, and liaison with other services);
- Self-management education (teaching skills, guiding behaviour change, and providing support);
- Occupational therapy (education on coping, discussion of psychological issues, solving work problems, stimulating work reintegration);
- Enhanced primary care (general practitioners enrolled in a quality improvement program);
- Shared care (joint participation of primary care physicians and specialty care physicians, and informed by enhanced information exchange).

5.4.2 Effects on social participation

We summarised all the results on effectiveness in Table 5-2. Details of the interventions (objective(s), content, frequency and duration), participants (age, chronic disease, setting), effects (short term outcomes, long-term impact), and the studies in which these effects were found (design and methodological quality) are described in a more comprehensive table in appendix G.

Below is a description of the main results.

Cancer

Multidisciplinary and psychological interventions

Multidisciplinary and psychological interventions are effective interventions for improving the social participation of people diagnosed with cancer. However, the interventions are evaluated in low- and moderate-quality studies (178) (see Appendix G). Multidisciplinary interventions, including physical, psychological and vocational (return-to-work) components, increase return-to-work rates in patients with breast cancer and those with prostate cancer. Multidisciplinary interventions also have a long-term impact on return-to-work rates, measured between 10 and 16 months after the intervention ends. Psychological interventions improve return-to-work rates in patients with breast, gynaecologic, and melanoma skin cancer. Follow-up measurements took place only for gynaecologic cancer patients. The follow-up lasted until approximately 11 months after the intervention ended and showed the long-term impact of the psychological intervention on improved return-to-work rates. Psychological interventions, however, are not effective in improving return-to-work rates for patients with prostate cancer.

Medical interventions

Medical interventions are not effective in decreasing absenteeism in people diagnosed with cancer. Results of low-quality RCTs show that medical interventions in breast, thyroid, gynaecological, head and neck, and laryngeal cancer do not influence the number of reported sick days (see Appendix G). For these interventions, the effects of the interventions on return-to-work rates were also evaluated, but no effects on this outcome were identified (178).

Physical training

Physical training or exercise programs for cancer patients have no effect on the number of days they report being sick, interference of the disease with their family and social life, or their ability to work, doing jobs or other daily activities. Appendix G shows that these results are based on several moderate- and high-quality RCTs (174, 175) and on a single very low-quality RCT (178). There is one other RCT, however, that found less disease symptom interference with work (including work around the house), in cancer patients after participating in an exercise program, but this is a low-quality study (179).

Cardiovascular diseases

Patient education

Patient education in a 3-week course provided in a health school and with a final knowledge evaluation improves the social functioning in patients with coronary heart diseases. Results of a low-quality RCT (see Appendix G) show that the participants reported less health interference with social activities with family, friends, neighbours, or others (180).

Telephone-, home-, or problem-based patient education, however, does not increase social participation (180). Three good-quality RCTs show that these types of patient education have no effect on role limitations (problems with work or other regular daily activities) or social functioning (health interference with social activities with family, friends, neighbours, or groups) (see Appendix G). Telephone-based patient education consists of follow-up by telephone and an open telephone line to provide information, education and support. Home-based patient education provides information and psychological support in two sessions with materials developed for the intervention. Problem-based patient education is a group intervention in which real life situations or scenarios are presented.

Physical training

Stroke survivors, who participate in cardiorespiratory physical training, have a decrease in their role limitations (problems with work or other daily activities) due to emotional problems, but this was found in a low-quality RCT that only measured short-term effects (see Appendix G). 'Mixed' physical training (a combination of cardiorespiratory and resistance training), is evaluated in several good-quality RCTs. Although role limitations due to emotional problems are decreased by mixed training, this effect does not continue to the last follow-up measurement at six months after the intervention ends. Improvements in role

limitations due to physical problems are found immediately after the end of mixed training and this effect is retained at follow-up (4-6 months after the end of the intervention). Mixed training, however, has no effect on stroke survivors' social functioning (health interference with social activities with family, friends, neighbours, or groups) (181).

In patients who have had a myocardial infarction (MI), effects of mixed training are similar to the effects found in stroke survivors. Mixed training after MI improves role limitations due to physical problems and this effect was also retained at follow-up (measured six months after the intervention ended). As in stroke survivors, mixed training has no effect on social functioning. These are the results of an RCT for which the quality score is not reported. Also, results on role limitations due to emotional problems are not reported (182).

Cardiac rehabilitation

Cardiac rehabilitation has no effect on role limitations (problems with work or other regular daily activities) due to emotional problems or physical problems. Cardiac rehabilitation is a multidisciplinary intervention consisting of exercise training in combination with psychosocial and/or educational interventions.

Effects of cardiac rehabilitation on social functioning are mixed. Appendix G shows that improvements in social functioning indicated by health interference with social activities with family, friends, neighbours, or groups were found immediately after cardiac rehabilitation in two studies. In another study, however, no effect was found on social functioning, as measured by the ability to perform social activities and fulfil social roles. Quality scores of the studies on cardiac rehabilitation are not reported (182).

Stroke liaison workers

Stroke liaison workers are not effective for patient participation in work, recreational, or other social activities with family, friends or acquaintances. This is the result of four RCTs (see Appendix G). Information on the quality of the studies evaluating stroke liaison workers is not reported (183).

COPD

Self-management education

For patients with COPD, several good-quality RCTs evaluated self-management education and found no effects on the number of days lost from work, restricted activity days (days where work was missed or normal activities reduced), role limitations (problems with work or other regular daily activities) due to emotional problems, role limitations due to physical problems, or social functioning (health interference with social activities with family, friends, neighbours, or groups) (184) (see Appendix G).

Occupational therapy

Role limitations due to emotional problems, role limitations due to physical problems, as well as social functioning all improved in patients with COPD immediately following community-based occupational therapy provided by a multidisciplinary team (185). The team consisted of an occupational therapist, a physiotherapist, and a dietician. However, only the effects on role limitations due to physical problems continued during the 1-year follow-up. The results are based on one RCT for which no major limitations are found in study quality (see Appendix G).

Depression

Cognitive-behavioural or occupational therapy

Cognitive-behavioural or occupational therapy for employees or self-employed people with depressive disorders has no effect on their sickness absence. People with depressive disorders participating in a low-quality RCT showed no effect of cognitive-behavioural therapy on sickness absence (see Appendix G). Occupational therapy that was evaluated in a high quality RCT also showed no influence on sickness absence (186).

Enhanced primary care

Enhanced primary care by general practitioners enrolled in a quality improvement program for patients with depressive disorders, improved the patients' work functioning measured at follow-up approximately a year after the intervention ended (one low-quality RCT, see Appendix G). Patients indicated their work functioning on a 1-10 scale of productivity at work. However, enhanced primary care had no effect on sickness absence (two low-quality RCTs) or employment status (one low-quality RCT) (186).

Shared care

A high-quality RCT shows that shared care for people with persistent symptoms of depression had no effect on their social functioning (health interference with social activities with family, friends, neighbours, or groups) or problems with work or other regular daily activities due to emotional problems (187, 188). Shared care is a structured and continuing joint programme of primary care physicians and specialty care physicians (see Appendix G).

Diabetes

Shared care

In patients with diabetes mellitus, no effect of shared care could be found on the number of days that diabetes had disrupted their normal activities (187, 188). The quality of the RCT in which this was measured is not reported (see Appendix G).

Table 5-2: Summary[*] of the intervention effects on social participation.

Chronic disease	Intervention	Effects[**]
Cancer	- Multidisciplinary intervention (with psychological, vocational, and physical training components).	[+] Higher return-to-work rates for patients with breast cancer and for patients with prostate cancer.
	- Psychological intervention (counselling, patient education or training in coping skills undertaken by a qualified professional).	[+] Higher return-to-work rates for patients with breast cancer, gynaecologic cancer, and melanoma skin cancer. [0] No effect on return-to-work rates for patients with prostate cancer.
	- Medical interventions (including function-conserving approaches such as breast conservation).	[0] No effect on return-to-work rates or on the number of days reported sick for breast, thyroid, gynaecological, head and neck, and laryngeal cancer patients.
	- Physical training / exercise programs	[0] No effect on the number of days reported sick, interference of the disease with family and social life, or ability to work, doing jobs or other daily activities.
Cardiovascular diseases	- Patient education in a course with final knowledge evaluation at course completion	[+] Better social functioning: less health interference with social activities with family, friends, neighbours, or groups.
	- Telephone-, home-, or problem-based patient education	[0] No effect on role limitations (problems with work or other regular daily activities) or on social functioning (health interference with social activities with family, friends, neighbours, or groups).
	- Cardiorespiratory physical fitness training (doing exercises in water).	[+] Improvements in role limitations due to emotional problems (less problems with work or other regular daily activities).

Chronic disease	Intervention	Effects**
Cardiovascular diseases	- Mixed physical fitness training (a combination of cardiorespiratory training and resistance training). - Cardiac rehabilitation - Stroke liaison workers (volunteers or health or social care professionals who provide support, education and information, and liaise with other services.)	[+] Improvements in role limitations due to emotional problems (less problems with work or other regular daily activities), and improvements in role limitations due to physical problems. [0] No effect on social functioning (health interference with social activities with family, friends, neighbours, or groups). [+] Improvements in social functioning (health interference with social activities with family, friends, neighbours, or groups) / [0] No effect on social functioning (ability to do social activities and fulfil social roles). [0] No effect on role limitations (problems with work or other regular daily activities). [0] No effect on extended activities of daily living (including social activities), or patient participation (e.g. in work, recreational activities, or social activities with family, friends or business acquaintances).
COPD	- Self-management education (teaching skills needed to carry out medical regimens, guide health behaviour change, and provide emotional support).	[0] No effect on the number of days lost from work, restricted activity days (days when work was missed or normal activities reduced because of health problems), role limitations (problems with work or other regular daily activities) due to emotional problems or physical problems, or social functioning (health interference with social activities with family, friends, neighbours, or groups).

Chronic disease	Intervention	Effects**
COPD	- Occupational therapy (education on coping, psychological issues, and exercise training) provided by a multidisciplinary team (occupational therapist, physiotherapist, and dietician).	[+] Improvements in role limitations due to emotional problems (less problems with work or other regular daily activities), in role limitations due to physical problems, and in social functioning (health interference with social activities with family, friends, neighbours, or groups).
Depression	- Psychological intervention consisting of a computerised form of cognitive-behavioural therapy.	[0] No effect on sickness absence.
	- Occupational therapy involving contact with both an occupational physician and employer, exploration and resolution of work problems, and preparation and initiation of work reintegration.	[0] No effect on sickness absence.
	- Enhanced primary care (quality improvement program for general practitioners).	[+] Improvement in work functioning (subjective rating of productivity at work). [0] No effect on sickness absence or employment status ('not working' or 'working').
	- Shared care or integrated care (a structured and continuing joint participation of primary care physicians and specialty care physicians in the planned delivery of care, informed by an enhanced information exchange).	[0] No effect on social functioning (health interference with social activities with family, friends, neighbours, or groups), or on role limitations (problems with work or other regular daily activities) due to emotional problems.
Diabetes	- Shared care or integrated care (a structured and continuing joint participation of primary care physicians and specialty care physicians in the planned delivery of care, informed by an enhanced information exchange).	[0] No effect on the number of days that diabetes had disrupted normal activities.

* Details of the interventions (objective(s), content, frequency and duration), participants (age, chronic disease, setting), effects (short term outcomes, long-term impact), and the studies in which these effects were found (design and methodological quality) are described in a more comprehensive table in appendix G.

** Increases in social participation: [+] ; No effects on social participation: [0]

5.5 Conclusion and discussion

Conclusion

Multidisciplinary interventions are effective

Based on the available results of the systematic review and meta-analyses selected for this chapter, we conclude that social participation is increased by:

- Multidisciplinary interventions (consisting of psychological, vocational, and physical training components) for patients diagnosed with cancer;
- Mixed physical training (cardiorespiratory combined with resistance training) for patients with cardiovascular disease;
- Occupational multidisciplinary therapy for patients with COPD.

Our review also indicates that two out of three of these effective interventions are multidisciplinary.

Based on several RCTs and CBAs with a lower quality, there are indications that psychological interventions for patients diagnosed with cancer, patient education provided in a course for people with coronary heart diseases in general, cardiorespiratory physical training for stroke survivors in particular, and enhanced primary care for people with depressive disorder all improve the social participation of these groups of patients.

Discussion

Few reviews found on interventions with social participation outcomes

An important finding of this review is the lack of systematic reviews and meta-analyses on methodologically sound intervention studies including chronic disease patients that focus on social participation outcomes in general or labour participation in particular. This may be due to the fact that good-quality intervention studies on this subject are scarce.

In the systematic reviews and meta-analyses studied for inclusion in this chapter, we found that summed health-related quality of life (HRQOL) and summed participation outcomes are often used. Although some of the summed outcomes incorporate items on social participation, a score for this specific outcome is seldom presented - only total scores are reported.

Home-based ICT-enabled interventions are not specifically reviewed for social participation effects

Although home-based ICT-enabled interventions may be part of the health care or patient interventions reviewed in this chapter, we did not find any systematic reviews or meta-analyses that evaluated these specific interventions using the selection criteria described in the Methods section (5.3). In their systematic review of diabetes teleconsultation and videoconferencing care Verhoeven et al. (2007) reported that most reviews on this subject focus solely on clinical values. Although Verhoeven et al. (2007) included quality of life as an outcome measure in their own systematic review, they reported only two studies that evaluated the effects of videoconferencing on social participation specifically, and these were both observational studies (175). Outcome measures included in reviews of ICT-enabled interventions usually include medication adherence, length of hospital stay, healthcare costs, clinical outcomes and patients' functional status, behavioural outcomes (patient-caregiver interaction, self-care), care-coordination outcomes, and mortality, as well as number of hospitalisations, emergency department visits, and exacerbations (167-170, 183). Quality of life may be one of the outcomes considered, but social participation outcomes are scarce.

Long-term impact of interventions is relatively unknown

Research has mainly concentrated on immediate to short-term outcomes only; relatively little is known about the long-term impact of interventions, although it is evident that the long-term effects of interventions for chronic diseases are quite relevant. Unfortunately, our results show that this evidence is limited since long-term follow-up is rare.

All the reviewed interventions are worker-directed

All the interventions that were studied in the systematic review and meta-analyses selected for this chapter were 'worker-directed' - aimed at employees with chronic illness or on the (health) professionals who support these employees. None of the interventions were 'work-directed', i.e. focused on adaptations in the work environment. Nieuwenhuijsen et al. (2008) explicitly searched for work-directed in addition to worker-directed intervention studies in their meta-analysis evaluating the effectiveness of interventions to reduce work disability in depressed workers. The authors found no work-directed intervention studies (e.g. modified work) (186). However, the work environment - including the supervisors' behaviour - plays

an important role in improving the work participation of employees with chronic diseases. Bouknight et al. (2006) found that work-related factors such as employer discrimination, availability of work adjustments, and workplace support (all factors as perceived by the employee), improve return-to-work outcomes for people with cancer (189). Obviously, a supportive workplace environment is important for enhancing a return to work. However, this is probably not always common as illustrated by Banning (2011) who explored the return-to-work experience of breast cancer survivors by synthesising qualitative studies on this subject. Results show that the employers' expectations of cancer survivors may be unrealistic and that employment modifications are often refused (190). Also, Bouknight et al. (2006) found that 13% of all breast cancer survivors in their study reported that their employer did not accommodate their cancer illness and treatment (189).

No reviews found for the social participation effects of interventions for coexisting chronic diseases

All of our research evidence is on interventions for specific chronic diseases, although cardiovascular disease is a common comorbidity in people with diabetes (191) and depression is a common complication for people after a stroke (192), or with chronic heart failure (192, 193), diabetes (193) or COPD (194). However, we found no recent integration of studies that evaluated the intervention effects on the social participation of patients with coexisting chronic conditions. Even if multimorbidity is recognised, social participation outcomes are not necessarily incorporated in a review or in the intervention studies. In a systematic review of non-pharmacological interventions for depressed patients with type 2 diabetes (195), no outcome measure was related to social participation. None of the few studies found in another systematic review of the effectiveness of interventions to improve outcomes in patients with multimorbidity reported social participation outcomes (196). Consequently, it is likely that there are not enough studies to integrate in a systematic review or meta-analysis on the social participation effects of interventions for patients with coexisting chronic diseases.

Risk of missing relevant studies not included in systematic reviews or meta-analyses

A weakness in our review is the risk of missing the results of (recent) intervention studies that are not synthesised in systematic reviews or meta-analyses. In addition, systematic reviews or meta-analyses published in languages other than English were excluded from the search strategy. Also, relevant information may be missing in our results, since not all authors responded to our request for additional information on the quality of the studies included in their reviews and we were not able to fill all the information gaps.

Interventions of older trials not comparable with current practices

A point of particular interest is that interventions performed in older trials included in the systematic review and meta-analyses may be not comparable with current practices, since changes in content and modes of delivery are likely to have occurred over time for some interventions. The conclusion that multidisciplinary interventions for cancer patients improve return-to-work is based on three RCTs including one trial published in 1983. Although the intervention tested in the early 1980s may not be comparable with current practice, the other trials were published more recently and consequently include interventions that are more comparable with current practice. All three trials that formed the basis for the conclusion that psychological interventions for cancer patients improved their return to work, however, were published in 1980 and therefore, a comparison with current psychological interventions may not be legitimate.

Systematic reviews and meta-analyses offer synthesised information

We focused on systematic reviews and meta-analyses, because these are of the highest quality (level of evidence) and include the results of multiple individual studies, therefore combining results and offering the most synthesised information. Our selection was also confined to systematic reviews and meta-analyses of randomised controlled trials (RCTs), non-randomised controlled trials (CCTs), and controlled before-and-after studies (CBAs). In CCTs and CBAs however, it is still difficult to be sure that improvements are due to the applied intervention and consequently RCTs are the gold standard of trial designs. In our review, almost all studies are RCTs; only one meta-analysis included CBAs that evaluated interventions for people diagnosed with cancer. However, because of this restriction in our selection of research evidence, we may have missed information on possibly relevant interventions for increasing social participation in people with chronic diseases. Especially interventions that are less suitable to evaluate in controlled studies, such as adaptations in the built environment or in the social/community environment, may be missing in our review.

