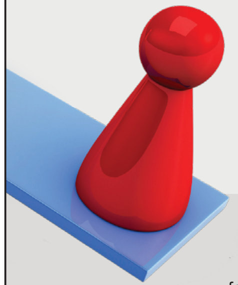

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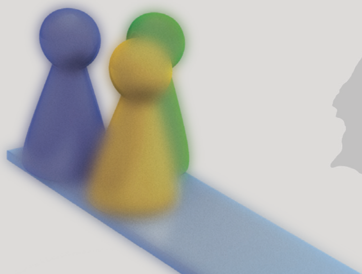
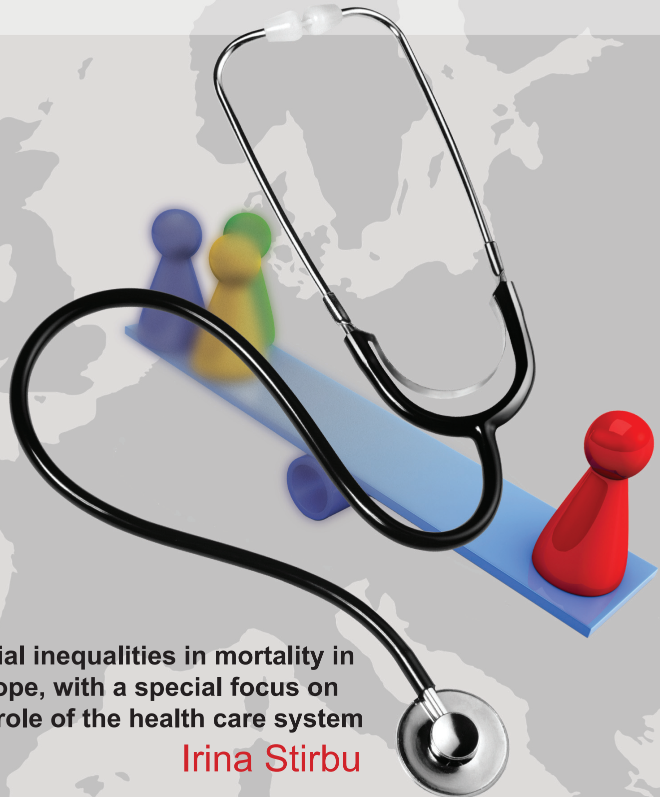


Inequalities in health, does health care matter?

Irina Stirbu

Inequalities in health, does health care matter?



Social inequalities in mortality in Europe, with a special focus on the role of the health care system

Irina Stirbu

Inequalities in health, does health care matter?

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Inequalities in health, does health care matter?

Social inequalities in mortality in Europe, with a special focus on the role of the health care system

Gezondheidsverschillen door verschillen in gezondheidszorg?

Sociale verschillen in sterfte binnen Europa met speciale aandacht voor de rol van de gezondheidszorg

Proefschrift

ter verkrijging van de graad van doctor aan de
Erasmus Universiteit Rotterdam
op gezag van de rector magnificus

Prof.dr. S.W.J. Lamberts

en volgens besluit van het College voor Promoties.

De openbare verdediging zal plaatsvinden op
vrijdag 5 december 2008 om 9.00uur

door

Irina Ştirbu

geboren te Chişinău, Moldavië

Promotiecommissie

Promotor:	Prof.dr. J.P Mackenbach
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Co-promotor:	Dr. A.E. Kunst

To my parents

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Summary

Introduction

The international evidence on socioeconomic inequalities in health is compelling: in all European countries, people who live in disadvantaged circumstances have poorer health, more disability and shorter lives than those who are more affluent. Also, the health of migrants is often poorer compared to the health status of the host population, particularly among some ethnic groups and for some conditions. Poorer access to health services and lower quality of services provided to disadvantaged populations may potentially contribute to the explanation of inequalities in health. Knowledge of these shortcomings can be used by policy makers as potential entry points for improvements in population health and for reductions of socioeconomic and ethnic inequalities in health.

The research underlying this thesis aims to contribute to the discussion on the role that the health care system plays in socioeconomic and ethnic inequalities in health. Specifically, we aim to measure the magnitude of socioeconomic and ethnic inequalities related to the functioning of the health care system. We do so by estimating the levels of inequalities in avoidable mortality, utilization and quality of health services.

The following specific research questions are addressed:

1) What is the magnitude of socioeconomic and ethnic inequalities in mortality in different European countries?
2) What is the magnitude of socioeconomic and ethnic inequalities in mortality from causes that are related to the functioning of health care in Europe?
3) What is the magnitude of socioeconomic and ethnic inequalities in the utilization and quality of specific health care services?

Data and methods

This thesis features two different groups of populations: national populations of a large number of European countries and migrant populations residing in the Netherlands.

This thesis has the advantage of using multiple data sources from different European countries. Mortality data from a number of populations in Western, Central and Eastern European (CEE) countries were used for answering the first and the second research questions. These mortality data included information on the number of deaths with distinctions made by country, age, gender, marital status, socioeconomic position, ethnic background (only in the Netherlands), and a wide array of causes of death. By selecting causes of deaths related to the quality of health services, we could assess the role of health care in inequalities in mortality between different groups. A broad inclusion of countries also allowed us to judge about the extent to which socioeconomic inequalities in causes of death related to the functioning of health care services are a generalized phenomenon throughout Europe.

To answer the third research question, we studied utilization patterns and quality of services among different population groups: general European population aged 16 and older, older population aged 50+, and migrant populations. We specifically studied the utilization of different types of services: general practitioner (GP), specialist, and preventive services. In order to evaluate inequalities in the quality of services, we additionally compared the process of care provided to Dutch and migrant diabetes patients. By comparing the level of mortality inequalities in different countries, we were able to draw specific conclusions on how national, social, and health care policies might influence population health and the utilization of services among people with different socioeconomic position.

Summary of the findings

In Part II of this thesis, we focused on describing socioeconomic and ethnic inequalities in general health, with special attention to mortality. In chapter 3, we particularly described the magnitude of educational inequalities in mortality and self-assessed health in 22 European countries. Results showed that the rates of mortality and poorer self-assessed health were almost always substantially higher in lower socioeconomic groups. We also found large variations in the magnitude of health inequalities between countries. Relative and absolute inequalities in mortality varied up to twenty-fold, with some Southern European populations having smaller inequalities and many countries in the East and Baltic regions having larger inequalities than the European average. Some of the variations appeared to be related to smoking and excessive alcohol consumption. This study demonstrated that there are enormous opportunities for reducing health inequalities.

In a study using data from the Netherlands, we also found important ethnic differences in mortality. Specifically, all-cause mortality among all migrant groups combined was significantly higher compared to the native Dutch population. The pattern of inequalities, however, was not as uniform as that found in socioeconomic inequalities in mortality. Surinamese and Antillean/Aruban men and women and Turkish men had high relative risk of mortality compared to the native Dutch population, while Moroccan men had lower mortality risk and Turkish and Moroccan women did not differ in their mortality risk from the Dutch population. We also found important variations among different causes of death.

In Part III, we investigated socioeconomic and ethnic inequalities in avoidable mortality, i.e. mortality from causes amenable by appropriate and timely medical care. Thus, these causes of death can be considered directly related to the functioning of the health services. Our results showed that educational inequalities in avoidable mortality were present in all countries of Europe and in most types of avoidable causes of death (chapter 6). Inequalities in avoidable mortality were slightly larger than inequalities in all-cause mortality. Inequalities in nearly all types of avoidable conditions were larger in CEE and Baltic countries, followed by Northern and Western European countries and smaller in the Southern European regions. Avoidable mortality inequalities contributed between 11 and 24% to the difference in temporary life expectancy between high and low educated groups.

On the other hand, in analysis of ethnic differences in the Netherlands, mortality from avoidable causes of deaths was found to be only slightly elevated for all migrant groups combined compared to the native Dutch population (chapter 7). Cause specific examination showed a higher risk of death among migrants for infectious and several chronic conditions (such as diabetes and asthma) and lower risk of death from malignant conditions. Surinamese and Antillean groups had higher risks of death and Turkish and Moroccan groups had generally lower risks of death from avoidable conditions compared to the native Dutch population. Demographic and socioeconomic factors explained a substantial part of ethnic differences in avoidable mortality.

In Part IV, we further focused on the potential role of the health care system by assessing inequalities in utilization and the quality of specific health services. In chapter 8, we showed that people with higher education used specialist care services significantly more often in most European countries. These inequalities in utilization of specialist care were not compensated by inverse inequalities in the utilization of GP services and were similarly large among patients with chronic diseases, diabetes, and hypertension. Additionally, we have found large variations between European countries in the magnitude of educational inequalities in preventive services utilization (chapter 9). For example, significant inequalities in the uptake of mammography favouring better-educated women were present in Belgium, Austria, Germany, and Greece, while there were no inequalities present in Sweden, the Netherlands, and Switzerland. Large variations between countries indicate that these inequalities might be related to the organization and delivery of preventive health services in individual countries.

In chapter 10 we further hypothesized that some of the inequalities in diabetes mortality between migrants and the native Dutch population might be caused by differential quality of care (i.e. differences in diagnostic and treatment procedures) provided by health professionals. Therefore, we investigated inequalities in the process of care (evaluated against recommended clinical guidelines) between patients with Turkish or Moroccan descent and the native Dutch diabetes patients. We observed no consistent differences regarding the process of outpatient care for diabetes delivered to Turkish and Moroccan patients as compared to native Dutch. However, diabetes outcomes differed significantly, with migrant patients having higher levels of glucose and cholesterol. These differences were not explained by the quality of care provided to patients. Adjustment for educational status significantly reduced the difference in mean glucose and cholesterol levels by about 30%. Turkish and Moroccan patients who were better integrated into the Dutch society had similar outcomes as those who were less well integrated.

Conclusions

In this thesis, we have demonstrated that large socioeconomic inequalities in mortality exist in all European countries. We have provided evidence that some of the roots of these mortality inequalities should be sought within the health care system. In particular, we have demonstrated that socioeconomic inequalities in avoidable mortality are likely to be related to the functioning of the health care system. Both access to and the quality of health services may be inadequate to address the needs of people from lower socioeconomic strata. In addition, we have provided further evidence that variations in mortality are also present among migrant groups residing in the Netherlands. However, further analysis of Dutch mortality data suggested that the Dutch health care system is not likely to play an important role in explaining variations found in mortality among migrants and the native Dutch population. In particular, inequalities in avoidable mortality were small and related to particular ethnic groups and specific diseases. We could also not find consistent evidence for the differences in the quality of care provided to migrant patients compared to native Dutch.

Overall, the chain of events leading to socioeconomic and ethnic inequalities in mortality is very complex and the health care system is not likely to be the main driving force. However, the health care sector has its own responsibilities in addressing these inequalities. This thesis shows that there are many unexploited windows of opportunity within the health care systems in terms of accessibility, quality, and general organization to address the health problems of lower socioeconomic groups. The health care system does have an important, even if relatively minor, role to play in promoting social justice and equity in health.

PART I

INTRODUCTION

Chapter 1

Health care and inequalities in health

1.1 Socioeconomic and ethnic inequalities in health

The international evidence on socioeconomic inequalities in health is compelling. People who live in disadvantaged circumstances have poorer health, more disability and shorter lives than those who are more affluent. Health inequalities were consistently found in all European countries despite a long tradition of universal health care coverage[1-6]. In the past decade, not only the substantial size of these inequalities but also the widening gap between the health of lower and higher socioeconomic groups in many countries, has contributed to an increased awareness of health inequalities by governments and policymakers[7].

In addition to a general description, in-depth knowledge has been gained on determinants that may potentially explain health inequalities. Among these specific determinants material, psychological and behavioural factors were explored[8]. It was shown that factors related to individual lifestyle choices, such as smoking, excessive alcohol consumption, poor nutrition, and low engagement in physical activity (that are often characteristic to people with lower socioeconomic status), play an important role in explaining health inequalities in all European countries[9-13]. Other studies emphasize the importance of psychological factors, such as stress related to insecure employment, life events and external locus of control[14, 15]. In addition, poor material circumstances, substandard housing, higher occupational health risks, reduced access to sport facilities and healthy foods were also shown to contribute to the explanation of inequalities in health and mortality[16-19].

That persons with a lower socioeconomic status experience poorer health status and higher mortality is the final conclusion of most studies on socioeconomic inequalities in health. Nevertheless, most of the explanatory factors of health inequalities discussed in the literature lie beyond the health care system. Does the health care system play a role in mediating or alleviating these health inequalities? The literature in this area is less conclusive. On the one hand, most European countries have a health system that is (in theory) universally accessible to all population strata; on the other hand, there are large inequalities in the utilization of different types of services[20, 21]. Similarly, although medical practice should be steered by evidence-based guidelines, people with lower socioeconomic status are less often referred to undergo complex medical procedures (e.g. coronary bypass surgery)[22, 23] or receive some types of medication[24, 25]. Shortcomings within the health care system may potentially contribute to the explanation of inequalities in health outcomes between different socioeconomic groups. The full extent of this contribution has, however, not yet been studied. It is also unclear which areas within the health care system perform inadequately in satisfying the needs of different socioeconomic groups. Knowledge of these shortcomings can be used by policymakers as potential entry points for improvements and thus reduction of socioeconomic inequalities in health.

Ethnic minorities are a special population subgroup. In addition to largely belonging to the groups with lower socioeconomic position, their health status is also influenced by their cultural norms and behaviour, circumstances of life before arrival to the host country, stress of migration, and adjustment to the new lifestyle in the host country. Although their need of the health care is often heightened due to a poorer health status[26], utilization of health services by ethnic minorities is often hampered by lack of knowledge of the system and inferior language skills.

Evidence for inequalities in health among migrant populations in different host countries is as abundant as evidence for socioeconomic inequalities in health. However, unlike the case of socioeconomic inequalities in mortality, the patterns of inequalities in mortality between migrant and host populations is variable and it is impossible to draw a single straightforward conclusion. For example, in the USA, black men are reported to have an 8-year shorter life expectancy than white men[27], but the mortality rates of Latinos and Asian-Americans is more favourable compared to white Americans[28]. In New Zealand, Maori populations have been reported to have a 10-year shorter life expectancy than people of Anglo-European descent[29]. Similarly in Europe, mortality rates of people originating from Bangladesh, East and West Africa residing in the UK, and Surinamese living in the Netherlands, are higher compared to the national average mortality rates; on the other hand, mortality rates of Caribbean and South Asian men living in the UK, and Turkish and Moroccan people living in Germany, France and the Netherlands, are lower compared to mortality rates of the host populations[30-36].

The picture of ethnic differences in mortality becomes even more diverse when investigating ethnic differences in the cause of death. For example, people originating from the Indian sub-continent living in the UK have significantly elevated mortality rates for ischaemic heart diseases and diabetes, but significantly reduced rates of cancer and suicide mortality[37-39]. Almost all migrants arriving from non-western countries experience higher rates of incidence and mortality from infectious diseases, while the opposite is generally true for cancer incidence and mortality[40].

About 10% of the population living in the Netherlands is of non-western origin. The largest migrant groups originate from Turkey, Morocco, and the former Dutch colonies in South America and the Caribbean (Surinam and Netherlands Antilles/Aruba). Turkish and Moroccans are mostly labour-related migrants, followed by their immediate family and descendants for family reunification. Surinamese came to the Netherlands more recently with the independence of Surinam as a Dutch colony.

Recent studies on ethnic difference in mortality in the Netherlands have shown that, compared to native Dutch men, all-cause mortality was higher among Turkish, Surinamese, and Antillean/Aruban men, and lower among Moroccan men[40]. Most migrant groups had an excess mortality at younger ages and reduced mortality at older ages. Cause-specific analyses showed that cardiovascular disease mortality was high among Surinamese men and women and low among Moroccan men. All migrants had elevated risk of death from external causes and reduced risk of death from neoplasms[40]. Socioeconomic factors explained part of the excess mortality observed among migrant groups, although some age and cause-specific inequalities between native Dutch and migrants remained after adjustment for socioeconomic position. Genetic factors, lifestyle behaviours and access to health care were also suggested to explain ethnic differences in mortality[40].

Although recent attention paid by the Dutch government to the health status of migrants living in the Netherlands has resulted in a large flow of information on differences in health and mortality between migrants and native Dutch, some gaps remain. Detailed cause-specific analysis remains less elucidated. For example, it is known that cancer mortality is generally lower among ethnic minorities, but little is known about the rate of convergence of cancer mortality of migrants compared to the native Dutch population. Other specific causes of deaths, such as traffic-related death and non-traffic accidents, were also not described. In addition, none of the suggested explanatory factors explained the full variation in mortality outcomes seen between migrants and the native Dutch population. Some researchers have suggested that health care may influence mortality outcomes among migrant populations by providing unequal access to care and sub-optimal quality of services[41-43]. Learning more about these factors will enable health authorities to adjust the health care in ways that can reduce ethnic inequalities in health.

In this thesis we explore the role of the health care system in explaining inequalities in health for special subgroups of the population. Two main subgroups are studied: people with a lower level of education living in European countries, and migrants living in the Netherlands.

1.2 Health care as a determinant of health

The main objective of the health care service is to provide adequate and timely measures to restore, or at least improve, the well-being of the patient; it is also responsible for a number of preventive measures to protect the population from acquiring diseases. Although it is logical to believe that the health care services contribute to the population’s health, the evidence for a causal link between health care services and health outcomes remains elusive. The problems emerge from the difficulty of isolating the contribution of the health service to population health outcomes, since several other factors related to general economic development at the population level, as well as individual non-health related determinants, also have a strong influence on population health. Consequently, in comparing trends within a country over time (e.g. for longevity) there is no experimental control group to provide comparable data in the absence of health services. Moreover, in most cases an individual’s visit to a health professional for treatment does not necessarily result in extending his or her life span; it simply brings some improvement in the individual’s feeling of 'well-being', which is difficult to determine with common outcome measures (such as mortality or life expectancy).

Despite the difficulties and limitations, a number of attempts were made to measure the contribution of health care to health outcomes. This research was mainly instigated by the work of McKeown, who suggested that mortality reduction since the mid-19th century was mainly the result of a decline in mortality from infectious diseases[44]. McKeown concluded that, because this decline in mortality preceded the introduction of antibacterial treatment, it was the changing environment and improved living standards (primarily sanitation and nutrition) and not health care that made a substantial contribution to decreased mortality. Taking this conclusion further, he suggested that future health problems are also more likely to be resolved by changing the environment rather than by changing health care.