Policy recommendations

In short, we recommend the following actions for the EU and Member States:

- To increase research evidence, EU and Member States' policy makers should use incentives to ensure that chronic disease-related interventions are adequately evaluated and include social participation outcome measures.

- EU and EU Member States should particularly stimulate the evaluation of innovative home-based ICT-enabled interventions for their effects on social participation.
- Both the EU and EU Member States should stimulate research to counteract the lack of evidence for social participation effects by directing more attention to the areas that require more research (e.g. ‘work-directed’ interventions and interventions for people with coexisting chronic conditions) in one of their research programs.
- The EU and EU Member States should stimulate the exchange and implementation of best practices through the development of an EU-wide best practice database.

These and other policy recommendations based on this chapter are described in chapter 6.

6 Policy recommendations

Against the background of the growing burden of chronic diseases, two parallel strategies can improve the labour participation of Europeans of retirement age (50-70 years):

1. Prevent the onset or consequences of chronic diseases;
2. Improve the participation of people with a chronic disease.

To prevent the onset or consequences of chronic diseases, we recommend the following actions for the EU and EU Member States based on our findings described in chapters 3, 4 and 5 and in accordance with recommendations of international organisations as described in chapter 2:

- The EU and EU Member States should stimulate the use of effective interventions for the prevention and treatment of chronic diseases.
- The EU and EU Member States should use an integrated and intersectoral approach to combat the growing and unequally distributed burden of chronic diseases. Health should be an issue in all policies.

To improve the participation of people that have a chronic disease, we recommend that:

- The EU and EU Member States should encourage the development and use of effective interventions to improve the social (including work) participation of people with a chronic disease who are at high risk for economic inactivity.

At the same time, it is important to evaluate new chronic disease-related interventions for their effects on participation.

- EU and EU Member States' policy makers should use incentives to ensure that chronic disease-related intervention studies are adequately evaluated and that these include social participation outcome measures.
- EU and EU Member States should particularly stimulate the evaluation of innovative home-based ICT-enabled interventions for their effects on social participation.
- The EU and EU Member States should use participation outcome measures to evaluate their health policies.

Next, to stimulate the actual use of interventions that have been proven to be effective:

- EU Member States should learn from each other's experiences by an exchange of best practices.

- The EU and EU Member States should stimulate the exchange and implementation of best practices through the development of an EU-wide best practice database.

Policy makers should not forget the basics, i.e. systematic health monitoring, which requires the availability of comparable and good quality data for chronic diseases, risk factors as well as measures of participation. To improve future data availability in the European Union we recommend that:

- The EU and EU Member States should invest further in sustainable and harmonised data collections in the area of chronic diseases.
- The EU will take responsibility for improving current data in Europe by stimulating joint data collection and facilitating the central coordination of data harmonisation and quality control and the exchange of best practices in data collection.

Next, the EU could envisage a preliminary research agenda based on our findings by highlighting several specific research areas that in our view need more attention. We feel that the EU may also have an important coordination role here. We recommend that:

- Both the EU and EU Member States should stimulate research to counteract the lack of evidence on the impact of economic inactivity on the health of older Europeans and on effective interventions to improve the social participation of people with a chronic disease.
- The EU takes a coordinating and stimulating role to support the research efforts by individual Member States.

Below we describe these recommendations in more detail.

Considerable scope to reduce disease burden through effective prevention policies

The burden of chronic diseases among older Europeans of retirement age is substantial and is expected to increase. Yet, four of the major chronic diseases discussed in chapter 3 (cardiovascular diseases, cancers, COPD and diabetes) are known to be highly susceptible to prevention efforts. Reducing or eliminating underlying risk factors including smoking, alcohol abuse, obesity and a lack of physical activity or reducing environmental risks can reduce or postpone the future incidence of these diseases. In addition, for depression effective preventive interventions are available. Therefore, there is still considerable scope to reduce chronic disease prevalence and premature death in people of retirement age with policies that implement effective efforts to prevent diseases and disability.

Maintaining the functioning and workability of people with a chronic disease is important

Our research (chapter 4) has identified evidence that self-perceived poor health, depression and musculoskeletal problems are often predictors of economic inactivity among older workers. Given the expected future shortage in the labour supply, the fact that many elderly EU citizens already suffer from a chronic disease at working age and that the number of elderly workers with a chronic disease may further increase due to higher retirement ages, there is a growing importance of preventing the economic inactivity among older workers due to health problems. Therefore, policies and interventions should also focus on ways to maintain or improve the functioning and workability of elderly people who have a chronic disease. Such interventions can mitigate the impact of chronic diseases on individuals and households as well as on the economy (7). We would like to stress that such interventions should not only focus on labour participation but also on participation in a broader sense, which also includes the ability to volunteer, provide informal care and participate in education or recreational activities. The reason for this is that social life and leisure activities are not only important in peoples' lives (160), but social activities such as volunteering or providing informal care are also economically valuable (161), especially in an ageing society (162, 163) (see chapter 5).

Stimulate the use of effective interventions to prevent and treat chronic diseases

The EU and EU Member States should stimulate the use of interventions that have been proven to be effective to prevent and treat chronic diseases. To this end, WHO has identified several priority interventions that include both population-wide interventions as well as health-care interventions for the individual. These interventions are not only evidence-based, cost-effective measures, but they are also both financially and politically feasible for implementation and scaling-up in a wide range of country contexts (see paragraph 2.2.2 WHO's policy context). In addition, many other public health organisations and societies have collected information on effective interventions and good practices related to the prevention or treatment of chronic diseases.

An integrated and intersectoral approach is needed

Since the major non-communicable diseases (NCDs) that affect the European Region share common modifiable lifestyle-related risk factors, an integrated policy approach is needed to prevent NCDs as a group (see WHO Action Plan described in paragraph 2.2.2). To optimise the treatment of people with a chronic disease, national healthcare systems also need a more integrated approach with a central role for chronic disease management and integrated care models (see paragraph 5.2.1). Acknowledging that NCD risk factors can rarely be modified

by policies and interventions within the healthcare sector alone, this integrated approach should be accompanied by an intersectoral approach that reaches across 'health' boundaries and includes a range of other policy sectors (e.g. finance, employment, agriculture, education, environment, urban design, industry and transport) (5, 31, 197, 198) (see 'Health in all Policies' in paragraph 2.2.2).

Such an intersectoral approach includes, for example, creating environments that promote physical activity and surroundings that make social participation of people with disabilities easier. In addition, the close relationship between health and economic (in)activity (chapter 4) as well as the influence of statutory retirement ages and the availability of disability and pension-like social benefits on the elderly's labour force participation, show that Member States should integrate their social and health policies. Another example is raising tobacco and alcohol taxes and allocating part of the revenue for health promotion (see paragraph 2.2.2). Particularly during this time of economic crisis and budget savings, such innovative financing mechanisms may provide opportunities to complement the national health budgets that are necessary for an effective response to the threat of chronic diseases (33). Innovative financing also refers to public-private partnerships and market-based financial transactions.

Encourage the development and use of effective interventions to improve the work participation of people with a chronic disease who are at high risk of economic inactivity

Effective interventions aimed at maintaining or improving older workers' social (including work) participation (as reviewed in chapter 5) might help to limit their early exit from work due to chronic conditions and hence increase their labour participation. However, not all people with a chronic disease have problems with social participation in general, or returning to work or work ability specifically. In chapter 4, for example, we saw that poor self-perceived health is by itself an important predictor for becoming economically inactive often without being linked to a specific chronic disease. Furthermore, in chapter 3 we saw that the percentage of people reporting good or very good self-perceived health is lower among people with a lower educational level and this percentage decreases with age. Therefore, enrolment for effective interventions like multidisciplinary interventions for people with cancer, mixed physical training for people with a cardiovascular disease, occupational multidisciplinary therapy for people diagnosed with COPD, and enhanced primary care for patients with a depressive disorder (see chapter 5) should be combined with assessments of which patients are most in need of support to improve their social participation. In addition to selecting high-risk groups for participation in effective interventions to increase social participation, it might be useful to learn from people with chronic diseases who remain socially active and use this information to develop interventions for the higher-risk groups.

However, in chapter 5 we conclude that there is only limited research evidence to formulate recommendations regarding best interventions to improve the social participation of people with a chronic disease. Systematic reviews/meta-analyses on the effectiveness of interventions to improve social participation of people with a chronic disease are scarce. Therefore, it remains important to evaluate interventions on their effects on participation.

Use incentives to ensure that intervention studies are adequately evaluated

To increase the body of evidence about interventions that improve social participation, we need studies with a longer follow-up and more methodologically robust evaluations (chapter 5). The evaluation of chronic disease interventions requires careful preparation and ideally should be built into the development of the intervention from the start. To stimulate the evaluation of chronic disease interventions, providers and insurers are encouraged to make the data they collect available for research. Policy- and decision-makers should understand the relevance and basic methodological requirements of evaluation and use incentives or regulations to ensure that evaluation (e.g. research projects that study elements of chronic disease management programs) become an integral part of programs to improve chronic disease management (48).

Stimulate the inclusion of social participation outcome measures in future intervention studies

The limited evidence from systematic reviews and meta-analyses (chapter 5) highlights the importance of explicitly including measures of social participation as an outcome measure in future systematic reviews and meta-analyses. Obviously, this is only possible if this outcome is specifically incorporated in future intervention studies. The effectiveness of disease management programmes (DMPs), for example, is currently mainly based on biomedical outcomes (199). Although it is plausible that the health benefits of chronic disease management programs result in labour productivity gains for patients who are in the labour force, there is a lack of evidence of such a causal (or even associative) link (200). Restricted activity days (days in which work and other social activities are impaired by disease) may be a better outcome than ‘days lost from work’ or ‘employment status’ for evaluating interventions for older patients with a chronic disease, because only a part of this population may have paid work. The EU can stimulate the inclusion of social participation outcome measures in future studies by directing more attention to this in one of their research programs.

Stimulate the evaluation of home-based ICT-enabled interventions on social participation effects

The EU and EU Member States should stress the importance of evaluating information and communication technology (ICT)-enabled interventions on improvements in the social participation of people with chronic diseases. Innovative ICT-enabled interventions like telehealthcare may have an impact on social participation in addition to the other positive effects that have already been assessed (174). However, in the absence of an explicit evidence base, further research is needed to precisely clarify the role of innovative ICT-enabled interventions for improving the social participation of people with chronic diseases (see chapter 5). Also, further development of innovative home-based interventions using ICT should be stimulated, since these interventions may benefit patients in ways that other more conventional interventions cannot succeed. Telecommunications (such as those used in telehealthcare programmes, for example) hold some promise for releasing people with chronic diseases from illness-imposed isolation and restricted participation.

Use social participation outcomes as an indicator for evaluating health policies

The here suggested focus on (social) participation is not new, since this is already a specific goal for several policy areas, e.g. employment. The Working for Equity in Health project showed that Active Labour Market Programmes can have positive health effects as well as reduce unemployment (159). However, little is known about the actual effectiveness of these programs, both in terms of their ability to return people to employment, as well as their potential health impacts. Therefore, the project recommends the inclusion of health as an outcome and indicator of labour market policy success. To facilitate this inclusion, the Working for Equity in Health project proposes that Health Impact Assessment methodologies form an essential feature of the Europe 2020 policies (159). Looking in the other policy direction, we recommend the inclusion of participation outcomes in the planning and evaluation of health policy and interventions.

Countries can learn from each other

The variation in disease burden among countries strongly suggests that countries can learn from each other's experiences and the exchange of best practices. This is particularly true given the relatively long time that some high-income countries have explored innovative methods of responding to chronic illness (7). However, successful approaches from low- and middle-income countries can also serve as sources of innovative ideas and strategies and should not be neglected. Learning from the experiences of other countries can stimulate the actual use of innovative interventions that have proven to be effective in preventing or treating chronic diseases or improving social participation. This should be taken into

consideration within the Open Method of Coordination on social protection and social inclusion, by which the EU promotes the coordination of national policies on issues relating to poverty and social exclusion, health and long-term care as well as pensions.

Since the burden of chronic diseases varies considerably among as well as within the EU Member States (chapter 3), the necessary policy actions may also vary. Experience from other countries needs to be tailored to fit the specific nature of the national or regional burden of chronic diseases and the organisation of the health care system in each country (7, 201). When introducing a specific intervention, policy makers should use a step-by-step approach, such as encouraging a small number of providers to use a well-designed evidence-based intervention for a small number of patients. Once positive results are available from an evaluation, the number of providers and/or patients can be increased (48, 199). The need for evaluation should not, however, unnecessarily hinder innovation nor should it be used as an excuse for uncontrolled implementation (48).

Stimulate the exchange of best practices through the development of an EU-wide best practice database

We suggest supporting the development of a centralised database on European practices and experiences that have proven to be effective for increasing the social participation in people with chronic diseases (such as the interventions described in chapter 5). Implementation barriers are particularly important components of such a database, since we also need to know what institutional and organisational conditions favour the successful implementation of an effective intervention. Information on features, barriers encountered in implementation, and outcomes, may help policy- and decision-makers to increase the social participation of people with chronic diseases in other regions. In addition, an intervention that has been proven to be effective and implementable for a specific diagnosis may also be applicable to other diagnoses since chronic conditions probably share many characteristics concerning limitations in social participation.

Invest in sustainable and harmonised data collection

The European Union and EU Member States need to monitor the changing burden of chronic diseases with accurate, comparable and timely chronic disease monitoring systems. Although some Members States (e.g. Finland, Germany and the UK) have a long tradition in national Health Interview Surveys (HIS) or Health Examination Surveys (HES), there is a lack of regularly collected and comparable data on chronic diseases at the EU level (see chapter 3), for example data such as collected in comparable disease registries. Therefore, the evidence base for supporting health policies through monitoring disease trends and making

comparisons among countries is often incomplete or lacking. EU-wide data collections such as the European Health Information Survey (EHIS), the European Health Examination Survey (EHES) and actions by Eurostat that focus on diagnosis-specific morbidity data have the potential to become important future sources of data for the prevalence of chronic diseases and their risk factors in the EU27.

The EU and Member States should invest in continuous data collection and harmonisation to provide a sustainable database that provides the possibility of monitoring and comparing trends. This is necessary to prioritise and evaluate national and European health policies. The fact that cancer registries are well established in a majority of EU Member States (although their quality and completeness may vary), shows the potential for using disease registries to obtain accurate prevalence or incidence data. The extensive experience of certain Member States with HIS, HES, and specific disease registers, shows that the EU should not only promote the exchange of best practice interventions to increase social participation, but also the exchange of best European practices for chronic disease monitoring, for example within the framework of EHIS, EHES and the Joint Action for ECHIM.

Stimulate joint data collection and facilitate central coordination

To improve future data in Europe, DG SANCO should stimulate joint data collection among Eurostat, the OECD, WHO and EU Member States by supporting their collaboration in the area of health information relating to chronic diseases as part of a common health information strategy. These organisations should join their forces and expertise and support networks that contribute to the improvement of availability, quality and comparability of health data in general, and for chronic diseases in particular. However, these international organisations and their Member States do not currently have a common strategy on chronic disease-oriented data collection and harmonisation. Sustainable and co-ordinated action and investments are needed in this area to effectively improve data availability, comparability and quality. A central form of coordination, priority setting and financial support as well as actual Member State commitment are needed to make this effort effective. The EU should play an important role in facilitating this central coordination as an accurate chronic disease monitoring system will provide the necessary overall EU picture of chronic diseases, including risk factors and consequences.

Stimulate research to counteract the lack of evidence

The limited knowledge on the impact of economic inactivity on the health of older Europeans (chapter 4), on the relationship between specific chronic diseases and economic inactivity (chapter 4) and about effective interventions to improve the social participation in people with a chronic disease (chapter 5) requires an increased research effort by individual Member States. EU policies should play an important role in stimulating and coordinating this research, for example, by directing more attention to these subjects in research programs.

Focusing on social and geographical inequalities is an essential priority

All our recommendations are particularly important in the light of the growing burden of chronic diseases such as diabetes, chronic respiratory disease and cancer that are particularly prevalent in the ageing EU population and already cause a considerable disease burden for Europeans of retirement age. Since we know that the underlying problem of ill health near retirement age is greater in lower educated people and in the economically lesser-developed central and eastern EU countries (see chapter 3), we particularly need more data, research and interventions for these population groups and these generally poorer countries and regions. Therefore, valuable studies such as SHARE (see chapter 4) should be extended to include more central and eastern EU countries, if necessary, with increased support from the European Commission.

Specific research needs

Apart from the need for more studies on the impact of specific chronic diseases and economic inactivity among older Europeans and more appropriately evaluated intervention studies that include measures of social participation as an outcome measure, specific research needs are:

- **The health effects of raising statutory retirement ages (chapter 4):** The health effects of working longer can be both positive and negative depending on the complex interaction of a series of variables. This interaction requires further research for deeper understanding. National governments should be aware that raising statutory retirement ages can seriously affect the health of the group of people who find themselves nearing retirement age. Collecting and disseminating more evidence in this area seems warranted, since European working populations are ageing and retirement ages are being shifted upward.

- **The effectiveness of interventions to stimulate voluntary labour participation beyond retirement age (chapter 4):** As labour participation can help to maintain or improve the health of older workers, more evidence-based interventions are needed to stimulate the participation of those who are willing to work beyond eligible

retirement ages by improving their health and/or working conditions. Improved knowledge about how to keep people healthy beyond their retirement and motivated to work until even higher ages will support the EU's healthy ageing strategy by highlighting effective strategies that increase the population's health and economic participation.

- **The effectiveness of 'work-directed' interventions (chapter 5):** The effects of interventions to improve the work environments of people with chronic diseases need more attention in the future. Although the work environment may have an important role in improving the work participation of employees with chronic diseases (189), the effects of interventions to improve the work environment of people with chronic diseases do not seem to be sufficiently integrated in reviews or even analysed in individual studies to date. Occupational health departments, for example, could offer managers improved education, training, and realistic guidance in terms of work expectations for employees recovering from serious illness (190).

- **Intervention studies in individuals with coexisting chronic conditions (chapter 5)**: There should be more focus on intervention studies in individuals with coexisting chronic conditions, because comorbidity and multi-morbidity are already common among Europeans of retirement age (191-194, 202) and both may increase problems with social participation (203). However, we found no recent integration of studies that evaluated the intervention effects on the social participation of patients with coexisting chronic conditions, and this may well be caused by a lack of intervention studies on this specific subject. Most disease management programs (DMPs), for example, have a single-disease approach and European country-experts on DMPs have reported that the risk of fragmentation due to this vertical approach is a weakness (199).

- **The role of underlying factors influencing the relationship between economic (in)activity and health (chapter 4):** Research into the underlying factors that influence the relationship between economic (in)activity and health should be stimulated in a broader sense. The EU may facilitate such research by supporting the exchange of best methods, practices and experiences and promoting harmonised multi-country research projects.

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Appendix A: List of abbreviations

AMI	acute myocardial infarction
BMI	Body Mass Index
CBA	controlled before-and-after studies
CCM	Chronic Care Model
CCT	controlled clinical trials
CHD	coronary heart disease
CI	confidence interval
CIDI	Composite International Diagnostic Interview
CIDI-SF	Composite International Diagnostic Interview - Short Form
COPD	Chronic Obstructive Pulmonary Disease
CVD	cardiovascular disease
DALY	Disability Adjusted Life Years
DCP	Disability Creation Process
DG SANCO	Directorate-General Health and Consumers
DMP	Disease management program
ECHIM	European Community Health Indicators Monitoring
ECHP	European Community Household Panel
EFTA	European Free Trade Association (EFTA) (EFTA has four Member States: Iceland, Liechtenstein, Norway and Switzerland)
EHIS	European Health Interview Survey
ELSA	English Longitudinal Study of Aging
EPIC	European Prospective Investigation into Cancer Nutrition
ESEMeD	European Study of the Epidemiology of Mental Disorders
EU	European Union
EU15	The 15 countries making up the European Union before 1 May 2004: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and the United Kingdom
EU27	The 27 Member States of the European Union since 1 January 2007: these are the EU15 countries plus Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia
EU-OSHA	European Agency for Health and Safety at Work
EuroCoDe	European Collaboration on Dementia
EURODEM	The European Community Concerted Action on the Epidemiology and Prevention of Dementia
Eurofound	European Foundation for the Improvement of Living and Working Conditions
Eurostat	Statistical Database of the European Union
EU-SILC	European Union Statistics on Income and Living Conditions
FYROM	Former Yugoslav Republic of Macedonia
GALI	Global Activity Limitation Indicator
GBD	Global Burden of Disease
GP	General Practitioner
GSOEP	German Socioeconomic panel
HES	Health Examination Survey
HIS	Health Interview Survey
HLY	Healthy Life Years
HR	hazard ratio
IARC	International Agency on Research on Cancer

ICD	International Classification of Diseases
ICF	International Classification of Functioning, Disability and Health
ICT	information and communication technology
IDF	International Diabetes Federation
IHD	ischemic heart disease
IPO	Panel Study of the Netherlands, Inkomens Panel Onderzoek (IPO)
ISCED	International Standard Classification of Education
LASA	Longitudinal Aging Study Amsterdam
LFS	Labour Force Survey
MCD	Major and chronic diseases
MEHM	Minimum European Health Module
MONICA	MONItoring trends and determinants in CArdiovascular disease
MS	multiple sclerosis
NCD	non-communicable disease
OECD	Organisation of Economic Cooperation and Development
OR	odds ratio
RCT	randomised controlled trials
RR	relative risk
SHARE	Survey of Health, Ageing and Retirement in Europe
SMR	standardised mortality ratio
UN	United Nations
WHO	World Health Organization
WHO-Europe	World Health Organization Regional Office for Europe
WHO-GBD	WHO Global Burden of Disease study
WHO-Hfa	WHO Health for All database
WHO-MDB	WHO Mortality database

Appendix B: List of country name abbreviations

EU27	European Union (27 countries)
EU15	European Union (15 countries)
BE	Belgium
BG	Bulgaria
CZ	Czech Republic
DK	Denmark
DE	Germany
EE	Estonia
IE	Ireland
EL	Greece
ES	Spain
FR	France
IT	Italy
CY	Cyprus
LV	Latvia
LT	Lithuania
LU	Luxembourg
HU	Hungary
MT	Malta
NL	Netherlands
AT	Austria
PL	Poland
PT	Portugal
RO	Romania
SI	Slovenia
SK	Slovakia
FI	Finland
SE	Sweden
UK	United Kingdom
IS	Iceland (EFTA and Candidate country)
NO	Norway (EFTA)
CH	Switzerland (EFTA)
ME	Montenegro (Candidate country)
HR	Croatia (Acceding country)
MK	Former Yugoslav Republic of Macedonia, the (Candidate country)
RS	Serbia (Candidate country)
TR	Turkey (Candidate country)
AL	Albania (Potential Candidate)
BA	Bosnia and Herzegovina (Potential Candidate)
XK	Kosovo (Potential Candidate)

Appendix C: Quality and comparability of data sources chapter 3

1. EHIS
2. EU-SILC
3. GLOBOCAN
4. IDF Diabetes Atlas
5. Alzheimer Europe/EuroCoDe
6. WHO-MDB and Eurostat mortality statistics
7. WHO-GBD

1. EHIS (European Health Interview Survey)

EHIS provides information on the proportion of individuals who report having been diagnosed with diabetes, COPD and depression in the past 12 months (self-reported prevalence). The data are collected via questionnaires. The answers are obtained through face-to-face interviews, telephone interviews, self-administered questionnaires or by a combination of these methods (depending on the country) (204).

The EHIS aims to achieve a high degree of harmonisation and hence a high degree of comparability among Member States. To this end, a standard questionnaire (questions, answer categories, filters, etc.) was developed as well as conceptual guidelines. In addition, a standard translation protocol was used to translate the English questionnaire into national languages. Due to varying time periods and incomplete coverage, Eurostat did not calculate EU aggregates. Furthermore, data are not age-standardised. (E)HIS-based estimates may be influenced by reporting biases and sampling related biases. Therefore they may not be an adequate reflection of the current disease prevalence in a country, and other estimates may be better for this purpose. However, as a common methodology is underlying the gathering of EHIS data, they suit well the purpose of international comparison.

2. EU-SILC (Statistics on Income and Living Conditions)

Self-reported chronic morbidity and self-perceived health

Since 2004, the data on the prevalence of chronic morbidity and self-perceived health have been provided by a health question from the EU-SILC (EU-Statistics on Income and Living Conditions). EU-SILC aims to ensure standardisation at various levels by the use of common definitions, recommendations for design and sample size as well as common requirements for sampling. Furthermore, specific fieldwork aspects are also controlled, e.g. follow-up rules for individuals and households in case of refusal or non-contact. At the same time, flexibility is a key aspect to allow a country's specificities to be taken into account to maximise the quality of the data (205).

Although Member States are urged to use standardised questionnaires, between 2004 and 2008 the implementation of the health questions in the various SILC questionnaires translated into national languages was not yet fully harmonised which may have limited the comparability of the results in some cases (205). Examples of problems for the question on chronic morbidity are differences between national questionnaires in whether the word 'longstanding' is used, whether the words 'illness' and 'health problem' are both translated and whether the explanation of a 6 months duration was included in the question (if needed in a national language). A problem with the question on self-perceived health is that some differences exist in the response categories, especially relating to the 'fair' answer category (which should be translated into a neutral term) (206). In 2007, Finland changed the answer categories for the question on self-perceived health and now it corresponds to the standard version of questionnaire. However, this action caused a break in trend for the Finnish data before and after 2007 (205).

The detailed wording of the health question on self-reported chronic morbidity and self-perceived health in the successive waves of SILC for each Member State is available on the EurOhex website (207). In October 2007, Eurostat provided the Member States with new guidelines for the health questions in the EU-SILC to improve the data comparability for the coming years. The SILC health questions benefited from these guidelines from 2008 onwards. Furthermore, a data translation protocol has been elaborated to check data comparability in all languages (205).

In addition to problems with question standardisation, cultural differences among countries might influence the interpretation of and answers to the questions on self-reported chronic morbidity and self-perceived health. Respondents from various countries may not only have distinct reference levels of health, but due to differences in habitual language use, their response categories may also have different connotations (208, 209).

Furthermore, the institutionalised population is excluded from the EU-SILC study sample (210). This could result in an underestimation of self-reported chronic morbidity and an overestimation of good self-perceived health in countries with a high proportion of institutionalised people compared with countries with a low proportion of institutionalised people. Finally, Eurostat currently does not age-standardise EU-SILC data. This hampers comparing countries with different age structures for their populations. This is especially the case for indicators that are influenced by age, such as self-reported chronic morbidity and self-perceived health.

Healthy Life Years (from 2004 onwards)

The Healthy Life Years (HLY) indicator has been purposely developed by the European Commission for comparing the health status of the EU Members States and therefore comparability is maximised. The HLY indicator is calculated using the same method (Sullivan's) for all countries. For calculating HLY, both mortality data and data on activity limitation (disability) are needed. For issues regarding the comparability of mortality data see the section on the WHO Mortality Database (WHO-MDB) and Eurostat mortality data below.

Since 2004, the disability prevalence data used in the calculation of the HLY indicator have been provided by the GALI (Global Activity Limitation Indicator) question from the EU-SILC (EU-Statistics on Income and Living Conditions). EU-SILC aims to ensure standardisation at various levels by the use of common definitions, recommendations for design and sample size and common requirements for sampling. Furthermore, specific fieldwork aspects are also controlled, e.g. follow-up rules of individuals and households in cases of refusals or non-contact. At the same time, flexibility is a key aspect to allow a country's specificities to be taken into account to maximise quality of data (205).

The GALI was developed specifically for comparing the health status of the EU Members States and is one of the few survey instruments that has undergone a long conceptual

development phase, cognitive and field trials, a scientific translation (with several back translations) and several validation studies to assess and improve comparability (207, 211-214).

Although Member States are urged to use standardised questionnaires, between 2004 and 2008, the implementation of the GALI question in the SILC questionnaires in national languages was not yet fully harmonised and this limits the comparability of the results. The detailed wording of the GALI question in the successive waves of SILC for each Member State is available on the EurOhex website (207). Examples of problems in the question implementation are (205, 206):

- The six-month period is considered as a reference period and not as the minimum duration of the limitation;
- The question refers to the respondent's own daily activities and not to the ones that people usually do;
- The use of two answer categories instead of three (e.g. Denmark);
- Only persons who declare having a longstanding illness or health problem are to answer this question instead of all persons whether or not they have a longstanding illness or health problem (also Denmark).

In October 2007, Eurostat provided new guidelines for the GALI question to the Member States to improve data comparability for the coming years (205). Furthermore, in the preparation of the European Health Interview Survey (EHIS), special attention was given to ensure a high degree of harmonisation for the GALI question by providing translation guidelines. The GALI question used in SILC has benefited from this improvement from 2008 forward.

In addition to problems with question standardisation, cultural differences among countries might influence the interpretation of and answers to the question on activity limitations. Respondents from various countries may not only have different reference levels of health, but due to differences in habitual language use, response categories may also have distinct connotations (208, 209). However, the GALI (used in EU-SILC since 2004) appears to appropriately reflect levels of function and disability as assessed by long-standing objective and subjective measures, both across Europe and in a similar way among countries (214).

The institutionalised population is excluded from the EU-SILC study sample (210). This could result in an overestimation of HLY in countries with a high proportion of institutionalised people compared with countries with a low proportion of institutionalised people. However, simulations carried out by Eurostat and EHLEIS/EHEMU have shown that the effect of this issue for the indicator HLY at birth is quite limited and not significant (215).

3. GLOBOCAN

GLOBOCAN 2008 presents national estimates based on modelling of data from regional or national registries. To account for differences in the age structure of the various populations, the incidence rates in GLOBOCAN are adjusted for age with the direct method of standardisation by use of an international standard population. GLOBOCAN uses the world population as a standard (216). To compare incidence rates from European countries, the European standardisation is preferable. Since cancer incidence varies significantly with people's age and sex, the use of age-standardised rates improves comparability over time and among countries.

In some Member States, one cancer registry covers the entire population; in others, one or more regional cancer registries cover variable proportions of the population. Some registries cover relatively small populations, which causes fluctuating incidence rates. Both issues can influence comparability.

Several other aspects can influence comparability (41):

- The calculation of the incidence rates in cases of multiple primaries (new cancer cases in patients who have already a cancer diagnosis) can differ among countries. This is corrected by excluding duplicates when the calculation is done at an international level. However, for some countries it may be difficult to distinguish between the recurrence or extension of an existing cancer and the development of a new primary cancer. Hence, their incidence rates will be too high. This is especially difficult if patient identification numbers are missing.
- Registries that include cancers identified in the necropsy examinations of subjects in whom cancer was not diagnosed (or perhaps even suspected) during their lifetime, will have higher incidence rates than registries that ignore those cancers.
- In some registries, it is possible that duplicate registration of the same cases occurs.

- The completeness of the registries differs, as well as the accuracy of the recorded diagnosis.

Total incidence rates do not provide a complete picture of cancer morbidity. The distribution of cancer stages (the extent to which the cancer has spread) among the incident cases may give additional information. The distribution can differ among countries.

Incidence rates are affected by the prevalence of risk factors in the population, and therefore also affected by primary prevention. The extent of cancer screening also influences the incidence. By screening, some cases will be detected at an earlier stage and others will be detected that would never have evolved into a symptomatic cancer.

4. IDF (International Diabetes Federation) Diabetes Atlas

The IDF Diabetes Atlas provides 'best estimates' for all European countries. The underlying data come from a variety of sources, including peer-reviewed literature, national and regional health surveys, personal communications provided by investigators in the IDF network and official reports by multinational organisations. For countries that do not have information on diabetes, data are estimated based on information from other countries that are matched for ethnicity, income level, and geography. Prevalence rates are adjusted to the World Standard Population to correct for differences in the age structure of the population and to facilitate cross-national comparisons (217).

5. Alzheimer Europe/EuroCoDe

Data on dementia prevalence are available from the EuroCoDe project (European Collaboration on Dementia) led by Alzheimer Europe. EuroCoDe's country-specific estimates are based on age distribution statistics for European countries provided by Eurostat and on the estimated European average prevalence rates from the EURODEM group and a study by Ferri et al. (2005) (87). The EURODEM group pooled data on the prevalence of moderate to severe dementia in several European countries to provide European average prevalence rates for nine age groups. Ferri et al. developed their prevalence rates through a DELPHI approach, i.e. based on a consensus statement by experts in the field of dementia and not directly from epidemiological studies.

In addition, EuroCoDe has pooled data from 31 studies from 12 (mostly Western European) countries to provide prevalence rates for eight age groups (60-64, 65-69, 70-74, 75-79, 80-84, 85-89, 90-94 and 95+) (88, 89).

6. WHO Mortality Database (WHO-MDB) and Eurostat mortality statistics

The World Health Organization and Eurostat calculate cause-specific mortality rates in a uniform way to improve international comparability. Mortality data are age-standardised so as to be comparable among countries. Since most causes of death vary significantly with people's age and sex, the use of standardised death rates improves comparability over time and among countries. Comparability is also enhanced by the fact that all countries follow the standards and rules specified in the International Classification of Diseases (ICD) for coding death certificates. In addition, the overall procedures for the collection of causes of death data are relatively homogenous among European countries (medical certification of causes of death) (218).

However, national differences in interpretation and use of ICD rules exist, and as a result there are still important quality and comparability issues (41, 218, 219):

- The coverage of residents dying abroad is not complete in all countries. On the other hand, in many countries domestic deaths of non-residents are not fully excluded.
- The revision of the classifications used to collect information on the underlying causes of death differs among the EU countries. Some countries use ICD-9, while others use ICD-10. Furthermore, not all countries apply the recommended WHO's updates (within these revisions).
- Causes of death statistics require information on the sex, age, place of residence etc. of the deceased. This information is either collected from the death certificate or taken from other sources. The completeness and validity of this information may vary among countries.
- Depending on the country, coding is done manually or using automated coding systems. These two systems may lead to (small) differences in causes of death statistics.
- Information on autopsy is often collected on the death certificate, but the results of an autopsy are not systematically included in the final statistics in some countries.

- The denominator of this indicator comes from population registers. In some countries, the completeness of the population register may not be 100% because of difficulties in reaching some population groups (like homeless or illegal immigrants), or when persons who should not be counted (emigrated persons) are nevertheless included. These problems in the population registers are considered to be small and should not lead to significant problems in comparability.

7. WHO Global Burden of Disease study (WHO-GBD)

Regional DALY estimates are based on the results of the WHO Global Burden of Disease (GBD) study for 2004 (81). DALY estimates are based on the analysis of the latest available national information on levels of mortality and cause distributions that existed at the end of 2007, together with the latest available information from WHO programs for 35 causes of public health importance, and regional information on the incidence and prevalence of diseases, injuries and their disabling sequelae. Data, methods and cause categories are described elsewhere (81, 220). The GBD 2004 uses the 2006 revision of the 2004 population estimates for WHO Member States prepared by the UN Population Division.

The individual countries' DALY estimates represent the best estimates of WHO - based on evidence available in mid-2008 - rather than the Member States' official estimates. These estimates have been computed using standard categories and methods to ensure cross-national comparability. Therefore, they are not always the same as official national estimates, nor are they necessarily endorsed by specific Member States. Methods and data sources are summarised in the Annexes of the 'Global burden of disease: 2004 update' (81) and the methodology is described in more detail elsewhere (220).