During a 30-year long debate many researchers generally agreed with McKeown that socioeconomic development and improvements in the environment had a marked influence on mortality reduction in the 19th and early 20th century[45-48]. At the same time, many disagreed about the role of the health care system arguing for its 'sizeable' place in mortality reduction[48, 49]. To demonstrate their point, some researchers made quantitative estimations of the role of health care services in mortality reduction. Among others, much important work is attributed to Mackenbach et al.[49-51] and Bunker et al.[52]. In their work, Mackenbach and colleagues attempted to quantify the contribution of health care to the mortality reduction in the Netherlands between 1950-54 and 1980-84. They concluded that medical care has contributed approximately 3 years to life expectancy increase among men and 4 years among women[51]. Later, Mackenbach extended this work by conducting an analysis for the period 1970-1989 in which he demonstrated a further increase in life expectancy attributed to medical care[53]. Previous analysis was based on an assumption that mortality reduction for a number of causes of death (e.g. infectious diseases) was solely attributable to medical care; that is, however, unlikely (due to the influence of other factors). Therefore, in an additional analysis, Mackenbach attempted to estimate the part of mortality reduction attributed directly to medical care[49]. According to this latter analysis, between 5% and 18.5% of the mortality reduction between 1875/79 and 1970 is directly attributable to improvements in medical care.

Similar analyses (but using a different approach) were conducted in the USA[52]. Researchers estimated that an aggregate effect of medical care on life expectancy was roughly 5 years during the 20th century, with a further potential of 2 years. In addition, this work demonstrated the enormous burden of pain, suffering, and dysfunction that afflicts the population for which medical care can provide substantial relief.

Several other studies also reported a positive effect of medical care on the life expectancy of populations[54-56], although to varying degrees. The results of the latter studies are difficult to compare due to large differences in the methodological approaches used by the various researchers.

Although the debate continues, a general agreement has emerged from this discussion: i.e. that public measures and general socioeconomic development were effective in reducing mortality in the 19th and most of the 20th century; however, evolving medical care was an important factor in this process. Whilst for medical historians discussion on the causes of mortality reduction in the past continues, modern societies are more interested in the contribution of current medicine to health. Are the reasons for the decline in mortality after 1975 similar to those underlying the change in the era studied by McKeown? If not, how has the role of medical care changed?

The scope and potentials of health care has expanded exponentially in the last 50 years: this includes new pharmaceuticals, new diagnostic technology, effective treatment methodologies, tremendous advances in surgical care, and the organization of large-scale screening programs. Modern health care is not static but is a self-learning mechanism able to discard ineffective and inefficient methods, and discover and employ innovative evidence-based practices.

Most of the important health care interventions date from the post-World War II period, and are mainly associated with causes of mortality other than infectious diseases[57] (Figure 1.1). Substantial advances were achieved in the management of cardiovascular diseases, oncology, and maternal and child care. Data from the Netherlands indicate that since 1970 an increase of 3.9 years in life expectancy (3.3 years among women and 4.1 years among men) and 5.2 years gain in healthy life years can be attributed to medical advances alone[58] (Table 1.1). More than half of this increase can be credited to developments in the area of cardiovascular disease management, while the remaining increase in life expectancy is attributed to the use of vaccines and antibiotics, and improvements in cancer detection and management.

Similar data from the USA suggest that between 25-75% of the reduction in cardiovascular mortality can be attributed to medical advances made in the post-World War II period[56, 59-62]. The remainder of the decline in mortality since 1960 includes reduced infant mortality, reduced mortality from motor vehicle accidents, pneumonia/influenza, and a slight decrease in cancer mortality. All these achievements in mortality reduction are partly attributed to advances in the organization of neonatal, emergency and preventive care, as well as to achievements in surgery and operative care.

The beneficial effect of the health care system during the last 50 years is visible not only in a continuously declining mortality, but also in improved quality of life. Hip replacement, organ replacement, cataract surgery, and orthopaedic prostheses have enabled large numbers of people to enjoy a good quality life that would otherwise not have been possible.

Figure 1.1 Change in mortality from infectious and cardiovascular diseases, USA 1900-2000 [57]

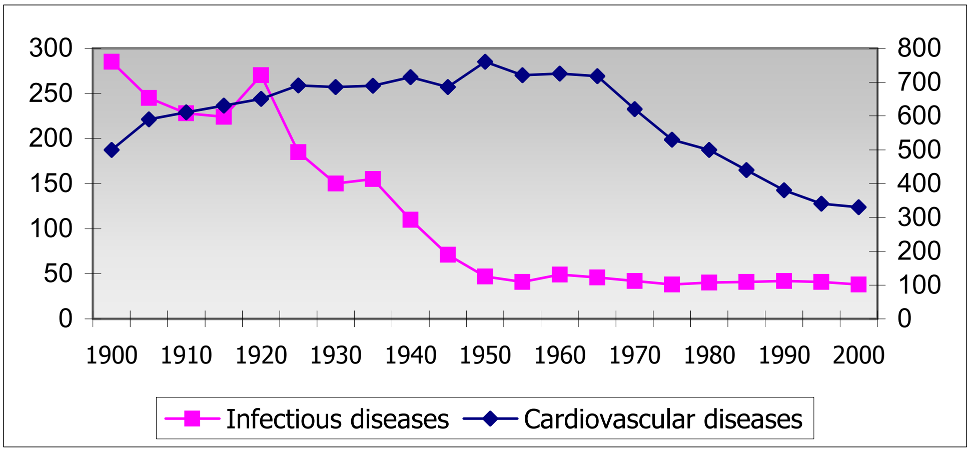


Table 1.1 Life expectancy and disability-adjusted life expectancy (DALE) gains attributable to medical care (Based on data from Meerding et al.[58])

	Men (years)	**Women** (years)	**Men & Women** (years)
Infectious diseases (1947-2003)			
Life expectancy	-	-	1.40
DALE	-	-	1.57 (1.14-2.01)*
Pneumonia, Bronchitis, Flu DALE	-	-	0.55
Tuberculosis DALE	-	-	0.35
Cancer (from 1955)			
Life expectancy	0.36	0.84	0.60
DALE	0.32	0.84	0.58
Breast cancer DALE	-	0.63	-
Colorectal cancer DALE	0.10	0.10	0.10
Cardiovascular diseases (from 1970)			
Life expectancy	1.65	2.32	1.98 (1.51-2.29)
DALE	2.33	3.82	3.07 (2.46-3.85)
Coronary heart disease DALE	2.33	3.82	-
Infectious, cancer and cardiovascular diseases combined			
Life expectancy	3.3	4.5	3.9
DALE	4.1	6.2	5.2

* Numbers in parenthesis indicate conservative and less conservative estimates

1.3 Role of health care in explaining socioeconomic and ethnic inequalities in health

Taking into account the current large socioeconomic inequalities in mortality, several questions emerge: Did health care play an equally important role in reducing mortality for all subgroups of the population? Or did some groups benefit more from advances in medical care than others? If the benefit is differential for different subgroups of the population, in which ways can the health care system contribute to the expansion or reduction in inequalities in health?

The general scepticism about the contribution of health care to population health has also translated into inequalities in health: in developed countries there is a strong element of disbelief about the potential contribution of health services to inequalities in health. This scepticism is, however, unjustified; to support this opinion we provide the evidence below.

Historical data from England and Wales that provide unique mortality trend data by occupational class since the early 20th century, show that mortality rates fell dramatically among both manual and non-manual occupational classes[63]. To estimate the role of the health system in this mortality decline, an analysis was made of trends in death rates from a range of diseases that had become amenable to health care interventions in the period 1930 to 1960 (e.g. tuberculosis, appendicitis, neonatal mortality)[64]. This analysis revealed that mortality in the non-manual occupational groups declined more rapidly than that in the manual class; however, mortality in the manual occupational class decreased to such an extent that the absolute differences in mortality between the highest and the lowest class nonetheless declined. The latter study indicates that health care contributed to reducing the absolute inequalities in health in England and Wales, although relative inequalities between the two occupational classes increased. Similar historical data from other countries are not available, but it is plausible that other European countries underwent a comparable development.

Using the basic principle operating in modern European society 'equal access for equal needs', researchers have produced a plethora of evidence showing inequalities generated by or directly related to the health care system. Most extensively described are inequalities in the utilization of different health services by people with different education, income or occupation. Studies show that primary care physicians usually see more patients with a low socioeconomic status. At the same time, secondary care services (e.g. specialist care), are consistently more used by those with a higher socioeconomic position compared to their counterparts lower in the social hierarchy, even after taking medical needs into consideration[20, 65-69]. Equitable access to good quality neonatal services may account for the absence of socioeconomic differences in neonatal mortality in Sweden[70], while differential access to such services may account for widening of infant mortality inequalities in the Czech Republic[71, 72].

Evidence also suggests that low utilization of most preventive services is linked to socioeconomic status. For example, cancer screening uptake rates were found to be greater among the higher educated for different types of cancer (e.g. cancer of breast, colon, and cervix) in different countries[73-76]. Similarly the uptake of vaccination among children and elderly was also related to socioeconomic status[77, 78]. Those with lower income and/or uninsured were less likely to attend a preventive check or undergo cardiovascular screening (e.g. cholesterol screening)[79, 80].