Appendix D: Tables with country-specific data chapter 3

Table D-1: Self-reported diabetes prevalence (%) by sex and age groups (45-54, 55-64, 65-74, 75-84, 85+) in 2008 (source: EHIS first wave, Eurostat 2012).

	both sexes	men						women					
	all ages	all ages	45-54	55-64	65-74	75-84	85+	all ages	45-54	55-64	65-74	75-84	85+
Belgium	4.2	4.0	2.7	7.6	9.1	13.9	9.2	4.3	2.9	6.9	9.8	10.1	12.7
Bulgaria	4.2	3.4	2.3	8.1	9.8	8.4	5.6 (u)	5.0	3.4	9.0	12.2	13.1	2.7 (u)
Czech Republic	6.1	5.8	3.3	15.4	19.0	21.8	:	6.4	2.7	11.5	11.0	27.6	7.7 (u)
Germany	7.4	7.6	6.1	13.0	18.0	22.5	c	7.1	3.9	10.3	14.9	18.4	c
Estonia	3.5	3.0	5.3	6.7	5.6	9.0	:	3.8	2.4	6.7	9.6	10.7	:
Greece	7.7	7.2	8.2	10.3	16.1	22.0	15.1	8.2	5.1	11.9	23.3	21.2	19.1
Spain	5.9	6.0	4.8	12.3	17.3	20.4	17.4	5.8	2.7	9.1	15.6	19.5	15.9
France	5.2	5.7	4.6	11.0	16.0	15.7	12.9	4.8	3.1	8.3	10.8	12.5	9.8
Cyprus	5.6	6.6	6.7	15.3	21.9	21.4	23.5 (u)	4.6	2.8	8.3	16.8	18.4	13.5
Latvia	3.7	2.6	1.6	6.8	8.2	6.9	:	4.6	2.2	7.2	12.2	11.1	6.7
Hungary	7.9	8.0	10.8	14.4	21.8	18.7	8.5 (u)	7.9	5.7	11.4	20.1	21.4	8.6
Malta	6.9	7.7	6.6	15.4	16.5	18.6	15.0 (u)	6.2	4.0	8.2	18.0	18.1	15.4 (u)
Austria	5.6	5.2	3.0	10.6	15.6	19.3	14.1	5.9	3.2	7.7	12.2	23.1	19.3
Poland	5.2	4.4	4.6	10.4	13.8	14.9	8.2	6.0	3.8	8.7	17.5	20.4	19.5
Romania	3.1	2.5	2.7	6.3	6.9	8.4	7.8	3.6	3.3	7.1	10.6	8.1	8.2
Slovenia	6.4	5.7	6.3	13.1	12.0	17.4	:	7.0	3.4	12.2	17.1	18.8	:
Slovakia	6.0	5.1	5.0	11.0	24.0	17.8	:	6.9	3.3	11.2	22.6	30.4	18.9 (u)
Turkey	5.2	3.9	6.4	12.0	15.1	9.2	30.5 (u)	6.5	10.1	19.0	20.8	17.9	6.9 (u)

c=confidential
u=unreliable data

Table D-2: Standardised mortality (SDR) for stroke (SDR per 100,000) in 2009, by sex and age (all ages, 45-59, 60-74, 75+) in all EU countries, EFTA, Accession and Candidate countries (source: WHO-MD, 2012).

	both sexes	men				women			
	all ages	all ages	45-59	60-74	75+	all ages	45-59	60-74	75+
EU average	53.91	60.52	27.11	134.23	894.04	48.40	14.71	80.81	844.73
Austria	33.58	37.96	14.31	73.49	638.63	30.23	8.46	44.78	561.03
Belgium (2006)	40.44	44.26	17.31	94.63	715.26	37.16	12.96	59.98	662.72
Bulgaria	174.86	205.03	111.35	568.05	2754.08	151.11	50.69	330.04	2484.89
Cyprus	36.36	36.57	11.38	65.94	652.91	35.79	11.50	41.03	714.10
Czech Republic	79.08	88.52	29.85	194.14	1462.20	71.62	14.56	104.37	1389.20
Denmark (2006)	52.40	58.61	23.24	125.43	937.45	47.41	17.54	87.12	815.95
Estonia	66.21	84.20	57.82	255.33	1006.91	54.56	19.84	116.44	897.59
Finland	45.86	52.10	23.33	122.01	798.30	40.33	13.58	57.90	739.29
France	27.20	31.83	14.36	65.39	508.34	23.62	8.12	35.49	428.67
Germany	37.62	40.09	15.88	86.57	646.35	34.60	10.67	47.45	653.94
Greece	74.66	73.64	24.86	136.67	1265.65	74.93	11.95	82.15	1548.14
Hungary	90.83	114.99	71.46	331.98	1468.78	74.23	26.77	159.50	1216.44
Ireland	40.84	42.54	14.20	82.70	720.99	38.75	11.51	60.63	712.73
Italy	45.51	50.78	13.29	84.50	928.36	41.29	8.48	47.68	832.13
Latvia	132.30	161.10	85.53	508.67	1990.58	113.73	37.30	257.50	1829.19
Lithuania	119.52	138.61	73.75	382.67	1851.90	105.86	27.21	219.31	1812.56
Luxembourg	46.37	55.55	12.04	136.91	909.64	38.92	12.44	50.27	751.58
Malta	58.16	70.72	13.24	115.59	1329.29	50.07	6.84	51.76	1020.98
Netherlands	33.96	34.68	12.28	67.89	587.90	32.83	12.39	49.02	590.63
Poland	72.35	87.33	58.56	250.47	1079.35	60.86	25.62	129.67	976.68
Portugal	74.70	84.55	32.49	170.57	1405.90	66.57	15.66	92.29	1288.62
Romania	169.92	195.30	105.08	564.19	2597.06	149.64	49.35	336.64	2440.57
Slovakia	94.36	115.23	62.73	339.94	1509.75	79.31	19.93	180.88	1319.89
Slovenia	66.22	78.61	23.70	185.57	1256.49	57.07	13.51	91.65	1075.14
Spain	36.10	40.86	15.93	85.33	665.53	31.88	8.71	45.19	603.06
Sweden	40.51	44.73	15.09	80.06	786.14	36.83	10.42	52.37	702.60
United Kingdom	43.20	44.11	15.88	80.36	758.36	41.72	12.22	58.97	784.63
Other countries									
Croatia	113.68	131.22	45.42	347.33	1975.96	101.08	27.32	200.15	1761.12
Iceland	37.23	42.65	12.98	65.17	760.40	31.84	0.00	39.75	644.73
Montenegro	71.77	66.63	26.59	193.87	935.88	74.75	21.61	190.02	1149.85
Norway	37.98	43.38	12.96	86.99	747.94	33.30	7.57	42.66	656.34
Serbia	144.82	153.27	71.67	453.11	2059.91	136.59	40.60	321.18	2204.85
Switzerland	26.05	27.88	8.68	47.52	501.54	24.53	6.77	32.76	474.66
FYROM	184.75	197.60	87.01	508.33	2912.28	173.80	48.93	415.13	2812.57
Turkey									

Table D-3: Standardised mortality (SDR) for ischaemic heart disease (SDR per 100,000) in 2009, by sex and age (all ages, 45-59, 60-74, 75+) in all EU countries, EFTA, Accession and Candidate countries (source: WHO-MD, 2012).

	both sexes	men				women			
	all ages	all ages	45-59	60-74	75+	all ages	45-59	60-74	75+
EU average	83.01	115.20	80.38	297.88	1423.66	58.20	17.08	105.16	1000.35
Austria	97.84	131.48	67.57	302.05	2001.40	72.56	15.03	102.30	1422.60
Belgium (2006)	59.45	87.46	59.75	238.03	1133.59	38.18	13.14	72.88	662.21
Bulgaria	116.12	158.55	159.00	472.78	1604.62	81.69	31.27	193.45	1282.45
Cyprus	69.71	108.00	105.44	291.92	1177.60	36.46	12.73	66.57	623.54
Czech Republic	170.12	218.29	119.27	551.01	3160.66	133.58	23.23	224.13	2538.15
Denmark (2008)	71.55	97.70	51.47	227.80	1465.64	51.71	12.41	98.50	924.39
Estonia	204.81	298.81	180.14	827.73	3998.28	150.16	25.78	234.64	2902.21
Finland	122.52	179.32	91.65	480.30	2548.96	80.06	13.44	110.32	1596.33
France	33.28	51.87	38.43	124.36	697.82	19.57	6.32	28.65	364.53
Germany	84.43	115.92	69.58	284.78	1654.41	59.47	14.08	89.33	1136.81
Greece	67.40	96.63	124.86	273.05	808.32	41.13	22.59	77.73	639.77
Hungary	214.82	288.98	229.91	803.12	3540.17	163.04	55.65	324.71	2784.62
Ireland	103.10	143.74	84.06	381.04	1971.14	69.20	18.28	121.75	1257.13
Italy	57.37	80.05	44.92	181.00	1196.45	40.16	8.84	58.41	778.29
Latvia	254.53	378.41	312.53	1231.90	4018.13	177.65	51.12	406.93	2931.38
Lithuania	305.14	428.55	267.70	1210.70	5557.03	229.46	51.38	378.32	4297.63
Luxembourg	43.62	68.64	45.02	175.07	948.09	25.05	8.33	40.97	452.75
Malta	115.56	154.90	52.46	413.80	2340.91	85.17	25.30	134.30	1599.89
Netherlands	42.82	62.60	36.10	169.50	840.03	27.59	11.77	53.62	458.48
Poland	96.94	139.64	116.65	418.38	1581.51	66.09	23.67	136.15	1114.11
Portugal	42.17	56.70	40.75	155.16	717.33	30.55	8.77	57.79	539.91
Romania	188.83	239.78	197.77	672.35	2823.00	147.57	51.88	309.42	2462.35
Slovakia	268.08	338.72	181.52	897.67	4757.50	217.10	43.88	375.96	4053.88
Slovenia	64.42	93.70	76.00	267.74	1112.59	41.86	13.91	73.87	755.37
Spain	45.33	66.88	51.54	179.81	829.22	27.79	8.13	45.98	508.73
Sweden	83.67	116.48	56.17	284.10	1754.07	57.54	14.53	99.06	1057.90
United Kingdom	80.77	115.60	84.49	317.88	1449.00	52.22	18.93	108.78	870.06
Other countries									
Croatia	157.75	201.04	129.57	523.10	2707.37	123.86	24.70	220.05	2299.17
Iceland	83.25	117.48	44.49	263.27	1895.89	54.60	0.00	63.24	1175.17
Montenegro	59.36	83.46	88.38	299.34	712.59	39.73	29.07	119.68	473.02
Norway	65.90	92.35	52.26	224.08	1334.18	44.85	11.37	77.26	821.69
Serbia	117.62	148.38	142.24	466.64	1502.10	91.00	38.19	228.93	1372.63
Switzerland	59.71	84.91	43.74	189.12	1312.76	40.52	6.67	52.69	815.72
FYROM	89.70	119.26	119.69	431.32	967.40	63.01	36.21	187.45	808.28
Turkey									

Table D-4: Age-standardised incidence for all cancers excl. non-melanoma skin cancer, in the EU27, EFTA, Accession and Candidate countries by sex and by age groups 50-59, 60-69, 70+ (source: GLOBOCAN 2008).

	both sexes	men				women			
	all ages	all ages	50-59	60-69	70+	all ages	50-59	60-69	70+
EU average	264.3	308.0	609.4	1503.6	2618.4	233.3	584.4	918.3	1308.4
Austria	232.7	275.4	603.9	1388.0	2124.5	200.6	491.8	797.1	1164.2
Belgium	306.8	351.3	737.5	1795.2	2812.9	275.7	723.7	1066.6	1315.1
Bulgaria	224.7	252.9	630.7	1223.7	1684.6	206.6	552.6	750.1	937.6
Cyprus	178.8	187.2	296.6	852.3	1636.7	174.5	428.7	703.4	706.6
Czech Republic	295.0	348.8	694.5	1782.8	2934.6	259.1	621.0	1096.2	1558.1
Denmark	326.1	334.7	559.8	1636.6	2960.4	325.3	757.1	1389.6	1883.8
Estonia	230.4	285.7	568.2	1414.5	2444.5	203.7	507.1	808.5	1099.0
Finland	249.8	271.3	461.5	1335.2	2477.9	239.8	592.0	1005.1	1349.9
France	300.4	360.6	804.6	1785.8	2892.8	254.9	711.9	923.6	1234.3
Germany	282.1	330.7	618.1	1650.6	2809.6	245.7	596.2	996.0	1467.7
Greece	160.0	190.0	351.7	859.9	1823.3	136.2	294.9	487.3	991.4
Hungary	282.9	352.3	875.5	1616.1	2394.6	235.6	611.5	919.0	1290.3
Ireland	317.0	355.9	677.7	1884.9	2957.2	285.1	697.2	1122.7	1758.6
Italy	274.3	310.0	537.9	1455.6	2797.5	251.6	593.7	934.7	1373.0
Latvia	230.4	304.0	583.0	1515.5	2639.6	193.4	494.9	788.3	1007.6
Lithuania	244.4	316.5	663.1	1598.3	2718.7	207.8	533.4	796.4	1065.9
Luxembourg	284.0	324.0	541.6	1534.4	3203.3	254.4	608.6	879.3	1895.0
Malta	211.4	233.2	396.9	1130.9	2210.3	199.7	516.2	818.1	1109.5
Netherlands	286.8	306.3	539.3	1511.2	2711.6	276.5	699.7	1089.7	1496.7
Poland	222.9	280.5	606.9	1444.0	2428.8	185.5	536.0	854.5	1063.7
Portugal	223.2	266.8	572.8	1198.7	2068.9	190.8	467.9	640.0	1010.2
Romania	205.1	240.6	581.6	1136.3	1626.2	179.5	463.1	688.0	903.8
Slovakia	260.6	320.2	646.5	1555.1	2696.9	223.4	546.5	914.0	1331.7
Slovenia	267.9	319.6	666.9	1569.6	2548.8	232.9	578.3	887.6	1284.6
Spain	241.4	309.9	619.4	1462.8	2656.5	187.0	459.2	655.6	1037.9
Sweden	252.1	269.6	474.3	1375.6	2343.8	241.2	552.4	1041.4	1370.3
United Kingdom	266.9	280.0	482.0	1340.0	2587.4	260.5	611.5	1073.4	1609.9
Other countries									
Croatia	263.1	315.0	655.7	1457.9	2618.1	229.3	574.2	859.2	1277.4
Iceland	282.2	305.5	556.8	1457.8	2824.7	265.6	681.8	1044.3	1649.1
Montenegro	204.3	231.2	518.1	1067.8	1833.2	185.2	486.8	731.6	1019.0
Norway	299.1	338.4	566.0	1696.9	2987.4	270.3	669.2	1124.6	1610.6
Serbia	218.9	238.5	626.7	1164.9	1606.8	205.2	600.3	830.1	953.4
Switzerland	269.3	313.2	574.3	1608.0	2624.9	236.0	597.4	963.9	1315.5
FYROM	225.1	262.1	608.2	1194.9	1812.8	196.5	509.6	751.3	925.3
Turkey	144.8	182.3	403.7	882.7	1301.9	112.8	277.4	409.5	595.5

Table D-5: Age-standardised incidence for breast cancer, in the EU27, EFTA, Accession and Candidate countries by age groups 50-59, 60-69, 70+ (source: GLOBOCAN 2008).

	women			
	all ages	**50-59**	**60-69**	**70+**
EU average	77.1	232.1	305.4	285.4
Austria	62.1	161.8	249.5	254.8
Belgium	109.2	339.4	406.5	352.9
Bulgaria	55.5	158.4	195.9	191.3
Cyprus	67.5	195.5	279.1	217.5
Czech Republic	70.9	196.6	314.7	308.0
Denmark	101.1	296.0	485.2	382.0
Estonia	50.2	153.1	185.7	193.6
Finland	86.3	284.4	385.5	288.2
France	99.7	325.8	378.2	333.6
Germany	81.8	245.9	348.3	305.2
Greece	41.4	97.7	154.3	211.3
Hungary	56.8	159.8	205.6	231.8
Ireland	93.9	301.4	348.2	347.1
Italy	86.3	248.8	324.9	317.2
Latvia	47.9	147.3	190.0	180.7
Lithuania	46.4	142.1	173.3	178.7
Luxembourg	82.3	208.2	278.9	393.4
Malta	72.2	214.6	293.4	308.4
Netherlands	98.5	293.7	359.9	376.3
Poland	48.9	158.8	212.7	178.9
Portugal	60.0	182.3	177.4	197.2
Romania	45.4	138.6	173.7	174.3
Slovakia	53.4	154.9	212.6	241.7
Slovenia	64.9	189.2	247.0	259.9
Spain	61.0	183.8	213.4	208.3
Sweden	79.4	227.1	340.5	306.6
United Kingdom	89.1	267.7	365.7	351.1
Other countries				
Croatia	64.0	198.1	252.4	252.8
Iceland	95.5	285.6	399.8	373.7
Montenegro	50.0	151.3	187.9	172.1
Norway	73.5	244.5	295.2	236.8
Serbia	57.1	182.1	229.0	206.8
Switzerland	89.4	273.7	386.4	340.3
FYROM	53.5	154.6	187.3	163.8
Turkey	28.3	79.9	79.7	90.3

Table D-6: Age-standardised incidence for lung cancer, in the EU27, EFTA, Accession and Candidate countries by sex and by age groups 50-59, 60-69, 70+ (source: GLOBOCAN 2008).

	both sexes	men				women			
	all ages	all ages	50-59	60-69	70+	all ages	50-59	60-69	70+
EU average	30.2	47.4	114.8	252.8	397.0	16.0	45.4	78.9	104.6
Austria	25.9	36.9	98.3	201.9	278.6	16.9	55.9	84.6	90.2
Belgium	35.5	57.1	130.4	318.3	492.3	17.5	61.1	83.0	84.0
Bulgaria	29.0	53.7	168.9	312.2	272.9	8.5	26.3	41.1	41.7
Cyprus	12.7	22.0	40.0	122.6	213.5	4.9	14.3	29.0	24.2
Czech Republic	34.0	55.5	119.0	343.5	456.4	17.1	47.9	90.4	121.4
Denmark	38.4	43.3	70.7	234.3	456.8	34.6	79.8	184.9	288.3
Estonia	30.5	64.1	147.7	363.9	517.0	9.0	23.0	43.2	71.7
Finland	20.2	31.2	43.7	184.0	326.9	11.7	26.4	67.8	90.6
France	30.0	47.7	155.8	236.4	309.4	14.7	54.1	58.1	65.4
Germany	28.1	42.4	96.3	227.4	375.7	16.4	50.7	82.7	100.1
Greece	29.3	52.2	124.7	291.4	427.2	9.5	27.2	44.7	65.1
Hungary	52.0	80.9	237.4	402.3	491.7	30.7	101.5	142.5	145.1
Ireland	30.6	37.9	63.7	197.4	415.9	24.4	45.7	125.4	241.0
Italy	26.7	45.4	83.2	247.6	444.1	11.4	27.9	55.2	87.4
Latvia	25.8	55.2	131.7	329.0	409.5	7.1	20.5	35.4	47.4
Lithuania	25.9	55.6	132.7	325.5	436.7	6.5	17.3	27.5	54.2
Luxembourg	30.9	46.4	92.1	220.0	445.9	18.2	56.1	79.6	123.1
Malta	17.9	32.9	45.7	189.4	377.8	5.9	16.2	35.3	37.9
Netherlands	36.0	47.4	84.7	246.8	500.9	27.2	83.3	140.8	153.8
Poland	40.9	71.2	176.6	396.5	569.2	18.6	54.7	89.3	107.2
Portugal	16.4	29.0	75.4	153.6	207.7	6.0	16.6	24.4	40.0
Romania	30.0	54.6	164.9	315.9	305.1	9.8	26.3	48.2	66.4
Slovakia	26.7	49.2	107.7	273.3	425.1	10.6	30.1	49.1	74.9
Slovenia	33.3	54.7	146.3	277.7	448.8	16.2	52.4	68.6	104.3
Spain	28.8	53.3	135.0	281.7	413.2	7.7	23.6	28.0	39.1
Sweden	17.1	18.2	31.6	97.6	193.0	16.4	33.3	102.5	117.9
United Kingdom	31.3	38.2	60.4	200.2	425.0	25.8	51.4	141.4	242.5
Other countries									
Croatia	34.1	60.0	166.9	300.4	489.1	13.8	39.4	61.0	95.8
Iceland	30.5	31.6	85.4	148.6	308.0	29.4	80.1	146.6	285.1
Montenegro	34.7	56.5	156.5	307.6	409.2	16.7	48.6	73.4	124.3
Norway	29.3	35.3	54.2	194.3	371.9	24.7	53.3	145.6	193.4
Serbia	40.7	66.1	217.9	374.4	350.4	18.5	72.8	84.7	81.9
Switzerland	26.7	38.4	83.2	213.4	336.3	17.0	49.5	91.4	107.0
FYROM	31.3	57.8	171.8	311.2	320.2	7.7	20.5	35.3	49.7
Turkey	26.0	49.1	130.0	269.4	312.7	5.2	13.9	23.6	36.3

Table D-7: Age-standardised incidence for colorectal cancer, in the EU27, EFTA, Accession and Candidate countries by sex and by age groups 50-59, 60-69, 70+ (source: GLOBOCAN 2008).

	both sexes	men				women			
	all ages	all ages	50-59	60-69	70+	all ages	50-59	60-69	70+
EU average	31.7	39.9	75.3	200.6	402.6	25.2	52.9	114.7	236.0
Belgium	36.1	44.3	80.6	213.0	447.2	29.5	58.3	129.8	270.8
Bulgaria	29.9	38.4	84.7	197.4	323.6	23.3	60.5	111.1	179.1
Cyprus	18.2	22.0	41.8	94.1	232.8	15.2	39.8	64.5	123.6
Czech Republic	39.2	54.4	104.2	289.0	520.9	27.5	55.4	130.7	256.3
Denmark	37.8	43.2	72.3	210.2	462.0	33.5	69.7	150.8	324.8
Estonia	25.4	31.5	52.6	165.3	333.5	22.2	43.1	108.2	210.4
Finland	23.8	27.7	49.5	145.5	278.4	20.9	43.4	94.0	180.2
France	29.4	36.0	76.9	168.0	360.4	24.1	56.0	101.2	225.6
Germany	35.5	45.2	81.3	234.9	455.9	27.3	50.3	121.6	288.4
Greece	13.2	15.7	26.9	68.7	165.3	11.0	22.0	40.2	121.7
Hungary	41.2	56.4	125.0	295.3	497.2	30.8	70.2	142.3	264.6
Ireland	36.1	44.5	79.3	221.1	457.7	28.8	58.6	135.0	268.7
Italy	36.5	45.2	82.3	223.6	467.7	29.9	64.4	138.1	252.4
Latvia	23.2	30.0	50.2	155.4	320.9	19.5	38.5	103.1	178.4
Lithuania	24.8	33.1	56.1	173.2	337.3	20.0	38.1	102.4	174.1
Luxembourg	32.9	40.9	67.4	163.0	502.9	25.9	39.4	79.0	364.9
Malta	26.0	31.9	76.8	153.9	312.6	21.6	67.0	88.6	155.0
Netherlands	38.3	45.6	79.0	229.2	474.3	32.3	66.6	151.5	303.2
Poland	24.5	33.1	70.9	178.0	321.2	18.4	45.2	93.0	155.2
Portugal	31.4	40.6	80.0	201.3	390.6	24.1	56.4	108.3	204.5
Romania	22.8	27.6	62.7	146.1	237.7	19.0	48.1	97.8	154.3
Slovakia	42.1	60.6	110.8	324.5	596.0	29.2	59.9	141.4	264.5
Slovenia	34.9	46.5	83.4	247.6	448.0	26.2	57.4	129.7	233.0
Spain	30.4	39.7	74.8	188.3	415.5	22.9	49.7	103.0	211.9
Sweden	28.1	31.8	50.7	154.8	345.8	25.0	50.1	113.8	237.9
United Kingdom	30.8	37.3	63.9	183.1	387.9	25.3	48.0	113.8	247.8
Other countries									
Croatia	32.8	44.4	86.4	217.0	442.5	24.3	51.8	110.0	214.8
Iceland	26.8	30.9	59.9	97.9	370.5	23.4	69.4	89.9	230.6
Montenegro	18.6	22.9	53.1	114.5	180.7	15.1	41.2	73.4	106.6
Norway	38.0	43.0	66.8	201.5	474.7	34.0	65.3	157.8	342.8
Serbia	27.0	33.5	79.3	171.0	268.3	21.5	60.2	106.5	153.8
Switzerland	25.9	31.0	61.0	156.6	297.4	21.5	49.6	90.8	198.1
FYROM	24.2	31.3	71.2	162.9	255.4	18.1	42.3	90.6	147.4
Turkey	11.0	13.2	29.7	56.6	101.8	9.1	24.4	38.3	66.1

Table D-8: Age-standardised incidence for prostate cancer, in the EU27, EFTA, Accession and Candidate countries by sex and by age groups 50-59, 60-69, 70+ (source: GLOBOCAN 2008).

	men			
	all ages	**50-59**	**60-69**	**70+**
EU average	69.5	93.7	428.8	755.6
Austria	70.7	154.6	454.7	567.3
Belgium	100.5	192.4	653.6	890.8
Bulgaria	21.9	23.7	116.2	288.5
Cyprus	46.8	62.6	261.9	551.2
Czech Republic	66.6	95.6	406.0	721.9
Denmark	72.5	89.9	463.1	779.0
Estonia	42.8	41.7	218.1	587.7
Finland	83.2	144.5	485.8	870.3
France	118.3	181.7	774.3	1172.7
Germany	82.7	115.9	540.4	837.2
Greece	16.2	11.4	52.8	285.9
Hungary	32.3	41.0	172.6	400.4
Ireland	126.3	265.4	882.7	936.6
Italy	58.4	58.2	321.3	752.9
Latvia	66.4	63.0	336.7	903.3
Lithuania	66.7	72.9	350.2	877.2
Luxembourg	74.8	77.0	446.0	916.2
Malta	51.3	45.0	353.9	551.1
Netherlands	67.7	97.4	440.8	682.4
Poland	44.3	33.6	241.3	597.0
Portugal	50.1	68.0	293.4	567.1
Romania	19.8	12.7	92.8	271.8
Slovakia	39.8	34.7	205.0	550.5
Slovenia	62.8	93.9	407.1	628.4
Spain	57.2	53.8	331.8	718.3
Sweden	95.5	162.8	621.4	889.8
United Kingdom	64.0	95.8	390.9	681.5
Other countries				
Croatia	44.2	40.6	265.2	545.8
Iceland	112.1	163.0	744.3	1069.2
Montenegro	20.1	15.1	96.0	300.5
Norway	104.1	156.3	690.5	1011.1
Serbia	18.9	14.1	89.5	274.6
Switzerland	91.3	127.8	611.1	918.5
FYROM	20.8	20.5	100.6	295.9
Turkey	14.8	15.0	78.2	194.0

Table D-9: Disease-specific mortality for all malignant neoplasms (SDR per 100,000) in 2009, by sex and age (all ages, 45-59, 60-74, 75+) in all EU countries, EFTA, Accession and Candidate countries (source: WHO-MD, 2012).

	both sexes	men				women			
	all ages	all ages	45-59	60-74	75+	all ages	45-59	60-74	75+
EU average	170.56	225.70	208.98	785.58	2036.36	130.43	150.34	428.00	1043.64
Austria	157.94	203.95	177.23	700.14	1968.17	125.56	134.68	411.18	1086.04
Belgium (2006)	170.08	227.14	195.34	781.69	2204.72	129.39	150.77	418.87	1049.43
Bulgaria	161.16	217.68	284.87	840.19	1242.44	117.78	169.92	384.76	692.27
Cyprus	121.35	150.90	100.23	564.97	1494.36	97.69	103.82	286.73	892.62
Czech Republic	197.40	265.78	239.63	1012.07	2243.98	148.40	153.48	510.36	1245.89
Denmark (2006)	207.89	245.52	190.01	849.66	2482.21	182.10	184.39	650.22	1481.25
Estonia	187.31	286.05	251.18	1090.52	2479.63	135.71	159.45	455.10	1018.13
Finland	134.77	171.37	116.31	604.34	1768.85	110.80	112.60	386.05	927.50
France	169.75	237.35	247.73	803.87	2111.61	119.27	143.92	371.75	962.37
Germany	159.89	201.97	180.16	711.98	1873.24	128.87	143.03	428.07	1060.58
Greece	153.53	207.28	185.86	715.05	1929.22	108.93	116.99	302.42	1052.51
Hungary	243.16	339.29	464.92	1226.53	2207.86	178.21	256.73	589.46	1127.85
Ireland	181.99	224.93	154.56	761.58	2396.79	149.95	146.99	497.04	1335.90
Italy	159.94	212.08	158.13	731.21	2162.67	122.19	132.65	393.12	1050.96
Latvia	193.55	288.04	281.59	1117.00	2213.96	143.31	186.76	490.43	918.93
Lithuania	190.46	293.17	301.93	1122.23	2269.17	132.45	175.82	439.49	884.66
Luxembourg	162.65	206.91	179.20	661.78	2160.69	133.11	133.33	454.62	1223.60
Malta	152.76	196.66	132.02	668.40	2081.28	122.19	116.86	442.35	988.56
Netherlands	182.40	227.24	160.46	783.84	2379.57	151.27	173.09	508.07	1196.62
Poland	201.75	279.87	274.11	1085.83	2174.48	150.11	192.88	520.02	1034.96
Portugal	156.18	216.45	235.31	702.67	1908.94	110.75	128.14	338.31	916.13
Romania	181.42	248.17	352.09	925.93	1389.56	129.56	185.87	422.67	780.88
Slovakia	196.71	275.62	285.98	1052.23	2080.61	143.46	172.73	494.97	1049.47
Slovenia	198.42	277.69	238.70	966.76	2679.57	145.46	165.26	450.18	1281.09
Spain	152.97	219.23	210.58	760.35	1989.39	101.21	123.15	298.14	856.62
Sweden	144.83	168.07	107.82	544.61	1891.92	129.51	124.05	470.16	1058.74
United Kingdom	172.50	205.65	147.31	705.70	2138.99	148.34	146.13	508.26	1276.69
Other countries									
Croatia	210.91	299.88	309.78	1059.22	2559.67	148.43	155.67	483.83	1272.80
Iceland	155.88	185.75	151.15	544.99	2083.61	133.66	107.03	486.05	1185.86
Montenegro	128.68	163.20	177.89	646.87	1131.43	103.29	168.08	358.47	487.67
Norway	156.44	190.89	124.14	625.77	2132.23	132.83	132.99	461.68	1125.86
Serbia	206.61	263.31	324.96	1016.60	1649.94	161.83	234.36	541.55	961.77
Switzerland	139.69	176.98	138.71	597.22	1816.61	113.31	121.08	397.61	912.25
FYROM	173.81	228.17	257.88	869.54	1551.42	128.42	176.35	428.02	798.89
Turkey									

Table D-10: Self-reported chronic obstructive pulmonary disease (COPD) prevalence by sex and age groups (45-54, 55-64, 65-74, 75-84, 85+) in 2008 (source: EHIS first wave, Eurostat 2012).

	both sexes	men						women					
	all ages	all ages	45-54	55-64	65-74	75-84	85+	all ages	45-54	55-64	65-74	75-84	85+
Belgium	4.0	3.9	1.8	5.3	9.1	13.8	13.1	4.1	4.1	4.6	7.0	6.8	6.7
Bulgaria	3.3	3.1	1.6	5.2	7.6	10.1	18.9 (u)	3.6	1.5	5.6	6.1	9.8	2.0 (u)
Czech Republic	2.7	1.8	3.3	1.6	6.7	13.0	:	3.5	6.1	2.4	3.7	12.4	7.8 (u)
Germany	:	:	:	:	:	:	:	:	:	:	:	:	:
Estonia	2.1	1.7	2.5	2.7	2.6	3.4	:	2.4	2.9	2.5	5.5	3.7	:
Greece	2.9	2.9	1.1	3.2	7.7	8.4	13.8	2.9	3.0	3.9	4.2	8.7	7.9
Spain	3.5	3.8	2.0	4.8	8.2	14.0	21.3	3.2	2.5	4.3	8.2	7.3	7.3
France	4.3	4.6	3.3	5.3	8.6	15.1	23.2	4.0	4.6	4.0	7.1	8.1	9.7
Cyprus	2.4	2.4	1.6	3.6	5.2	8.7	12.7 (u)	2.3	2.2	3.5	5.8	5.2	6.3
Latvia	3.3	3.0	2.0	3.3	7.2	8.3	:	3.5	2.7	4.9	5.6	5.0	4.5
Hungary	4.7	3.2	1.9	5.9	6.9	7.6	9.0 (u)	6.0	5.5	10.9	7.1	10.8	13.5
Malta	1.2	0.8	1.0	1.0	0.6	5.2	:	1.5	1.7	2.9	1.5	2.8	:
Austria	3.7	3.4	2.4	5.5	7.2	9.2	11.9	4.0	3.9	5.6	5.1	8.7	11.1
Poland	3.0	2.9	2.4	3.8	8.1	11.1	12.6	3.1	3.0	4.0	6.5	8.1	7.7
Romania	1.7	2.1	2.1	4.7	5.3	6.5	3.8	1.4	1.5	1.7	3.2	3.6	3.4
Slovenia	3.1	2.3	2.8	3.1	6.1	8.7	:	3.9	4.9	4.0	4.6	10.8	:
Slovakia	3.3	3.0	3.0	4.5	5.5	7.5	:	3.6	3.3	5.1	6.7	8.7	4.5 (u)
Turkey	6.2	5.2	5.3	9.7	13.1	13.5	6.6 (u)	7.1	9.3	11.1	17.5	12.4	5.3 (u)

u=unreliable data

Table D-11: Disease-specific mortality for chronic lower respiratory diseases (SDR per 100,000) in 2009, by sex and age (all ages, 45-59, 60-74, 75+) in all EU countries, EFTA, Accession and Candidate countries (source: WHO-MD, 2012).