Inequalities were reported in the referral to and utilization of some diagnostic and/or treatment procedures. For example, cardiac surgeries, hip-replacement surgeries, and palliative and coronary care were found to be consistently less utilized by people from lower socioeconomic groups[81-83]. In several countries, stroke patients with higher socioeconomic position were more often treated at a university hospital, examined by a neurology specialist and examined with computed tomography or magnetic resonance imaging[84-86]. Differences in availability of anti-hypertensive medication may account for a component of East-West differences in mortality from stroke[87]. The weight of evidence related to the treatment of coronary heart disease suggests that admissions, rates of investigation and revascularization do not match the higher levels of need experienced by the most disadvantaged groups compared to the more affluent groups[88, 89]. A study of conditions amenable to surgery (hernia, gallstones, arthritis, hip replacement and varicose veins) revealed that operation rates for most conditions were lower in the most deprived areas suggesting that despite higher GP consultation rates, disadvantaged people are less likely to be referred on for surgery than their more affluent counterparts[90].

While we have clear indications for inequalities in access to and utilization of health services, other aspects of health system performance towards subgroups with different socioeconomic position remain unclear. Studies have shown that people from a higher social group tend to spend more time with their GP, ask more questions and get more information from them compared to those from lower social groups[91-93]. Researchers conclude that less educated patients are doubly disadvantaged: firstly because of their more passive communicative style, and secondly because of the physician's misperception of their desire and need for information[94]. This suggests that patients with lower socioeconomic position receive a lower quality service, although the interpretation of this effect is more complex.

A lower quality of services provided to patients with lower socioeconomic position is not only evident from the reports of poor communication. An audit among GPs in the Netherlands found a substantial number of shortcomings in the provision of stroke preventive services, especially in the area of hypertension control and the assessment of a patient's risk profile. These shortcomings were concentrated among patients living in more socially-deprived areas[95]. Similar findings were also reported for other types of services in different countries[85, 86, 96]. These findings suggest potential deficiencies in the provision of quality care to patients with different socioeconomic status. However, the contribution of inequalities in the quality of care provision to inequalities in health outcomes has not yet been measured. In addition, scientific evidence in this area is not always conclusive and unidirectional[97-99], which makes interpretation of evidence on inequalities in the provision of quality services to patients with different socioeconomic position less straightforward.

Inequalities in access and quality of health services were not only found for people from a lower socioeconomic position. Studies suggest that migrant populations also encounter difficulties in accessing health services, although this evidence is not always consistent. In the USA, black and Hispanic patients were noted to have an increased risk of advanced-stage cancer (stage III or IV) at diagnosis, irrespective of insurance status, compared with white patients, indicating inappropriate access to cancer screening services[100]. Also, effective pain treatment was less readily available for ethnic patients compared to their white counterparts[101]. Similarly in the UK, the median waiting time for renal transplantation was twice as long for Asian and black patients compared to white patients[102], and Bangladeshi, black Caribbean and black African patients had lower revascularization rates in comparison with the general population[103]. Also in the Netherlands, immigrant children more frequently received sub-optimal care related to asthma exacerbation compared with Dutch children[96].

Although inequalities in access to and quality of some types of health services for migrant patients are well documented in many countries (especially in the USA and UK), this knowledge remains limited in the Netherlands. A small number of studies that focused on aspects of access and quality of care among migrant populations offered contradicting results[104-109]. It is thus of interest to study to what extent health care contributes to the disparities in mortality outcomes among migrants.

1.4 This thesis

Research questions

The research underlying this thesis aims to contribute to the discussion on the role that the health care system plays in socioeconomic and ethnic inequalities in health. Specifically, we aim to measure the magnitude of socioeconomic and ethnic inequalities related to the functioning of the health care system. We do so by estimating the levels of inequalities in avoidable mortality, utilization, and quality of health services.

The following research questions are addressed:

1) What is the magnitude of socioeconomic and ethnic inequalities in mortality in different European countries?
2) What is the magnitude of socioeconomic and ethnic inequalities in cause-specific mortality related to the functioning of the health care in Europe?
3) What is the magnitude of socioeconomic and ethnic inequalities in utilization and quality of specific health care services?

In this thesis we include all European countries, for which data are available. Such a broad inclusion of countries would allow us to judge to what extent inequalities related to health care services are generalized throughout Europe. By comparing the level of inequalities in different countries we would be able to draw specific conclusions about how national social and health care policies may influence population health and the utilization of care among people with different socioeconomic position. Within this thesis we give a special attention to East European countries in order to fill the currently existing information gap in those countries in the area of socioeconomic inequalities in health. A part of the thesis also focuses on migrant population residing in the Netherlands. The Netherlands serves as a case study country selected due to its long history of migration and strong interest of Dutch policymakers in this area.

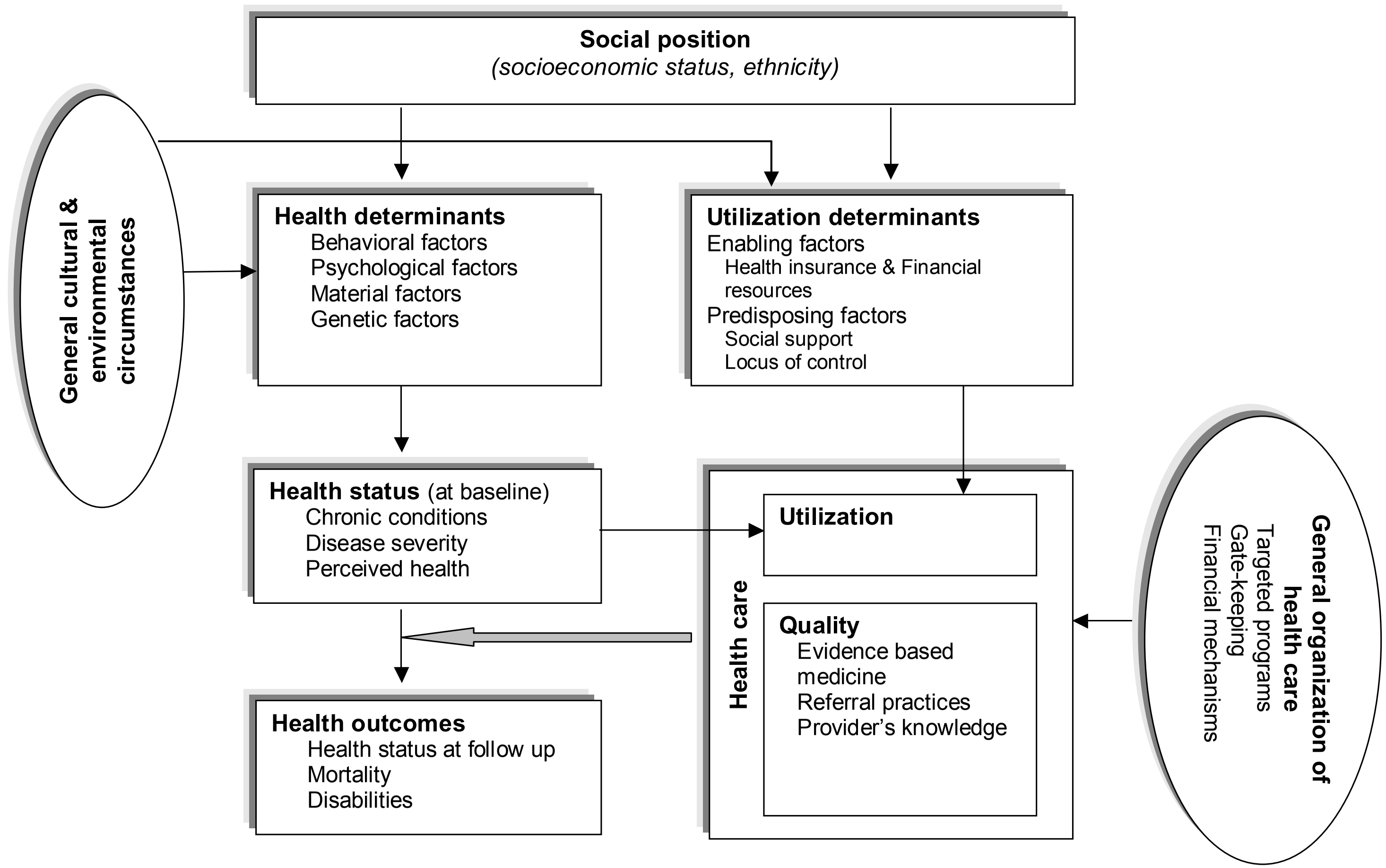
Conceptual framework

Below we describe the mechanisms through which socioeconomic position and ethnic background may influence health outcomes and mortality (Figure 1.2). We will use this conceptual framework to shed light on the role that health care might play in determining health outcomes of people with different socioeconomic position and ethnic backgrounds.

Recent literature shows that health-related behaviour, material, psychological and genetic factors to a large extent influence the occurrence of diseases and, thus, determine one's health status. People with lower education smoke more often and have a higher incidence of lung cancer and heart diseases, while people of Turkish and Moroccan background experience higher levels of stress related to migration and further self identification than native Dutch and have higher rates of schizophrenia. It may be concluded that behavioural, material, and psychological factors (separate, or in combination) lead to differential morbidity among people with different socioeconomic position and ethnic background. Also genetic factors might lead to differential morbidity among migrants compared to the native host population. Differential health status further may lead to differential heath outcomes. For example, migrants have a higher exposure to various infectious agents due environmental and living circumstances in their country of origin. Higher exposure may lead to higher incidence of infectious diseases and further higher mortality from infectious diseases among migrant populations.