	both sexes	men				women			
	all ages	all ages	45-59	60-74	75+	all ages	45-59	60-74	75+
EU average	18.49	28.51	9.73	70.63	443.85	12.18	5.53	31.6	176.78
Austria	18.85	27.78	9.8	70.88	423.53	13.15	4.89	34.04	200.1
Belgium (2006)	25.15	41.89	13.42	107.4	651.09	14.61	7.5	40.33	203.57
Bulgaria	11.76	20.42	14.02	69.47	215.82	5.5	3.81	14.48	72.42
Cyprus	11.68	19.12	2.53	41.58	340.61	6.15	1.23	9.26	119.75
Czech Republic	16.7	26.31	15.33	85.5	316.35	10.37	5.65	31.63	131.59
Denmark (2006)	37.33	41.94	12.33	104.66	666.95	35.5	15.37	124.38	434.94
Estonia	10.07	22.23	8.11	83.59	256.4	3.89	0.69	11.59	59.04
Finland	13.61	23.78	7.39	60.41	373.32	7.77	4.36	25.23	95.75
France	8.04	13.08	5.14	30.27	206.57	4.85	2.5	9.48	77.66
Germany	18.81	27.35	10.61	75.33	399.56	13.19	6.99	35.36	184.51
Greece	11.64	15.82	4.11	29.8	282.01	8.3	1.73	10.36	167.32
Hungary	33.49	51.94	39.91	160.27	595.98	22.45	20.89	62.96	252.24
Ireland	30.01	39.07	5.34	73.54	725.09	24.33	5.49	55.78	408.91
Italy	15.96	26.76	3.65	40.8	525.03	9.63	1.83	14.39	185.95
Latvia	8.53	16.87	12.46	64.54	152.9	4.1	5.19	12.28	33.13
Lithuania	17.2	38.98	18.37	120.44	514.19	6.27	2.52	17.49	87.16
Luxembourg	22.07	29.82	14.06	80.6	433.5	17.3	4.17	60.88	211.64
Malta	15.04	30.99	2.08	76.31	535.29	4.25	0	17.41	54.09
Netherlands	24.36	35.27	5.49	70.38	639.59	18.44	9.85	49.34	260.13
Poland	17.1	31.41	11.45	99.4	425.61	8.84	5.49	28.8	104.68
Portugal	14.8	24.99	6.19	50.25	438.58	8.13	1.09	12.43	158.42
Romania	21.5	35.08	25.83	107.6	406.74	11.73	5.97	26.72	178.34
Slovakia	12.11	22.69	10.83	68.5	301.35	6.05	5.66	14.1	72.07
Slovenia	13.33	23.84	4.52	49.99	423.48	7.72	1.75	16.57	134.6
Spain	18.72	35.97	7.51	75.31	630.24	7.29	2.06	11.53	134.72
Sweden	15.5	17.19	3.42	41.82	286.55	14.69	4.77	45.88	203.67
United Kingdom	28.25	34.8	10.83	94.77	524.43	24	10.1	74.12	320.59
Other countries									
Croatia	22.7	39.46	10.4	99.39	631.75	13.27	3.71	26.8	229.5
Iceland	25.93	25.19	3.23	61.68	428.66	27.24	6.81	98.22	352.31
Montenegro	0.12	0.27	0	2.27	0	0	0	0	0
Norway	26.47	33.58	8.91	82.15	538.89	22.3	9.59	73.88	282.84
Serbia	24.58	37.66	14.18	117.79	508.41	15.24	9.04	41.6	206.1
Switzerland	14.88	21.69	3.48	55.12	357.33	10.58	3.12	31.82	153.36
FYROM	17.65	25.17	9.2	73.23	361.14	12.06	5.89	32.06	166.58
Turkey									

Table D-12: Self-reported depression prevalence by sex and age groups (45-54, 55-64, 65-74, 75-84) in 2008 (source: EHIS first wave, Eurostat 2012).

	both sexes	men						women					
	all ages	all ages	45-54	55-64	65-74	75-84	85+	all ages	45-54	55-64	65-74	75-84	85+
Belgium	5.6	4.0	5.7	4.2	6.6	2.7	1.7	7.2	9.9	9.5	5.4	9.4	8.3
Bulgaria	0.8	0.4	0.3	0.7	0.6	0.5	:	1.2	0.2	2.3	2.0	2.2	:
Czech Republic	2.8	1.2	3.1	3.1	0.6	:	:	4.2	6.8	4.6	6.4	8.6	2.4 (u)
Germany	:	:	:	:	:	:	:	:	:	:	:	:	:
Estonia	:	:	:	:	:	:	:	:	:	:	:	:	:
Greece	2.3	1.3	1.1	1.2	2.1	5.8	4.0	3.3	2.6	5.8	5.0	6.9	3.9
Spain	5.3	2.9	2.7	5.3	4.4	5.0	5.3	7.6	7.2	11.8	14.6	14.9	14.9
France	3.7	2.7	4.0	3.8	2.9	2.8	3.0	4.7	6.5	7.8	5.6	6.6	4.2
Cyprus	2.4	1.6	1.4	2.0	3.2	5.0	:	3.2	3.8	3.9	6.3	8.7	11.1
Latvia	1.6	0.9	1.1	1.2	1.2	5.3	:	2.2	3.2	4.0	2.2	4.0	1.6
Hungary	4.9	2.5	2.7	4.9	4.9	2.9	:	7.0	11.5	12.6	8.6	7.9	8.6
Malta	4.7	4.1	5.1	7.9	4.7	5.2	5.0 (u)	5.1	6.0	8.2	8.0	8.5	16.0 (u)
Austria	:	:	:	:	:	:	:	:	:	:	:	:	:
Poland	2.1	1.4	2.1	2.6	2.0	2.9	0.5	2.7	4.4	4.3	3.9	3.6	3.2
Romania	0.8	0.6	0.9	0.7	0.5	1.1	0.9	0.9	1.1	1.6	1.3	2.1	:
Slovenia	3.4	2.2	2.1	4.3	3.7	:	:	4.6	5.9	6.5	13.5	4.9	:
Slovakia	1.8	1.1	2.4	1.9	1.2	2.5	:	2.4	3.8	4.4	4.5	3.9	:
Turkey	2.6	1.3	1.6	1.4	0.7	1.5	:	3.8	6.9	4.0	3.5	4.1	:

u=unreliable data

Table D-13: The number of people with dementia in Europe (source: Alzheimer Europe, 2006).

		EURODEM		Ferri et al.	
	Age group	Number of people with dementia	As % of total population	Number of people with dementia	As % of total population
Austria	30-94	104,428	1.27	94,441	1.15
Belgium	30-99	140,639	1.35	127,174	1.22
Cyprus	30-99	6,725	0.9	6,054	0.81
Czech Republic	30-99	105,553	1.03	93,973	0.92
Denmark	30-99	68,430	1.26	62,318	1.15
Estonia (2004)	30-99	15,065	1.12	12,955	0.96
Finland	30-99	65,362	1.25	59,360	1.13
France	30-99	847,808	1.36	760,715	1.22
Germany	30-94	1,118,429	1.36	1,010,245	1.22
Greece	30-99	135,566	1.22	123,700	1.12
Hungary	30-89	100,567	1	88,070	0.87
Ireland	30-94	35,381	0.86	31,940	0.78
Italy	30-99	905,713	1.55	820,462	1.4
Latvia	30-99	25,969	1.13	22,509	0.98
Lithuania	30-99	35,298	1.03	30,169	0.88
Luxembourg	30-94	4,857	1.07	4,370	0.96
Malta	30-89	3,427	0.85	3,148	0.78
Netherlands	30-99	183,485	1.13	165,585	1.02
Poland	30-99	350,511	0.92	300,447	0.79
Portugal	30-94	129,916	1.23	119,308	1.13
Slovenia	30-99	21,788	1.09	19,302	0.97
Slovakia	30-99	44,813	0.83	38,232	0.71
Spain	30-99	583,208	1.36	533,388	1.24
Sweden	30-99	138,641	1.54	128,220	1.42
UK (2004)	30-89	660,573	1.11	621,717	1.04
EU25 total		**5,832,152**	**1.27**	**5,277,802**	**1.14**
Romania	30-99	200,893	0.93	172,130	0.79
Bulgaria	30-99	87,797	1.13	76,556	0.99
EU27 total		**6,120,842**		**5,526,488**	
Iceland	30-99	2,845	0.97	2,584	0.88
Norway	30-99	61,077	1.33	56,227	1.22
Switzerland	30-94	97,068	1.31	88,900	1.2
Turkey	30-74	129,715	0.18	78,546	0.11
other countries total		**290,705**		**226,257**	
Grand Total		**6,411,547**		**5,752,745**	

Table D-14: Percentage of people reporting good or very good self-perceived health in 2010, by country, sex and age (source EU-SILC 2010, Eurostat 2012).

	both sexes	men						women					
	all ages	all ages	45-54	55-64	65-74	75-84	85+	all ages	45-54	55-64	65-74	75-84	85+
EU average	68.8	71.4	69.8	56.2	44.0	30.6	25.0	66.4	67.3	53.3	39.1	25.2	22.9
Austria	69.6	72.1	73.3	51.3	49.9	30.1	28.4	67.2	66.4	56.6	45.2	23.3	11.8
Belgium	73.1	75.5	72.3	63.9	60.5	42.6	40.4	70.9	71.5	66.7	46.5	37.5	29.9
Bulgaria	67.7	72.9	78.3	54.0	29.3	12.0	5.7	62.8	71.7	43.4	18.3	6.5	2.5
Cyprus	76.2	78.0	78.7	59.8	46.4	30.3	13.0	74.4	74.1	50.1	31.7	16.6	26.7
Czech Republic	62.4	65.1	62.7 (u)	44.3	24.9	13.7	8.4	60.3	61.7	40.6	24.0	9.3	7.1 (u)
Denmark	71.6	73.3	70.1	65.4	63.8	56.2	43.6	70.0	71.7	64.9	58.5	47.4	31.4
Estonia	52.8 (u)	55.8	43.1 (u)	32.4 (u)	20.5	18.0	5.4	50.8	47.4	36.4	15.4	8.2	8.9 (u)
Finland	69.0	70.3	72.3	54.8	42.1	28.5	6.5	67.7	73.1	57.7	43.7	21.8	12.1
France	67.3	69.8	68.5	60.1	45.3	28.9	19.8	65.0	65.8	58.5	43.4	23.6	22.9
Germany	65.4	66.4	64.6	49.3	42.8	29.3	11.1	64.2	64.8	52.3	41.9	23.6	18.8
Greece	76.9	78.4	83.3	67.4	50.1	24.9	14.3	75.4	81.9	67.2	38.0	18.7	14.8
Hungary	55.2	59.2	48.7	29.7	15.9	8.5	2.6	51.7	49.3	26.9	13.0	6.3	2.7
Ireland	83.6	84.3	82.2	70.2	68.1	61.8	65.5	82.9	83.0	72.7	72.3	58.3	48.8
Italy	67.3	70.9	73.8	58.8	39.8	20.5	17.3	63.9	71.1	53.3	30.3	16.3	15.9
Latvia	49.2	54.3	42.8	22.2	15.2	10.1	9.0	44.9	39.4	18.1	12.8	5.2	4.4
Lithuania	52.1	57.0	53.1	26.3	9.9	3.7	0.0	48.7	45.8	22.1	6.9	3.5	1.3 (u)
Luxembourg	75.7	76.8	72.5	65.0	52.2	50.9	20.8	74.5	71.2	65.1	51.3	37.2	35.7
Malta	68.7	70.7	68.0	51.5	38.0	22.9	10.1	66.8	66.8	50.9	30.9	17.2	23.0
Netherlands	77.9	80.3	78.7	73.4	65.5	57.6	34.0	75.6	77.7	68.2	60.5	48.1	50.7
Poland	58.1	61.7	54.5	32.1	17.1	10.0	10.9	54.9	50.6	27.0	11.9	6.9	6.4
Portugal	53.7	57.5	54.7	29.3	20.8	10.7	0.8	49.9	44.0	20.2	15.7	7.0	8.1
Romania	71.3	76.1	75.8	51.1	31.1	16.2	17.5	66.8	64.1	41.0	20.7	10.1	4.4
Slovakia	63.8	68.6	62.2	37.3	20.3	11.8	14.2	59.5	55.3	33.7	13.6	7.5	1.8
Slovenia	59.9	63.5	56.8	42.3	30.1	25.7	20.9	56.6	51.3	37.1	26.6	21.1	12.5
Spain	74.6	77.4	76.0	62.8	47.2	35.7	33.4	71.8	70.6	57.2	40.8	28.9	23.6
Sweden	80.1	82.3	84.8	77.4	70.1	56.3	49.3	78.1	78.5	72.0	70.9	55.3	45.2
United Kingdom	79.5	80.3	78.2	72.8	63.5	56.7	49.4	78.7	81.0	73.3	65.5	54.8	47.5
Other countries													
Croatia	47.2 (u)	47.2	45.9 (u)	35.4 (u)	24.3 (u)	20.4 (u)	17.2	47.2	50.2 (u)	33.6 (u)	17.1 (u)	9.2 (u)	5.6 (u)

	both sexes	men						women					
	all ages	all ages	45-54	55-64	65-74	75-84	85+	all ages	45-54	55-64	65-74	75-84	85+
Iceland	77.8	79.4	81.1	72.2	58.5	46.9	22.6	76.2	78.0	66.4	51.2	44.6	41.5
Norway	76.8	79.0	78.6	72.8	71.0	67.8	73.2	74.3	76.1	64.4	62.7	61.2	49.7
Switzerland	81.6	84.2	80.7	78.5	71.3	65.6	58.4 (u)	79.1	78.9	71.4	66.5	53.5	46.9

u = unreliable data

Table D-15: Percentage of people who reported having a long-standing illness or health problem in 2010, by country, sex and age (source EU-SILC 2010, Eurostat 2012).

	both sexes	men						women					
	all ages	all ages	45-54	55-64	65-74	75-84	85+	all ages	45-54	55-64	65-74	75-84	85+
EU average	30.9	28.9	29.2	42.9	54.0	65.1	69.2	32.8	32.1	44.4	55.5	66.8	69.7
Belgium	25.6	23.0	24.8	33.7	34.6	49.9	40.3	28.0	29.8	31.6	45.4	52.9	57.5
Bulgaria	18.9	15.6	12.5	27.7	37.2	49.4	69.2	21.8	15.4	32.6	44.8	58.1	76.6
Czech Republic	28.9	27.1	30.6 (u)	40.4	48.3	64.2	67.9	30.3	31.8	41.7	49.9	71.9	81.2 (u)
Denmark	27.1	23.9	24.0	32.1	35.6	33.5	35.7	30.1	30.1	36.4	39.4	40.4	42.7
Germany	36.2	35.6	35.2	51.4	63.7	72.7	82.7	36.7	35.7	48.5	58.1	70.0	75.2
Estonia	42.5	39.1	46.6	62.8	75.8	78.0	81.7	45.2	46.5	60.6	82.2	87.4	89.4
Ireland	27.5	25.9	27.7	44.2	49.0	61.1	49.5	29.1	28.9	40.5	48.5	68.7	83.5
Greece	21.4	20.6	15.8	32.2	48.9	69.4	81.7	22.3	15.3	30.9	55.4	75.6	84.2
Spain	27.7	26.1	26.7	41.0	51.5	64.1	67.6	29.4	30.5	42.6	56.3	65.1	68.7
France	36.9	35.1	34.8	47.6	60.0	74.3	75.2	38.6	38.6	47.9	59.8	68.3	72.4
Italy	22.0	20.3	18.5	26.0	36.4	52.4	59.0	23.6	18.7	26.1	39.3	55.9	63.5
Cyprus	32.5	32.2	36.1	53.1	68.5	81.7	83.7	32.7	38.4	59.4	81.0	90.6	76.2
Latvia	34.3	29.7	33.0	50.8	65.9	77.3	84.0	38.0	34.2	55.9	68.8	82.1	83.8
Lithuania	26.5	22.2	18.8	41.4	59.6	70.0	74.0	30.0	24.8	44.9	66.2	80.0	85.0
Luxembourg	21.5	20.5	22.1	30.9	35.8	37.1	49.7	22.6	25.9	34.5	41.8	42.5	58.0
Hungary	35.9	32.8	36.9	53.4	71.5	82.2	86.9	38.6	39.8	57.5	70.1	84.9	80.9
Malta	27.7	26.7	29.6	44.7	62.3	70.8	77.9	28.6	26.7	43.0	64.8	70.9	65.3
Netherlands	32.8	30.3	30.6	39.6	45.5	50.4	67.9	35.1	37.4	46.0	48.5	54.7	48.6
Austria	34.6	32.2	31.9	53.0	48.9	62.2	73.6	36.8	38.8	49.3	55.9	71.7	81.8
Poland	33.4	29.8	30.9	51.4	65.1	73.3	83.5	36.4	36.1	56.7	71.1	80.7	84.9
Portugal	29.6	26.4	25.8	47.2	53.0	66.3	77.5	32.9	34.8	53.6	65.0	69.5	64.7
Romania	19.2	15.8	15.8	32.7	42.8	57.5	58.1	22.4	23.3	38.9	53.0	68.4	71.7
Slovenia	35.8	33.2	36.9	53.4	65.8	71.0	89.0	38.2	40.6	55.3	62.7	75.1	67.6
Slovakia	30.4	26.4	28.3	48.6	58.9	73.1	82.8	34.2	33.1	52.9	70.6	80.7	84.8
Finland	44.4	38.5	36.2	54.6	66.8	78.1	84.1	50.0	50.9	60.9	71.5	82.0	94.3
Sweden	30.6	27.2	28.4	35.5	38.8	50.0	53.9	34.0	33.3	44.4	45.5	48.6	47.9
United Kingdom	34.7	33.1	36.0	46.5	59.4	67.8	69.1	36.2	35.2	46.8	55.6	68.9	69.4
Other countries													
Iceland	28.8	26.3	26.1	31.1	46.7	46.0	67.8	31.3	31.6	41.7	50.4	57.4	42.7

	both sexes	men						women					
	all ages	all ages	45-54	55-64	65-74	75-84	85+	all ages	45-54	55-64	65-74	75-84	85+
Norway	34.0	30.2	31.3	37.2	39.2	45.7	38.8	38.0	37.2	46.6	55.7	43.5	55.6
Switzerland	33.5	30.5	31.1	39.5	48.6	52.5	46.3	36.4	37.1	47.0	51.7	54.1	65.3
Croatia	37.3 (u)	36.9	32.7 (u)	44.7 (u)	58.4 (u)	58.7 (u)	82.8	37.6	30.4 (u)	48.6 (u)	66.5 (u)	70.7 (u)	63.7 (u)

u = unreliable data

Appendix E. Longitudinal studies paragraph 4.3.2.2

Author, year, country	Study population	Follow up time	Type and measure for economic inactivity	Health outcomes	Assessment of health outcomes	Statistical analysis	Characteristics controlled for	Key findings
Morris et al., 1994 United Kingdom (148)	Men aged 40-59 from 24 towns in England, Wales and Scotland. n = 7,423 at baseline (1980) n = 6,191 included [British Regional Heart Study]	5.5 years (range 4.5 - 7.0)	Self-reported early retirement and unemployment for reasons other then illness (mean age 57.4)	Cancer mortality Cardiovascular mortality Other	International Classification of Diseases codes	Cox's proportional hazard models	Geographic distribution Social class Cigarette smoking Alcohol consumption Weight Pre-existing disease	Men who retired in the five years after initial screening were more likely to die during the following 5.5 years as men who remained continuously employed (RR: 1.86, CI: 1.34-2.59). Men who experienced unemployment in the five years after screening were more likely to die during the following 5.5 years as men who remained continuously employed (RR: 2.13, CI:1.71-2.65).
Östberg and Samuelsson, 1994 Sweden (144)	Female municipal employees in Malmö aged 62-64. n = 116 at baseline (year not shown) n = 116 included	1 year	Retirement	Perceived health Ischeamic heart disease Angina pectoris Claudicatio intermittens Chronic bronchitis	Self-reported general health on a four-point scale Landahl procedures	X^2 statistics McNemar's test	Definable disease	After retirement subjective health improved in 25 (22%) and got worse in 10 (9%).