By diagnosing and treating diseases, health services intervene in the pathway between health status and health outcomes. Application of medical procedures often leads to slowing down of the disease evolution or even complete cure as, for example, in case of treated injuries or detection of breast cancer with subsequent complete cancer removal. Thus, overall, medical interventions result in a delay of eventual mortality and an improvement in the quality of life.

Figure 1.2 Conceptual framework
illustrating the mechanisms through which health care is able to modify the relationship between social position and health outcomes.



Provision of health care services relies first of all on health services utilization. Inequalities in utilization of services would clearly lead to inequalities in health outcomes. In addition to utilization, differential quality of health services provided to people with different socioeconomic position or ethnic backgrounds may also lead to differential health outcomes. Delays in referral to diagnostic or treatment procedures for people with lower education may more often lead to unfavourable health outcomes. General organization of health care may, in turn, influence both utilization and quality of provided health services. Financial and organizational mechanisms that regulate provision of health services may stimulate particular utilization patterns for people with different socioeconomic position or regulate quality assurance of provided services. Evidence suggests that financial barriers, such as co-payments and fee-for services negatively impacts on the utilization of health services among individuals with lower socioeconomic position[110].

As mentioned above, utilization of health services is one of the factors that determines inequalities in health outcomes among people with different socioeconomic position and ethnic backgrounds. The main determinants of health service utilization were earlier described in the widely used behavioral model of Andersen[111] . Three main determinants of health service use are distinguished in this model: medical need, enabling factors, and predisposing factors. The concept of 'need' is rather complex. A wide variety of definitions of 'need' has been developed, but without consensus on the meaning of 'need'[112]. Within this thesis we will refer to 'need' as a reflection of individual's health status measured through self-perceived health or according to professional standards.

Although a person may be in need of health services, s/he also must have means to use them. Income, health insurance, and physical accessibility of services are some of the examples of factors, which enable people to use health services. These enabling factors may be unequally distributed among people with different socioeconomic position and ethnic backgrounds. Predisposing factors, on the other hand, are associated with the social, psychological and cultural background. These factors determine a person's propensity to seek care. In particular, attitudes towards health and health care, coping style, locus of control, social support, and psychological stress may determine the decision (not) to use health care services.

According to this conceptual framework, in the hypothetical situation of no health care, inequalities in health outcomes would be driven by differential health status resulting from differences in health determinants. A fair health care system that is equally distributed across different population strata would significantly reduce absolute inequalities in health, while relative inequalities dictated by differential incidence would remain at the same level. Conversely, while relative inequalities would grow in a health care system that does not provide equal services to all people in the society, absolute inequalities might grow, stagnate or reduce, depending on the magnitude of (un)fairness.

Structure of the thesis

This thesis is divided into five parts. The first part provides general background information of the study, introduces the theoretical framework, and describes the aims and specific research questions addressed in this thesis (chapter 1). Further, in chapter 2 we provide detailed information on the data and methods used in this thesis.

In Part II of this thesis (consisting of three chapters) we focus on describing socioeconomic and ethnic inequalities in mortality in Europe. In chapter 3 we describe the magnitude of educational inequalities in mortality and self-assessed health in 22 European countries. Chapters 4 and 5 describe the magnitude of inequalities in cause-specific mortality between migrants and the native Dutch population. By particularly focusing on cancer mortality and injury-related mortality we complement previous knowledge on ethnic inequalities in mortality in the Netherlands.

In Part III we focus on inequalities in mortality related to the functioning of the health care system. In particular, in chapter 6 we quantify the level of inequalities in avoidable mortality among people with higher and lower levels of education (aged 30-64 years) in 14 European countries. Additionally, we estimate the differences in avoidable mortality among migrants and the native Dutch population (chapter 7), and elaborate on potential challenges and opportunities within the healthcare system.

In Part IV we continue investigation into the potential role of the health care system by focusing on inequalities in the utilization and quality of specific health services for people with different socioeconomic position and ethnic backgrounds. In chapter 8 we investigate educational inequalities in the utilization of general practitioner (GP) and specialist services in 9 European countries. In chapter 9 we explore educational inequalities in the utilization of preventive services (such as flu vaccination and cancer screening) among people aged 50 years and over in 11 European countries. In both these chapters we discuss potential factors that may influence differential utilization of health services in different European countries. Finally, in chapter 10 we explore differences in the quality of outpatient diabetes care between migrants and native Dutch. This latter study gives an impression of potential differences in the quality of care that patients of different ethnic background may experience. We focus on diabetes due to large differences in mortality between migrant and Dutch patients found in chapter 7.

This thesis ends with a general discussion of the findings (chapter 11), their implications for policymaking, and an overview of opportunities within the health care system to further reduce socioeconomic inequalities in health.

Terminology

Throughout this thesis we use the term "health care system" (or "health care services") defined as a set of services related to the prevention and treatment of diseases provided to the population. These services are provided by health care facilities, such as (but not limited to) general practitioner practices, policlinics, hospitals, or specialized clinics. In this definition we do not include general policy actions such as cigarette and alcohol taxations that also have an aim to prevent morbidity (or reduce socioeconomic inequalities in health), but are not specifically related to the provision of health care services to individual patients.

Ethnic minorities and migrants are not equal terms: ethnic Roma population or Native Americans do not belong to the group of migrants. However, in this thesis we use these terms interchangeably, in most cases operationalising them as non-western migrants that are settled in European countries or the USA (unless otherwise stated). In the Netherlands ethnicity is defined on the basis of the country of birth of the person and his/her parents[113].

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Chapter 2

Data and methods

2.1 Data

This thesis has the advantage of using multiple data sources from different European countries. Overall, five main data sources were used (Table 2.1).

1. EuroTHINE project mortality data is a collection of datasets with information on cause-specific mortality by socioeconomic position among people aged 30+ in 16 European countries (Finland, Sweden, Norway, Denmark, Belgium, Switzerland, Turin (Italy), Barcelona (Spain), Madrid region (Spain), Basque region (Spain), Slovenia, Hungary, the Czech Republic, Poland, Lithuania, and Estonia). Information on mortality is based on longitudinal and cross-sectional studies conducted at the national or regional levels between 1990-2003 and includes a total of 3.5 million deaths among more than 54 million European citizens.
2. EuroTHINE project morbidity data is a collection of datasets with information on health status, morbidity and health care utilization by socioeconomic position. This dataset is based on recent National Health Surveys (NHS) or multipurpose surveys conducted among people aged 15 and older in the period between 1996-2004 in 22 European countries and includes more than 350, 000 respondents.
3. The Survey of Health, Ageing and Retirement in Europe (SHARE) is a multidisciplinary international database of micro data on health, socio-economic status and social and family networks of individuals aged 50 or over. Eleven European countries have contributed data to the 2004 SHARE baseline study with over 22,000 respondents.
4. Study of ethnic inequalities in mortality is based on Dutch mortality registry in the period 1995-2000 linked to the population registry using a unique identifying number. This database contains information on cause-specific mortality and socio-demographic characteristics, including country of birth of the person, which allows studying ethnic differences in mortality.
5. Diabetes management data is a database of 106 diabetes patients treated at outpatient department in Rotterdam in 2004. It includes data on ethnicity of the patient and his socio-economic characteristics coupled with diagnostic and management procedures performed by medical staff.

2.2 The measuring of socioeconomic and ethnic inequalities in health

Socioeconomic position. The relative position of a person within society is determined by educational level that one has attained in his/hers life, occupation that one holds, by income that one earns or a combination of those factors[1]. Within this thesis we used education as the main indicator of socioeconomic position in all studies. Education allows classification of individuals who do not work, prevents reverse causation, and facilitates international comparisons due to its individual nature. In addition, recent studies suggested that education has an independent effect and is more strongly related to the likelihood of health

Table 2.1 Overview of data sources, main variables, and coverage

Source of data	Main outcome variable studied	Geographic coverage	Target group	Main independent variable	Thesis chapter
EuroTHINE project mortality database	All-cause mortality and large causes of death	16 European countries	Men and women aged 30-74	Education, Occupation	3
	Avoidable mortality	14 European countries	Men and women aged 30-64	Education	6
EuroTHINE project morbidity database	Self-assessed health and risk factors	19 European countries	Men and women aged 16-69	Education, Income	3
	Utilization of GP and Specialist services	9 European countries	Men and women aged 16+	Education	8
Survey of Health, Aging and Retirement in Europe	Utilization of preventive services	11 European countries	Men and women aged 50+	Education	9
Ethnic inequalities in mortality	Cancer-related mortality	The Netherlands	Men and women of all ages	Ethnicity	4
	Injury mortality	Idem	Idem	Ethnicity	5
	Avoidable mortality	Idem	Men and women aged 30-74	Ethnicity	7
Diabetes management data	Quality of diabetes care and Diabetes outcomes	The Netherlands	Men and women with Diabetes treated at an outpatient department	Ethnicity	10

services utilization, than income and employment status[2, 3]. Additional advantage is that information on level of education is available in most European countries, while that is not the case for other socioeconomic measurements. Where possible, we complemented information on inequalities in education with the results on inequalities by income or occupational class.