Author, year, country	Study population	Follow up time	Type and measure for economic inactivity	Health outcomes	Assessment of health outcomes	Statistical analysis	Characteristics controlled for	Key findings
Quaade et al., 2002 Denmark (134)	Population of Denmark born between 1926 and 1936 n = 241,634 men and 254,898 women at baseline (1987) n = 24,438 men and 25,868 women [Danish population-based registers]	10 years	Early retirement as registered in population-base (60 – 66)	Mortality	Population-based registers	Standardised mortality ratios Multiplicative Poisson regression models	None or not reported	The mortality in early retirement benefit recipients (SMR: 0.88, CI: 0.86-0.90 for men and SMR: 0.72, CI: 0.70-0.75) for women) was lower than the mortality for disability benefit recipients and higher than the mortality for employed recipients.
Mein et al., 2003 United Kingdom (139)	Civil servants aged 54-59 at baseline n = 10,308 at baseline (1985-1988) n = 1,000 included [Whitehall II]	7 to 10 years	Self-reported retirement (at mandatory age of 60)	Mental health Physical functioning	Short Form 36 General Health Survey	Linear regression analyses (adjusted difference in change)	Age Length of follow up Baseline score	Mental health functioning deteriorated among those who continued to work, but improved among retirees (restricted to higher employment grades). No effect for physical functioning.
Gordo et al., 2006 Germany (149)	Representative survey of the German population aged 21 to 65 years n = unclear at baseline (1984) n = 24,600 included [German socio-economic panel]	18 years	Registered unemployment	Health satisfaction	Self-report 10-point scale: 0 completely unsatisfied to 10 highest level of satisfaction	Descriptive statistics	Unclear	Job loss has a significant negative effect on health satisfaction among individuals older than 50.

Author, year, country	Study population	Follow up time	Type and measure for economic inactivity	Health outcomes	Assessment of health outcomes	Statistical analysis	Characteristics controlled for	Key findings
* Bound et al., 2007 United Kingdom	Men and women aged 50 years or older n = 12,000 at baseline (2002) n = unclear [English Longitudinal Study of Aging]	2 years (for the nurse visits) 3 years (for mortality)	Public pension eligibility ages (60 year or older for women, or 65 years or older for men)	Mortality Morbidity Perceived health	Self-reported measures: Nagi items, ADLs, IADLs, general health, presence of longstanding illness that limits activities, being frequently bothered by pain Objective measures: Short Physical Performance Battery, blood chemistry and anthropometric tests, UK vital statistics system (for mortality)	(Ordered) logit specification and linear regression models	None or not reported	No evidence was found of negative health effects of normal retirement ages. For men some evidence was found for a possible positive effect (data not shown).
Mojon-Azzi et al., 2007 Switzerland (141)	Individuals aged 55 to 75 years n = 2,461 at baseline (1999) n = 696 included [SHP]	4 years	Self-reported retirement due to old age	Perceived health	Self-stated changes in general health, general health status, satisfaction with health status, depression or anxiety, impediment of everyday activities due to health	Ordinal regression analyses Proportional odds model	Sex General health at baseline Highest level of education Occupation class Years from retirement Employment status	A positive effect was found of retirement on self-reported changes in health (OR: 1.9, CI: 0.5-3.8, p=0.07), on changes in depression (OR: 1.9, CI:1.1-3.2, p=0.02) and in the extent to which health impedes daily activities (OR: 1.9, CI: 1.1-3.3, p=0.02).

Author, year, country	Study population	Follow up time	Type and measure for economic inactivity	Health outcomes	Assessment of health outcomes	Statistical analysis	Characteristics controlled for	Key findings
Bamia et al., 2008 Greece (133)	Individuals aged 20-86 during 1994-1999 who at enrolment were employed or retired. n = 28,572 at baseline (1994-1999) n = 16,827 included [EPIC]	7.7-12.5 years	Self-reported retirement	All-cause mortality Cardiovascular mortality Cancer mortality	Death certificates and other official sources (physician codes)	Proportional hazards (Cox) regression model	Age at enrolment Education Smoking status Energy intake Ethanol intake Waist-to-hip ratio BMI	Retirees had a 51% increase in all-cause mortality (HR:1.51, CI: 1.16-1.98). An 5-year increase in age at retirement was associated with a 10% decrease in mortality (HR:0.90, CI: 0.85-0.96).
Van Solinge, 2007 The Netherlands (143)	Employees aged 55 or older working in 50+ companies of retail and trade and industry. n = 1,058 at baseline (1995) n = 778 included [Panel study on retirement behaviour]	6 years	Self-reported retirement	Medical consumption Severity of health problems Perceived health	Self-reports based on Likert-scale items	Least square regression analysis	Health at baseline Age Time since retirement	On average health did not deteriorate during the transition into retirement. Older workers who perceived retirement as involuntary showed decreases in perceived health.
Brockmann et al., 2009 Germany (136)	members of a compulsory German health insurance fund. n = 129,675 at baseline (1990) n = 129,675 included	15 years	Old-age pensioners as documented by the insurance fund	Mortality	Unknown	Cox proportional hazard models	Age at retirement Age sex Year of observation Hospitalisation Form of retirement Marital and socio-economic status	Pensioners with reduced earning capacities had a significantly higher mortality risk than old-age pensioners who retired between 56 and 60 or 61 and 65. Healthy people who retire early do not experience shorter long-term survival than those

Author, year, country	Study population	Follow up time	Type and measure for economic inactivity	Health outcomes	Assessment of health outcomes	Statistical analysis	Characteristics controlled for	Key findings
								who retire late.
* Westerlund et al., 2009 France (146)	Employees aged 35-50 of the French national gas and electricity company: Electricité de France-Gaz de France n = 20,624 at baseline (1989) n = 14,714 included [GAZAL cohort]	14 years	Date of retirement from company records (statutory age of retirement between 55 and 60). Mean age of retirement: 54.6	Perceived health	Self-report on 8-point scale: very good to very poor	Repeated measures logistic regression	Sex Year of birth Marital status Occupational grade Psychological and physical job demands Job satisfaction	Between the year before and after retirement the estimated prevalence of suboptimum health fell from 19.2% (95% CI 18.5-19.9) to 14.3% (13.7-14.9) for both men and women and across occupational grades. Poor work environment and health complaints before retirement were associated with a greater retirement-related improvement.
Behncke et al., 2012 United Kingdom (137)	Employed or retired individuals from England. n = 2,906 at baseline (2002-2003) n = 1,439 included [ELSA]	3 to 5 years	Self-report as being retired and not being in paid work in the last month	Subjective health status (Cardiovascular) disease Angina Heart attack Stroke Diabetes (not specified) Arthritis Cancer Psychiatric problem	Doctor's diagnosis and both diagnosis and self-report for angina	Non-parametric estimators	Socio-economic characteristics Job Pension Geographical characteristics Health behaviour Health Expectations	Retirees are 4 percentage points more likely to report lower self-assessed health (p <0.05). Retirement significantly increases the risk of being diagnosed with severe cardiovascular disease (4 percentage points, p<0.05), and cancer (4 percentage points, p<0.05). This is also reflected in increased risk factors

Author, year, country	Study population	Follow up time	Type and measure for economic inactivity	Health outcomes	Assessment of health outcomes	Statistical analysis	Characteristics controlled for	Key findings
								(e.g. BMI, cholesterol, blood pressure). No effect was found for diabetes, psychiatric disease and arthritis.
Jokela et al., 2010 United Kingdom (140)	Civil servants aged 54-76 n = 10,308 at baseline (1985) n = 7,584 included [Whitehall II]	6 to 19 years (6 phases)	Self-reported as being voluntary retired, retired due to ill health or statutory retired (at age 60) or other reasons for leave	Mental health Physical functioning	Short Form Medical Outcomes Survey 36 questionnaire	Random-intercept multilevel modelling Discrete-time survival analysis	Sex Age SES	Voluntary retirement and statutory retirement were associated with 2.2 points better mental health on the SF-36 compared to continued employment. These differences had disappeared by the age of 65 due to improvements in mental health of non-retired participants. Statutory and voluntary retirement led to 1.0 and 1.1 points better physical functioning compared with being in the workforce.
Westerlund et al., 2010 France (138)	Employees aged 35-50 of the French national gas and electricity company: Electricité de France-Gaz de France	18	Date of retirement from company records (statutory age of retirement between 55 and 60). Mean age of retirement: 54.8	Coronary heart disease Stroke Diabetes (not specified) Respiratory disease Mental fatigue	Depressive symptoms: CES-D scale Chronic diseases: self-reported and validated against medically	Logistic regression analyses	Sex Age at retirement Occupational category Time of data collection	Retirement did not change the risk for major chronic diseases. Retirement was associated with a decrease in the prevalence of mental fatigue (OR: 0.19,

Author, year, country	Study population	Follow up time	Type and measure for economic inactivity	Health outcomes	Assessment of health outcomes	Statistical analysis	Characteristics controlled for	Key findings
	n = 20,624 at baseline (1989) n = 14,104 included [GAZAL cohort]			Physical fatigue Depression	certified sickness absence records			CI:0.18-0.21) and physical fatigue (OR: 0.27, 0.26-0.30).
* Kalwij et al., 2010 The Netherlands (132)	Individuals turning 65 between 1996 and 2007 n = 10,013 at baseline (individuals turning 65 during 1996-2007) n = 9,618 included [IPO and causes of death registry]	Up to 18 years	Early retired or unemployed based on Inkomens Panel Onderzoek (IPO) information on labour market status	Cancer mortality CVD mortality Other mortality	Causes of Death registry	Discrete-time competing risks model	Socio-economic variables	Early retirement or unemployment have no significant association with cancer, CVD or other mortality risk.
* Bonsang and Klein, 2011 Germany (145)	No high-income men living in West-Germany between 50 and 70 years old n = at baseline (1984) n = 4 018 included [GSOEP]	11 to 23 years	Voluntary retirement: Self-report of being not employed and definitely no intentions to go back to work Involuntarily retirement: other not employed	Health satisfaction	Self-report one 10-point scale	Regression analyses Standard linear FE (within group) estimator	Household characteristics Doctor visits Hospital stays Disability	Significant positive effect of voluntary retirement on health satisfaction and significant negative effect for involuntary retirement.
Oksanen et al., 2011 Finland (142)	Finish public-sector employees n = 151,618 n = 11,019 included (1991) [Finish Public Sector Study cohort]	9 years	From the Finish Centre for Prevention	Antidepressant use	Drug Prescription Register	Repeated-measures logistic regression analysis with generalised estimating equations	Age at retirement Calendar year	Retirement-related changes in antidepressant use depended on the reason for retirement. Among old-age retirees antidepressant medication use

Author, year, country	Study population	Follow up time	Type and measure for economic inactivity	Health outcomes	Assessment of health outcomes	Statistical analysis	Characteristics controlled for	Key findings
								decreased during the transition period (adjusted prevalence ratio 1 year after versus 1 year before retirement = 0.77 (CI: 0.68-0.88).
Rijs et al., 2011 The Netherlands (147)	Pooled data from two cohorts First cohort: Men and women aged 55-85 n = 3,107 at baseline (1992-93) Second cohort: Men and women aged 55 - 64 n = 1,002 at baseline (2002) n = 506 included [Longitudinal Aging Study Amsterdam]	3 years	Not having a paid job for eight hours or more weekly Retirement categories based perceived age on which retirement is considered 'on time' (at age 60) Early retirees (55-58) Modal retirees (59-60) Late retirees (61-64)	Perceived health	Self-report on 5-point scale: excellent to poor	ANOVA Chi-square tests	Demographic Health Psychological Job Retirement	Compared to peers who continued employment modal retirees were more likely to attain excellent (OR: 5.43, CI:1.17-25.26) or good (OR: 4.12, CI: 1.28-13.30) self-perceived health. No effect was found for early or late retirement.
Kühntopf and Tivig, 2012 Germany (135)	Germen old-age pensioners n = 42,884,981 at baseline (2003 to 2005) n = 42,884,981 at follow-up		Men and women receiving a pension	Mortality	Probability calculation	Survival analyses	Ill health	The life expectancy is higher the later the retirement occurs and the higher the pension income.

* Grey literature

Abbreviations: RR = relative risk; OR = odds ratio; SMR = standardised mortality ratio; HR = hazard ratio; CI = 95% confidence interval

Appendix F: Detailed methods chapter 5

Search strategy

An information specialist searched relevant publications in conjunction with the researchers using MEDLINE, EMBASE, SciSearch, Social SciSearch, and PsycINFO.

In all search strategies, the definition of design (systematic review, meta-analysis, or review of reviews) was combined with several terms for 'chronic disease' and the selected chronic diseases (cancer, cardiovascular disease, COPD, depression, and diabetes), and with varying intervention descriptions (e.g. intervention, program, or treatment in general, and group practice, nurse-led clinics, disease management, integrated care, and work rehabilitation more specifically). In addition, outcome variables like social participation, social activities, informal care, voluntary work, work participation, employment, and absenteeism were incorporated in the search strategy as the focus was on the intervention effects on social participation, including work. Besides, restrictions were used in the search strategy for language (English). The aforementioned databases were screened for publications from January 2005-June 2012. Although the focus was on people aged 50-70 years, no age search term was used since most studies are not restricted to this specific age group and include younger and older people also.

The expanded search strategies for each database are available from the authors upon request.

Selection

Two investigators (MS, AV) independently screened all retrieved titles and abstracts to determine whether the study was suitable for inclusion. Disagreements about eligibility were resolved by consensus or consulting another investigator. Full-text papers were retrieved for the abstracts that were deemed relevant or whose relevance remained ambiguous. The same investigators (MS, AV) again independently assessed each retrieved article for inclusion and disagreements about eligibility were resolved by consensus or advice from a third person.

Appendix G: Detailed results chapter 5

Results: details on interventions, participants, effects, and basis for effects*

Interventions: **Objective(s), content, frequency and duration**	**Participants:** **Age, chronic condition, and setting**	**Effects:** **Short-term outcomes, long-term impact**	**Basis for effects:** **Number of (R)CTs and methodological quality**	**References**
Cancer				
Multidisciplinary, psychological, medical, or physical training interventions aimed at enhancing return-to-work. Interventions might be carried out either with an individual or in a group. - **Multidisciplinary interventions** incorporate psychological, vocational, and physical components by combining physical exercises with patient education and coping skills training with biofeedback-assisted behavioural training or vocational counselling training aimed at encouraging a return-to-work. - **Psychological interventions** include counselling, patient education or training in coping skills, undertaken by a qualified professional (e.g. a psychologist or an oncology nurse).	Adults (≥ 18 years old) who had been diagnosed with cancer and were in paid employment (employee or self-employed) at the time of diagnosis. The review aimed to include all types of cancer diagnoses; if at least 50% of the patients had a specific diagnosis, the study was included in that diagnostic group. Interventions were given in a clinical setting except for the physical training, which was set in the community. The setting of one multidisciplinary intervention is unknown.	- Higher return-to-work rates for patients with breast cancer and those with prostate cancer (OR = 1.87). Long-term impact assessments took place in two studies with last follow-up between 10 and 16 months after the end of the intervention. - No effect on return-to-work rates in patients with prostate cancer. - Improved return-to-work rates in patients with breast cancer, gynaecologic cancer, and melanoma skin cancer (one study in each patient group; OR = 4.67). Long-term impact assessments took place in one	3 RCTs [moderate quality] (control patients receive usual care) 2 RCTs [low quality] (control patients receive usual care) 3 controlled before-after studies (CBAs) [low quality] (control patients receive usual care)	De Boer et al., 2011 (178)

Interventions: Objective(s), content, frequency and duration	Participants: Age, chronic condition, and setting	Effects: Short-term outcomes, long-term impact	Basis for effects: Number of (R)CTs and methodological quality	References
		study on gynaecologic cancer patients with last follow-up measurement at about 11 months after the intervention ended.		
- **Medical interventions** are diverse and include function-conserving approaches such as intra-arterial chemoradiation, thyroid stimulating hormones after surgery, chemotherapy, endocrine therapy, laparoscopy, and breast conservation.		- Medical interventions by means of function-conserving approaches have no effect on the number of days reported sick or on return-to-work rates for breast, thyroid, gynaecological, head and neck, and laryngeal cancer patients.	8 RCTs [low quality] and 1 CBA [very low quality] (control patients receive usual care)	
- The **physical training** intervention includes physical training by means of a moderate walking program: an individually supervised exercise session, face-to-face counselling sessions with an exercise specialist, and home-based exercises.		- No effect on the number of days reported sick for patients with breast cancer.	1 RCT [very low quality] (control patients receive usual care)	
- **Exercise programs** consist of aerobic exercise (e.g. stationary biking), yoga, resistance training, resistance training combined with cycling, walking, stretching, strength training, or other exercise modalities, prescribed walking, or prescribed walking combined with jogging, cycling, resistance training, or strength training. Exercise programs may use an individual or a group format, be led by a professional or not, and home- or	Adults (≥ 18 years old) with various cancer types undergoing active cancer treatment (i.e. surgery, chemotherapy, radiation therapy, or hormone therapy) or scheduled to initiate treatment, excluding those who are terminally ill and/or receiving hospice care. The mean age of	- Less interference of disease symptoms with work, including work around the house (mean difference is -1.54). - No effect on interference of the disease with family and social life.	1 RCT [quality score is 3 on a 7-point scale] (control patients receive usual care) 4 RCTs [quality scores are 4, 0, 2, and 4 on a 7-point scale] (control patients receive	Mishra et al., 2012a (179)

Interventions: Objective(s), content, frequency and duration	**Participants: Age, chronic condition, and setting**	**Effects: Short-term outcomes, long-term impact**	**Basis for effects: Number of (R)CTs and methodological quality**	**References**
facility-based. Length of the exercise programs and frequency of individual sessions vary greatly with a range from 3 weeks-6 months of five sessions/ week (duration of intervention and number of sessions are not reported in one study).	participants is 53 years (age is not reported in one study).	- No effect on social functioning (health interference with social activities with family, friends, neighbours, or groups).	usual care) 4 RCTs [quality scores are 5, 4, 4, and 5 on a 7-point scale] (control patients receive usual care)	
	Adults (≥ 18 years old) with various cancer types after completion of active cancer treatment (i.e. people with a history of cancer who are beyond active treatment), excluding those who are terminally ill and/or receiving hospice care. The mean age of participants is 52 years (± 9.5 standard deviation).	- No effects on limitations in or inability to work/doing jobs. - No effects on role limitations (problems with work or other regular daily activities) due to emotional or physical problems. - No effects on disease interference with family or social life.	2 RCTs [quality scores are 4 and 2 on a 7-point scale] (control patients receive usual care) 1 RCT [quality score is 5 on a 7-point scale] (control patients receive usual care) 4 RCTs [quality scores are 4, 4, 6, and 2 on a 7-point scale] (control patients receive usual care in three studies and a placebo intervention (progressive relaxation	Mishra et al., 2012b (221)

Interventions: Objective(s), content, frequency and duration	Participants: Age, chronic condition, and setting	Effects: Short-term outcomes, long-term impact	Basis for effects: Number of (R)CTs and methodological quality	References
			training) in the fourth study) 2 RCTs [quality scores are 5 and 2 on a 7-point scale] (control patients receive usual care)	
Cardiovascular diseases				
Patient education is a process by which health professionals and others impart information to patients in a systematic way to alter their health behaviours or improve their health status. **Intervention modes are**: - **Telephone-based patient education**. Telephone-based patient education consists of telephone follow-up (eight sessions) and an open telephone line. Both are conducted over six months to provide information, education and support on the basis of individual needs, delivered by nurses with interest and experience in counselling and in providing information to patients with heart disease. - **Home-based patient education**. Home-based patient education consists of the provision of structured home-based information and psychological	Adults (≥ 18 years old) with a diagnosis of coronary heart disease including patients who have suffered myocardial infarction (MI), undergone a revascularisation (coronary artery bypass grafting (CABG) or percutaneous transluminal coronary angioplasty (PTCA)), or who had angina pectoris. Patients were recruited from hospitals. The mean age of participants is 60 years.	- No effect on role limitations (problems with work or other regular daily activities) due to emotional problems, role limitations due to physical problems, or social functioning (health interference with social activities with family, friends, neighbours, or groups) of telephone-, home-, or problem-based patient education (see intervention characteristics in the left column). - Patient education in a course (see intervention characteristics in the left column) improves social functioning, i.e. leads to less health interference with social activities with family, friends, neighbours, or groups.	3 RCTs [quality scores are 6 (1 RCT) and 7 (2 RCTs) on an 8 point scale] (control patients receive usual care) 1 RCT [quality score is 3 on an 8 point scale] (control patients receive usual care)	Brown et al., 2011 (180)

Interventions: Objective(s), content, frequency and duration	Participants: Age, chronic condition, and setting	Effects: Short-term outcomes, long-term impact	Basis for effects: Number of (R)CTs and methodological quality	References
support over four weeks, with a session in the second and in the fourth week for angina symptoms, medications, sexuality, anxiety, and depression, delivered by experienced and educated critical care nurses and with materials developed for the intervention. - **Patient education in a course** is a 3-week structured program, provided in a health school with discussion of one or two risk factors at each of all six sessions and an evaluation of knowledge about the disease and risk factors after the course. - **Problem-based patient education** is a group intervention with 13 sessions over one year in which real life situations or scenarios on exercise, food, drugs, smoking and cholesterol are presented to a group of patients by trained members of a rehabilitation team.				
Physical training: cardiorespiratory aquatic or mixed training - **Aquatic cardiorespiratory training** (exercises in the water) is aimed at improving cardiorespiratory fitness. This kind of physical training is typically performed for extended periods of time. The duration of the aquatic cardiorespiratory training analysed	Adult stroke survivors who were considered suitable for fitness training by the trial's authors. Participants were considered eligible regardless of the time since the onset of stroke. The mean age of cardiorespiratory aquatic training participants was 51.4 years (± 8.4 standard	- Improved role limitations due to emotional problems (less problems with work or other regular daily activities were measured immediately after the intervention). Long-term effects are not measured.	1 RCT [low quality] (control patients receive usual care)	Brazzelli et al., 2011 (181)

Interventions: Objective(s), content, frequency and duration	Participants: Age, chronic condition, and setting	Effects: Short-term outcomes, long-term impact	Basis for effects: Number of (R)CTs and methodological quality	References
here is 12 weeks with 45-60 minutes sessions twice each week.	deviation). The cardiorespiratory training was given in a community setting.			
- **Mixed training**. This kind of physical training is a combination of cardiorespiratory training and resistance training. Mixed training is comprised of various activities, some intended to improve cardiorespiratory fitness and others to improve strength, power or muscular endurance by performing repeated muscle contractions. An example of this kind of mixed training is a training program comprised of both cycling and weight training. The duration of mixed training varies from four weeks with 90-120 minutes exercise three times each week to 12-14 weeks of training for three days every week over 40-90 minutes each time.	Participants of the mixed training programs had a mean age of 73 years (± 10.3 standard deviation). Mixed training was given in a home-based setting, the community (only for the last weeks), or in a rehabilitation hospital.	- Improved role limitations due to emotional problems on the short-term (less problems with work or other regular daily activities were measured immediately after the intervention). This effect, however, did not last during follow-up (six months after the end of the intervention). - Improved role limitations due to physical problems (less problems with work or other regular daily activities) were measured immediately after the intervention. This effect was retained at follow-up (measured four months after the end of the intervention in one of the three RCTs, and six months after the end of the intervention in another of the three RCTs). - No effect on social functioning (health interference with social activities with family, friends, neighbours, or groups).	1 RCT [good quality] (control patients receive usual care) 3 RCTs [good quality] (control patients receive usual care) 2 RCTs [good quality] (control patients receive usual care)	

Interventions: **Objective(s), content, frequency and duration**	**Participants:** **Age, chronic condition, and setting**	**Effects:** **Short-term outcomes, long-term impact**	**Basis for effects:** **Number of (R)CTs and methodological quality**	**References**
- **Mixed training or cardiorespiratory / resistance exercise training** consists of stretching and callisthenics and pedalling on an electronically braked cycle ergometer. Mixed training is performed at the hospital gym and supervised by a cardiologist. The duration of this mixed exercise training is six months with three sessions each week.	Men and women of all ages who have had myocardial infarction (MI). Participants had a mean age of 56 years (± 10.5 standard deviation).	- Short-term effects were improved role limitations due to physical problems (less problems with work or other regular daily activities were measured immediately after the intervention). This effect was retained at follow-up (measured six months after the end of the intervention). - No effect on social functioning (health interference with social activities with family, friends, neighbours, or groups).	1 RCT [no information on quality scores] (control patients receive usual care) 1 RCT [no information on quality scores] (control patients receive usual care)	Heran et al., 2011 (182)
- **Cardiac rehabilitation** is a multidisciplinary intervention consisting of exercise training in combination with psychosocial and/or educational interventions to help patients preserve or resume optimal functioning in society and slow or reverse progression of the disease by improved health behaviours. It is a complex intervention that includes physical training (e.g. a walking program, or supervised exercise involving cycles, treadmills or weight training), risk factor education (e.g. on smoking or diet), behavioural changes (e.g. smoking cessation), and psychological support (e.g. stress management training, group support).	Men and women of all ages who have had myocardial infarction (MI), atherosclerosis, coronary artery bypass grafting (CABG), or percutaneous transluminal coronary angioplasty (PTCA). The mean age of participants is 62 years.	- Improvements in social functioning, indicated by less health interference with social activities with family, friends, neighbours, or groups, were found immediately after the intervention in two studies. In the third study, however, no effect on social functioning (measured as the ability to do social activities and to fulfil social roles) was found. - No effect on role limitations (problems with work or other regular daily activities) due to emotional problems, or role limitations due to physical problems.	3 RCTS [no information on quality scores] (control patients receive usual care) 2 RCTs [no information on quality scores] (control patients receive usual care)	

Interventions: **Objective(s), content, frequency and duration**	**Participants:** **Age, chronic condition, and setting**	**Effects:** **Short-term outcomes, long-term impact**	**Basis for effects:** **Number of (R)CTs and methodological quality**	**References**
Cardiac rehabilitation may be home-based, hospital-based, or both. Duration varies from six months to two years.				
- **Stroke liaison workers** are volunteers or health or social care professionals with multidimensional roles who provide emotional and psychological support (including counselling) in addition to education and information about stroke, as well as liaising with other services. A stroke liaison worker can be defined as someone whose aim is to increase patients' participation and improve the wellbeing of patients and carers. Often this intervention is provided from the point of the patient's discharge from the hospital. - **Stroke liaison workers in the 'proactive and structured' category** contact all identified stroke patients prior to or following discharge to deliver a fixed number of visits for a defined period of follow-up. They tend to cover a range of topics according to protocol with all patients rather than tailoring the material. - **Stroke liaison workers in the 'reactive and flexible' category** provide a flexible intervention that aims to meet the patient's needs as	Stroke patients and their carers. More specifically, participants are survivors of acute stroke and include their closest informal carer. However, involvement of a carer is not compulsory in this intervention. Participants are all adults; aged 16 years or over. Most stroke liaison workers are based in city hospitals with established stroke services that serve urban populations.	- No effects were found for stroke liaison workers in the 'reactive and flexible' category (described in the column 'Interventions' on the left) on patient participation (e.g. in work, recreational activities, or social activities with family, friends or business acquaintances).	4 RCTs [no information on quality scores] (control patients receive usual care)	Ellis et al., 2010 (183)

Interventions: Objective(s), content, frequency and duration	Participants: Age, chronic condition, and setting	Effects: Short-term outcomes, long-term impact	Basis for effects: Number of (R)CTs and methodological quality	References
they arise or as requested by the patient, often with a more open period of follow-up for a variable number of visits. - **Stroke liaison workers in the 'proactive and focused' category** contact all identified stroke patients and offer relatively limited numbers of visits for a fixed period of follow-up and also focus consultations on a specific issue, like mental health or risk factor control.				
COPD				
- **Self-management education** consists of educational programs aimed at teaching skills needed to carry out medical regimens specific to the disease, guide health behavioural changes, and provide emotional support for patients to control their disease and live functional lives. Intervention modes are individual education, group education, patient brochures, audiotapes, and nurse-assisted management. Content may include knowledge on COPD and healthy life styles, stress management, relaxation exercise, meditation, guided imagery, and communication and self-management skills. Duration and frequency varies widely; an intervention may take 1-4 hours or consist of monthly and 3-monthly visits with a practice nurse and a	Patients with a clinical COPD diagnosis but not with asthma as a primary diagnosis. Patients were recruited from outpatient clinics or a general practice. The mean age of participants is 65 years (± 8.2 standard deviation in three trials, and a range of 44-84 years in the fourth trial).	- No effect on the number of days lost from work. - No effect on restricted activity days (days where work was missed or normal activities significantly reduced because of health problems). - No effect on role limitations (problems with work or other regular daily activities) due to emotional	1 RCT [quality score is the maximum number of 3 quality points] (control patients receive usual care) 2 RCTs [quality scores of both trials are the maximum number of 3 quality points] (control patients receive usual care) 2 RCTs [quality score is the maximum number of 3	Effing et al., 2007 (184) http:/ www.rand.org /health/ surveys_tools/mos/mos _core_ 36item_survey. html; http:/ www.rand.org /health/ surveys_tools/mos/mos _core_ 36item_scoring. html

Interventions: Objective(s), content, frequency and duration	Participants: Age, chronic condition, and setting	Effects: Short-term outcomes, long-term impact	Basis for effects: Number of (R)CTs and methodological quality	References
general practitioner respectively during a year.		problems, role limitations due to physical problems, or social functioning (health interference with social activities with family, friends, neighbours, or groups).	quality points in one RCT and 2 points in the other] (control patients receive usual care)	
- **Community-based occupational therapy** is provided by a multidisciplinary team (occupational therapist, physiotherapist, and dietician). The intervention analysed here, is a 6-week group education program with three 2-hour sessions each week. The elements are education on coping, psychological issues, and exercise training. After that, the group can be patient-run weekly for social activities if desired and patients are also invited to join a supervised exercise program. The program promotes coping strategies, and is tailored to individual participants while also involving participant discussion.	Adults with COPD recruited in local hospitals and local general practices. The mean age of participants is 68 years (± 8 standard deviation).	- Short-term effects (measured immediately after the intervention) were improvements in role limitations due to emotional problems (less problems with work or other regular daily activities), in role limitations due to physical problems, and in social functioning (less health interference with social activities with family, friends, neighbours, or groups). However, only the effects on role limitations due to physical problems were lasting during the 1-year follow-up.	1 RCT [quality score: no major limitations noted in study quality] (control patients receive usual care)	Hand et al., 2011 (185) Griffiths et al., 2000 (222)
Depression				
- The **Psychological intervention** is a computerised form of cognitive-behavioural therapy with feedback to the patient and the general practitioner after each session and homework for participants between sessions.	Adult workers (i.e. over 17 years old), employees or self-employed, with minor or major depressive disorder, recruited in a primary care setting or an outpatient care setting.	- No effect on sickness absence.	1 RCT [quality score is 'low'; 9 on a 0-13 scale] (control patients receive usual care).	Nieuwenhuijsen et al., 2008 (186) Schoenbaum et al., 2001 (223)

Interventions: **Objective(s), content, frequency and duration**	**Participants:** **Age, chronic condition, and setting**	**Effects:** **Short-term outcomes, long-term impact**	**Basis for effects:** **Number of (R)CTs and methodological quality**	**References**
- **Occupational therapy** involves contact with both the occupational physician and the employer, exploration and work problem solving, and preparation for and starting of work reintegration		- No effect on sickness absence.	1 RCT [quality score is 'high'; 11 on a 0-13 scale] (control patients receive usual care).	
- **Enhanced primary care** means that general practitioners are enrolled in a quality improvement program and expected to provide enhanced care including antidepressant medication and psychological interventions, according to primary care guidelines.		- No effect on sickness absence.	1 RCT and 1 cluster RCT [quality scores are 'low'; 8 and 9 respectively, on a 0-13 scale] (control patients receive usual care)	
		- No effect on employment status ('not working' or 'working').	1 cluster RCT [quality score is 'low'; 9 on a 0-13 scale] (control patients receive usual care)	
		- Improvement in work functioning, according to subjective rating on a 1-10 scale of productivity at work (measurement at two years follow-up after a 57-59-week intervention).	1 cluster RCT [quality score is 'low'; 8 on a 0-13 scale] (control patients receive usual care)	
- **Shared care** is a structured and continuing joint participation of primary care physicians and specialty care physicians in the planned delivery	People with persistent symptoms of depression after 6-8 weeks of treatment from a primary care	- No effect on social functioning (health interference with social activities with family, friends, neighbours, or groups), or role	1 RCT [all quality criteria, except one, were met]	Smith et al., 2007 (187) Smith et al., 2008 (188) Katon et al., 1999 (224)

Interventions: Objective(s), content, frequency and duration	Participants: Age, chronic condition, and setting	Effects: Short-term outcomes, long-term impact	Basis for effects: Number of (R)CTs and methodological quality	References
of care. It is informed by an enhanced information exchange over and above routine discharge and referral notices. Shared care or integrated care is a complex intervention involving prior agreement of roles within each sector, pre-specified clinical protocols, referral guidelines, defined patient reviews in each sector, education for participating patients and professionals, and synchronised patient records and recall systems. The duration of the intervention analysed here was 1-2 months. After baseline assessments and randomisation, participants had two sessions with a psychiatrist in a primary care clinic within a 4-week period. Two additional visits were provided based on clinical response to treatment. Psychiatric visits were usually spaced two weeks apart.	physician. Participants were recruited in primary care clinics. The mean age of participants is 47 years (± 13.7 standard deviation).	limitations (problems with work or other regular daily activities) due to emotional problems. However, there was a trend towards improved social functioning in the shared care group. Follow-up assessments were completed at one, three, and six months after randomisation.	(control patients receive usual care)	http:/ www.rand.org /health/ surveys_tools/mos/mos _core_ 36item_survey. html; http:/ www.rand.org /health/ surveys_tools/mos/mos _core_ 36item_scoring. html
Diabetes				
- Shared care is a structured and continuing joint participation of primary care physicians and specialty care physicians in the planned delivery of care. It is informed by an enhanced information exchange over and above routine discharge and referral notices. Shared care or integrated care is a complex intervention involving prior agreement of roles within each sector, pre-specified clinical protocols, referral guidelines, defined patient	Patients aged 18 years or older with diabetes mellitus, attending a hospital diabetic clinic for at least one year and registered with any of three general practices. The mean age of participants is 58.9 years (range 42.6-74.7 years).	- No effect on improvements in disruption of normal activities. Patients rated the disruption of normal activities as the number of days that diabetes had disrupted normal activities. Measurements took place after two years.	1 RCT [no information on quality score] (control patients receive usual care)	Smith et al., 2007 (187) Smith et al., 2008 (188)

Interventions: Objective(s), content, frequency and duration	Participants: Age, chronic condition, and setting	Effects: Short-term outcomes, long-term impact	Basis for effects: Number of (R)CTs and methodological quality	References
reviews in each sector, education for participating patients and professionals, and synchronised patient records and recall systems.				

* Cells do not always contain information on all elements indicated in the column headings because some of the information is not available.