Ethnicity. We used country of birth to identify ethnic groups. Residents were categorized as non-native if they or one of their parents were born abroad. We thus followed a definition used by Statistics Netherlands which is widely accepted among health researchers in the Netherlands[4]. According to this definition, in mixed ethnic minority families, the country of birth of the mother predominated. In some studies we additionally distinguished age at immigration and duration of residence, which were established on the basis of the latest known date of immigration into the Netherlands.

Mortality. All causes of death were coded according to the International Classification of Diseases (ICD, version depending on the year and country). We studied all-cause mortality and a wide range of cause-specific deaths, particularly focusing on cancer, injury and avoidable causes of death. Selection of causes of death was contingent on the purpose of the study and number of cases.

Health care utilization and quality. Differences in utilization of health services may indicate problems in accessibility to those services among people with different socioeconomic position. We studied utilization of GP and specialist services among the general population and utilization of preventive services among people aged 50+. Utilization of services was self-reported in all surveys. We also compared the quality of care provided to Dutch and migrant diabetes patients by assessing physician's performance against clinical guidelines and final outcomes (e.g. control of diabetes, cholesterol levels, etc) between the two groups. Information on physician's performance and outcomes was extracted from patient's medical records.

2.3 Methods of analysis

Within this study we used a wide array of complementary measures to assess socioeconomic and ethnic inequalities in mortality and health care utilization. These measures could be divided into two main groups: those describing inequalities in absolute terms and those describing inequalities in relative terms.

Absolute level of inequalities in mortality between groups with different socioeconomic position or different ethnicity was measured using age and gender standardized (to the appropriate reference population) mortality rates. Absolute level of inequalities in utilization of services was measured using prevalence rates also standardized by age and gender to the appropriate reference population.

In all studies we have complemented information on absolute level of inequalities with the information on relative inequalities. International comparative studies rely on the measurement of relative index of inequality (RII) that estimates relative level of inequalities in mortality or health services utilization among higher and lower educational groups. The RII is a regression-based index that quantifies the relative position of each educational group within the hierarchy of all educational groups before it is related to health indicators by means of regression. RII results in ratio that can be described as mortality ratio or utilization prevalence ratio in the very bottom of the educational hierarchy compared to the very top of the hierarchy. This index has the advantage that it can be applied in a comparable way to all countries, provided that the educational classifications are strictly hierarchical. Inequalities in mortality between migrants residing in the Netherlands and the native Dutch population were estimated using Relative Risks.

A number of additional measures were used in order to better estimate the magnitude of the difference between socioeconomic or ethnic groups. For example, we used Odds Ratios to calculate differences in process of care performed by physicians with patients of ethnic origin compared to native Dutch (chapter 9). Additionally, the population-attributable risk (PAR) was calculated to assess the reduction in cause-specific injury mortality rates that would occur in case migrants would experience the injury mortality rates of the native Dutch population (chapter 4). In addition we used life table analysis to estimate the temporary life expectancy between the 35th and 70th birthday (with a maximum of 35 years), for higher and lower educational groups in different European countries (chapter 5). We estimated the contribution of each avoidable condition to inequalities in temporary life expectancy using the cause elimination life table.

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PART II

SOCIOECONOMIC AND ETHNIC INEQUALITIES IN CAUSE-SPECIFIC MORTALITY

'Die, my dear Doctor! That's the last thing I shall do.'
Viscount Palmerston (Henry John Temple),
1784-1865, on being told that he was dying

Chapter 3

Socioeconomic inequalities in health in 22 European countries

Based on: Mackenbach JP, Stirbu I, Roskam AJ et al
Socioeconomic inequalities in health in 22 European countries
N Engl J Med 2008;358(23):2468-81

Abstract

Background

Comparisons among countries can help to identify opportunities for the reduction of inequalities in health. We compared the magnitude of inequalities in mortality and self-assessed health among 22 countries in all parts of Europe.

Methods

We obtained data on mortality according to education level and occupational class from census-based mortality studies. Deaths were classified according to cause, including common causes, such as cardiovascular disease and cancer; causes related to smoking; causes related to alcohol use; and causes amenable to medical intervention, such as tuberculosis and hypertension. Data on self-assessed health, smoking, and obesity according to education and income were obtained from health or multipurpose surveys. For each country, the association between socioeconomic status and health outcomes was measured with the use of regression-based inequality indexes.

Results

In almost all countries, the rates of death and poorer self-assessments of health were substantially higher in groups of lower socioeconomic status, but the magnitude of the inequalities between groups of higher and lower socioeconomic status was much larger in some countries than in others. Inequalities in mortality were small in some southern European countries and very large in most countries in the eastern and Baltic regions. These variations among countries appeared to be attributable in part to causes of death related to smoking or alcohol use or amenable to medical intervention. The magnitude of inequalities in self-assessed health also varied substantially among countries, but in a different pattern.

Conclusions

We observed variation across Europe in the magnitude of inequalities in health associated with socioeconomic status. These inequalities might be reduced by improving educational opportunities, income distribution, health-related behaviour, or access to health care.

Introduction

Inequalities in health among groups of various socioeconomic status (as measured by education, occupation, and income) constitute one of the main challenges for public health[1], but it is unknown to what extent such inequalities are modifiable. Because international comparative studies can help identify opportunities for reducing inequalities in health, we conducted a study aimed at measuring variations in the magnitude of inequalities in health among 22 European countries and at identifying some of the immediate determinants of these variations.

Europe offers excellent opportunities for this type of research because of the inter-country variety of political, cultural, economic, and epidemiologic histories and because good data on inequalities in health are often available[2]. In a previous study, we compared socioeconomic inequalities in mortality and morbidity among 10 countries in western Europe during the 1980s[3-7]. We now report a study of the magnitude of inequalities in health in a much larger number of countries in both western and eastern Europe during the 1990s and early 2000s. The inclusion of eastern Europe allows us to determine whether countries that have gone through a turbulent period of political, economic, and health care reform[8-12] have larger inequalities in health than countries elsewhere in Europe.

Methods

We obtained data on mortality according to age, sex, cause of death, and indicators of socioeconomic status from mortality registries (Table 3.1). The data were based on 3.5 million deaths in 16 countries among more than 54 million persons ranging in age from 30 to 74 years at the beginning of the study. The data were drawn from national populations, except for the United Kingdom, with data from England and Wales only; Italy, with data from Turin only; and Spain, with data from Madrid, Barcelona, and the Basque country only. With regard to the mortality data from England and Wales, this article has received clearance from the Office for National Statistics Longitudinal Study (reference number 20037C). We performed analyses of the data on death according to cause focused on common causes of death (cancer, cardiovascular disease, and injuries), and focused on more specific causes of death (smoking-related causes, alcohol-related causes, and causes amenable to medical intervention, such as tuberculosis and hypertension[13, 14]). Code numbers of the causes of death according to the ninth and tenth revisions of the International Classification of Diseases, (ICD-9 and ICD-10) are given in Appendix Table 3.1.

Data on self-assessed health and risk factors for disease (e.g., smoking and obesity) according to age, sex, and indicators of socioeconomic status were obtained from national health or multipurpose surveys that also included self-reported socioeconomic data (Table 3.1). The data came from 19 countries and almost 350,000 respondents who ranged in age from 30 to 64 years in some surveys and from 30 to 69 years in others. All data are nationally representative. For self-reported illness, our study focused on the single-item

Table 3.1 Countries included in the analysis and sources of data

Region	Country	Mortality data				Morbidity data		
		Type of study*	Years	Person-years of follow-up	No. of deaths	Survey	Years	No. of respondents
North	Finland	National census-linked mortality follow-up	1990-2000	25,874,201	269,781	Finbalt Health Monitor. National Public Health Institute, Helsinki	1994, 1998 2000, 2002, 2004	16,963
	Sweden	National census-linked mortality follow-up	1991-2000	43,537,681	404,151	Swedish Survey of Living Conditions. Statistics Sweden, Stockholm	2000-2001	9,918
	Norway	National census-linked mortality follow-up	1990-2000	19,956,767	213,022	Norwegian Survey of Living Conditions. Statistics Norway, Oslo	2002	5,918
	Denmark	National census-linked mortality follow-up	1996-2000	13,926,291	136,065	Danish Health and Morbidity Survey. Danish National Institute of Public Health, Copenhagen	2000	14,503
West	United Kingdom	Census-linked mortality study for a representative sample of 1% of the population of England and Wales	1991-1999	2,295,029	21,234	Health Survey for England. Department of Health, London	2001	13,960
	Ireland	n.a.				Living in Ireland Panel Survey. Economic and Social Research Institute, Dublin	1995-2002	5,294
Continental	Netherlands	n.a.				General social survey Statistics Netherlands, Voorburg	2003-2004	13,782
	Belgium	National census-linked mortality follow-up	1991-1995	24,861,015	283,349	Health Interview Survey. Institute of Public Health, Brussels	1997-2001	16,268
	Germany	n.a.				German National Health Examination and Interview Survey. Robert Koch Institute, Berlin	1998	6,403
	Switzerland †	National census-linked mortality follow-up	1990-2000	27,910,587	25,5251	n.a.		
	France‡	National census-linked mortality follow-up for a representative sample of 1% of population	1990-1999	2,404,246	20,465	French Health, Health Care and Insurance Survey. Institut de Recherche et Documentation en économie de la santé, Paris	2004	14,727
South	Italy	Urban census-linked mortality follow-up for the city of Turin	1991-2001	4,873,109	50,621	Health conditions and use of health services. National Institute of Statistics, Rome	1999-2000	102,832
						Multipurpose Family Survey. Aspects	2000	43,011

						of daily living.		
	Spain	Urban census-linked mortality follow-up for the city of Barcelona	1992-2001	8,151,810	77,101	National Health Survey. Ministry of Health and Consumption, Madrid	2001	17,517
		Regional census-linked mortality follow-up for the region of Madrid	1996-1997	3,663,333	22,585			
		Regional census-linked mortality follow-up for the Basque Country	1996-2001	6,098,485	41,704			
	Portugal	n.a.				National Health Survey. Instituto Nacional de Salude, Lisbon	1998-1999	34,840
East	Slovenia	National census-linked mortality follow-up	1991-2000	9,647,452	101 557			
	Hungary	National unlinked cross-sectional mortality	1999-2002	21,031,348	363,508	National Health Interview Survey Hungary. National Public Health and Medical Officer Service, Budapest	2000-2003	9,179
	Czech Republic	National unlinked cross-sectional mortality	1999-2003	25,759,210	344,973	Health Interview Survey. Institute of Health Information and Statistics of the Czech Republic	2002	2,028
	Slovakia	n.a.				Health Monitor Survey. Public Health Institute of Slovak Republic, Bratislava	2002	1,200
	Poland	National unlinked cross-sectional mortality	2001-2003	54,883,245	717,743	n.a.		
Baltic	Lithuania	National unlinked cross-sectional mortality	2000-2002	5,156,703	78,399	Finbalt Health Monitor[c]	1994, 1998, 2000, 2002, 2004	10,336
	Latvia	n.a.				Finbalt Health Monitor[c]	1998, 2000, 2002, 2004	6,779
	Estonia	National unlinked cross-sectional mortality	1998-2002	3,435,255	60,794	Health Behavior among Estonian Adult Population. National Institute for Health Development, Tallinn	2002, 2004	3,525
Total	Europe			303,465,767	3,462,303			348,983

* In longitudinal, census-linked, follow-up studies of mortality, socioeconomic status as determined during a census is linked to mortality data during a follow-up period after the census. In unlinked, cross-sectional studies of mortality, socioeconomic data mentioned on death certificates and elicited during the census have been used to classify the numerator and denominator of mortality, respectively.
† Non-Swiss nationals are excluded.
‡ Residents of overseas territories, members of the military, and students were excluded.

question on self-assessed health ("How is your health in general?"), which has five possible answers, ranging from "very good" to "bad." In order to make use of the full range of levels of self-assessed health, we gave quantitative weights to each level (i.e., a multiplicative factor of 1.85 for each level worse than "very good") that were derived from the average number of chronic conditions in each level[15] (details of the calculation are given in the legend to Fig. 2). The only risk factors for disease for which data were available in a form that enabled them to be compared across countries were current tobacco smoking and obesity, defined as a body-mass index (the weight in kilograms divided by the square of the height in meters) greater than 30.

Socioeconomic status was measured by education, occupation, and income. Education levels were categorized as no education or primary education (up to approximately 6 years of education), lower secondary education (up to approximately 9 years), higher secondary education (up to approximately 11 years), and tertiary education (bachelor's degree or higher). Data on education level were available in a comparable form for most countries from both mortality registries and health interviews or multipurpose surveys. Occupations were classified as "manual" (considered the lower level) or "non-manual." Data on occupation were available from mortality registries for middle-aged men in a limited number of countries only. Income was categorized in approximate quintiles of equivalent net household income. The self-reported after-tax incomes of all household members, including benefits, were added, and the total was corrected for household size by dividing it by the total number of persons in the household to the power of 0.36. Income data were available from surveys in a limited number of countries only. Tables 3.2, 3.3, and 3.4 in the Appendix show the distribution of study populations according to education level, occupational classification, and income level. The proportion of the population with less education tended to be large in the southern and eastern regions, whereas inequalities in income were large in England and Wales and in Portugal.

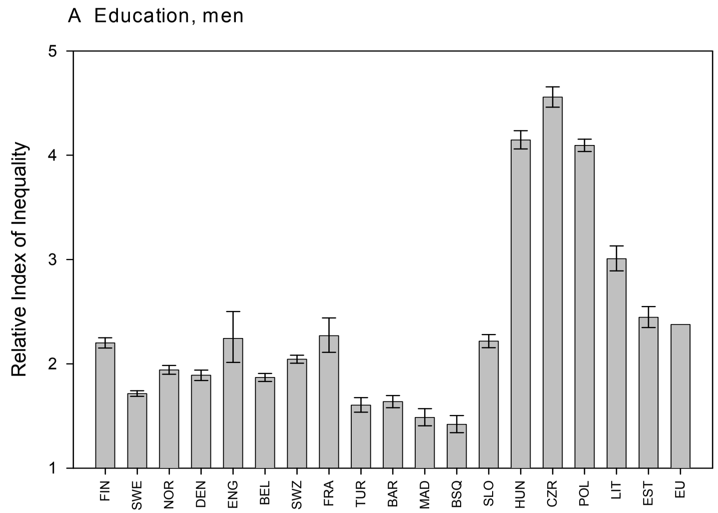
All measures were adjusted for age. Because both relative and absolute measures of inequalities in health are important, we have presented both the relative index of inequality and the slope index of inequality[16, 17] for each country separately. Both indexes are regression-based measures that take into account the whole socioeconomic distribution and that remove variability in the size of socioeconomic groups as a source of variation in the magnitude of inequalities in health[17]. In the regression analysis, mortality, morbidity, or risk factor prevalence was related to a measure of the rank of education, occupation, or income, in which the rank was calculated as the mean proportion of the population having a higher level of education, occupation, or income. The relative index of inequality is the ratio between the estimated mortality, morbidity, or risk factor prevalence among persons at rank 1 (the lowest education, occupation, or income level) and rank 0 (the highest level). The relative index of inequality was calculated with the use of Poisson regression analysis, which also generated 95% confidence intervals. The slope index of inequality measures absolute differences in rates (e.g., in deaths per 100,000 person-years) between the lowest and the highest ends of the socioeconomic scale. The slope index of inequality is derived from the relative index of inequality and the age-adjusted overall mortality rate according to the following formula: slope index of inequality = 2 × mortality rate × (relative index of inequality − 1) ÷ (relative index of inequality + 1)[16]. Because the slope index of inequality depends on the overall mortality rate in the population, we have presented these overall mortality rates together with the slope indexes of inequality.

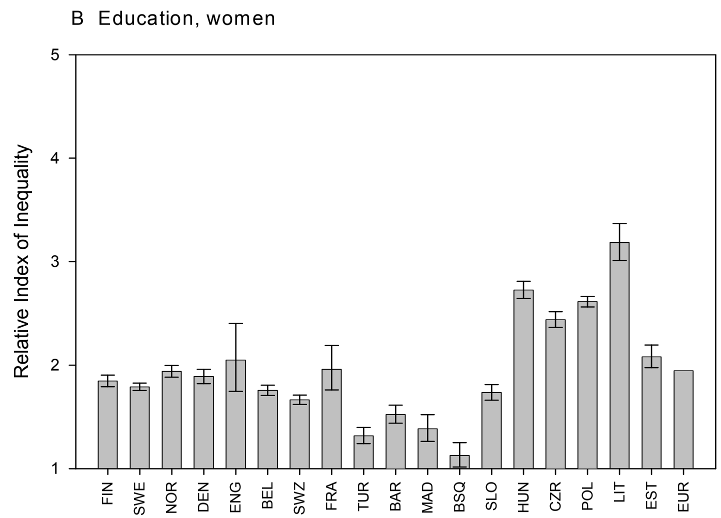
Results

Figures 3.1A and 3.1B show relative inequalities in the rate of death from any cause according to education level. The relative index of inequality is greater than 1 for both men and women in all countries, indicating that, throughout Europe, mortality is higher among those with less education. The magnitude of these inequalities varies substantially among countries. For example, in Sweden the relative index of inequality for men is less than 2, indicating that mortality among those with the least education is less than twice that among those with the most education; on the other hand, in Hungary, the Czech Republic, and Poland, the relative index of inequality for men is 4 or higher, indicating that mortality differs by a factor of more than 4 between the lower and upper ends of the education scale. The smallest inequalities for both men and women are found in the Basque country of Spain, whereas the largest inequalities are found in the Czech Republic and Lithuania. Education-related inequalities in mortality are smaller than the average for Europe in all southern European populations included in this analysis and larger than average in most countries in the eastern and Baltic regions. Data on occupation-related inequalities in mortality among middle-aged men (Fig. 3.1C) confirm that relative inequalities in mortality tend to be smaller in southern European populations.

Table 3.2 shows that the international pattern observed for relative education-related inequalities in mortality also generally applies to absolute education-related inequalities in mortality, as indicated by the slope index of inequality. In Europe as a whole, persons with less education have higher rates of death from all causes except breast cancer, as indicated by a negative slope index of inequality for this cause of death. Inequalities in the rate of death from cardiovascular disease account for 34% of education-related inequalities in the rate of death from any cause among men (451 of 1333 deaths per 100,000 person-years) and 51% of those among women (251 of 492 deaths per 100,000 person-years). Although death from almost any cause is more frequent among those with less education than among those with more education, the range of variation for a single cause of death sometimes includes both "reverse" inequalities (higher mortality in groups with higher education) and "regular" inequalities (higher mortality in groups with lower education).

These data help to explain how smaller education-related inequalities in the rate of death from any cause in southern European populations and larger inequalities in the eastern and Baltic regions arise. Among men and women, smaller inequalities in the rate of death from any cause in the southern region are due mainly to smaller inequalities in the rate of death from cardiovascular disease. For example, among men in the Basque country, where the





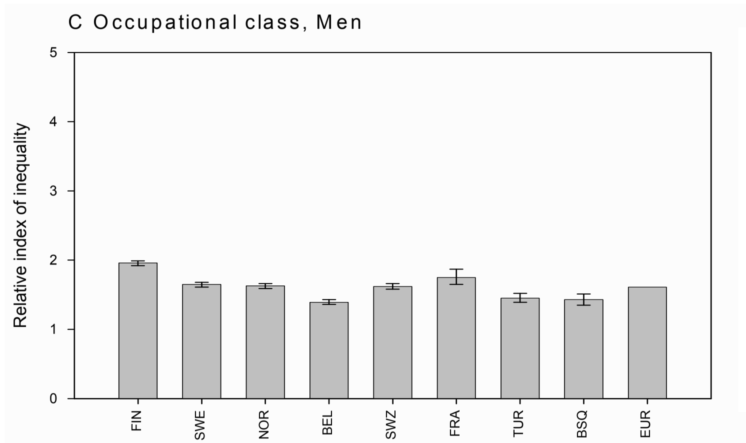


Figure 3.1 Relative inequalities in the rate of death from any cause.
Panel A shows inequalities between men with the lowest level of education and those with the highest, and *Panel B* shows education-related inequalities for women. *Panel C* shows inequalities between men in the lower and higher occupational classes. Economically inactive men whose last occupation was unknown were excluded from the analysis. Because exclusion of these men may lead to underestimation of mortality differences between occupational classes, we applied an adjustment procedure that was developed and tested in a previous European comparative study of inequalities in mortality; the procedure is based on national estimates of the proportion of economically inactive men in each occupational class and of the mortality rate ratio of inactive as compared with active men in each occupational class[18].

education-related inequality in the rate of death from any cause is below the European average, death from cardiovascular disease accounts for 46% of this difference. Larger inequalities in the rate of death from cardiovascular disease make an important contribution to larger inequalities in the rate of death from any cause in the eastern and Baltic regions as well; however, important contributions are also made by cancer in the eastern region and injuries in the Baltic region.

In Europe as a whole, inequalities in mortality from smoking-related conditions account for 22% of the inequalities in the rate of death from any cause among men and 6% of those among women (Table 3.2). Inequalities in smoking-related mortality tend to be larger in the eastern and Baltic regions (among men only) and smaller (or even "reverse") in the southern region. In Europe as a whole, inequalities in alcohol-related mortality account for 11% of inequalities in the rate of death from any cause among men and 6% of those among women. Larger inequalities in alcohol-related mortality contribute to larger inequalities in the rate of death from any cause in Hungary (among men and women) and the Baltic region (among men only). In Europe as a whole, deaths from conditions amenable to medical intervention account for 5% of inequalities in the rate of death from any cause. However, these inequalities are larger than the European average in Lithuania and Estonia, where they contribute to the larger inequalities in the rate of death from any cause (among men only).

Figure 3.2 shows the relative inequalities in the prevalence of poorer self-assessed health (weighted on the basis of the burden of chronic disease) according to education and income level. The relative index of inequality is greater than 1 in all countries, indicating worse health in groups of lower socioeconomic status throughout Europe. The variation of this measure among countries is considerably less than that of inequalities in the rate of death from any cause, and the international pattern also tends to be different from that of death from any cause. In Italy and Spain, education-related inequalities in self-assessed health are smaller than average, a finding that mirrors the smaller education-related inequalities in the rate of death from any cause observed in Turin, Barcelona, Madrid, and the Basque country. In the Baltic region, on the other hand, education-related inequalities in self-assessed health are smaller than average, whereas education-related inequalities in death from any cause are larger. Income-related inequalities in self-assessed health are not larger in the eastern and Baltic regions than in other parts of Europe and are remarkably large in the northern and western regions, particularly England and Wales, where income inequalities are also large (see Appendix Table 3.4).

In Europe as a whole, both smoking and obesity are more common among people of lower education level; education-related inequalities in smoking are larger among men, and education-related inequalities in obesity are larger among women (Fig. 3.3). There are striking differences among countries in the magnitude and even the direction of these inequalities, however. Large education-related inequalities in smoking are seen in the northern, western, and continental regions; small inequalities (and, among women, even

Table 3.2 Absolute inequalities in overall and cause-specific mortality rates between persons with the lowest and those with the highest level of education*

Country	Average rates of death from any cause †	Slope index of inequality according to cause of death											
		All causes	All cancer-related causes	Breast cancer	Lung cancer	All cardio-vascular diseases	Ischemic heart disease	Cerebro-vascular disease	Injuries	All other diseases	Alcohol-related causes §	Smoking-related causes ¶	Causes amenable to medical care #
Men													
FIN	1673	1255	213	-	135	533	393	94	143	347	101	215	88
SWE	1188	625	90	-	37	309	229	50	52	175	50	71	26
NOR	1529	980	169	-	95	434	307	78	70	305	62	166	49
DEN	1344	828	126	-	75	235	157	39	89	363	23	60	44
ENG	1124	862	225		141	401	284	67	19	157	28	241	n.a.
BEL	1510	915	274	-	179	233	99	55	64	340	36	302	28
SWZ	1475	1012	283	-	136	291	132	61	91	348	117	260	61
FRA	1241	1044	333	-	71	232	67	68	109	357	196	204	114
TUR	1377	639	232	-	107	140	57	52	23	243	63	177	24
BAR	1370	662	230	-	90	88	26	40	38	304	77	218	36
MAD	1355	530	181	-	56	38	-16	11	26	278	75	170	34
BSQ	1108	384	107	-	39	16	- 6	3	63	177	46	107	24
SLO	1902	1439	303	-	124	405	67	219	203	482	224	327	83
HUN	2110	2580	666	-	260	1003	482	385	222	671	420	508	66
CZR	1664	2130	676	-	247	825	472	259	138	489	146	364	73
POL	1804	2192	589	-	260	750	295	223	187	637	145	408	75
LIT	2531	2536	383	-	197	807	505	159	643	677	304	424	195
EST	2799	2349	355	-	191	929	610	263	436	618	286	323	162
EUR	1635	1333	328		153	451	233	131	147	425	141	288	72

Table 3.2 (Continued). Absolute inequalities in overall and cause-specific mortality rates between persons with the lowest and those with the highest level of education*

Country	Average rates of death from any cause †	Slope index of inequality according to cause of death: All causes	All cancer-related causes	Breast cancer	Lung cancer	All cardio-vascular diseases	Ischemic heart disease	Cerebro-vascular disease	Injuries	All other diseases	Alcohol-related causes §	Smoking-related causes ¶	Causes amenable to medical care #
Women													
FIN	811	483	49	-8	14	262	168	72	25	161	31	28	42
SWE	673	381	73	-6	20	172	104	44	8	128	15	39	18
NOR	811	518	103	-14	44	239	141	62	5	169	16	79	30
DEN	830	511	103	-12	63	160	90	42	22	230	9	70	27
ENG	672	462	111	-22	59	236	154	31	1	96	7	103	n.a.
BEL	761	417	47	-11	11	198	77	55	11	163	6	29	10
SWZ	676	337	53	-3	10	158	74	46	5	120	10	21	22
FRA	536	375	50	35	6	130	33	44	36	163	30	17	82
TUR	721	197	15	-17	-9	94	34	34	-3	94	8	-4	11
BAR	569	236	7	-12	-14	103	36	34	5	126	7	-14	12
MAD	543	175	-12	-29	-17	96	30	29	-1	94	-3	-17	9
BSQ	422	51	-76	-19	-20	56	23	17	7	74	3	-24	2
SLO	853	459	-13	-21	-18	263	62	127	28	180	44	-3	33
HUN	1023	948	120	-17	20	511	237	216	51	258	82	61	26
CZR	868	726	144	10	17	356	182	134	26	203	23	33	32
POL	840	750	139	6	10	356	117	142	29	222	23	28	27
LIT	1053	1099	130	7	7	535	297	162	178	251	87	39	51
EST	1213	851	7	-5	4	493	273	187	109	252	101	16	48
EUR	778	492	55	-9	10	251	120	85	30	172	30	28	27

* Code numbers of the causes of death according to ICD-9 and ICD-10 are given in Appendix Table 3.1. The slope index of inequality is a regression-based measure of absolute differences in mortality rates between the lowest and the highest ends of the socioeconomic scale. NA denotes not available.
† Age-standardized rates of death for all educational groups are given. ‡ Rates of death from breast cancer among men are not given.
§ Alcohol-related causes are accidental poisoning by alcohol and alcoholic psychosis, dependence, abuse, cardiomyopathy, and cirrhosis of the liver and pancreas.
¶ Smoking-related causes are chronic obstructive pulmonary disease and cancer of the buccal cavity, pharynx, esophagus, larynx, trachea, bronchus, and lung.
# Causes amenable to medical intervention are tuberculosis and other infectious and parasitic diseases, cervical cancer, breast cancer, Hodgkin's disease, leukemia, hypertension, cerebro-vascular disease, pneumonia or influenza, appendicitis, hernia, peptic ulcer, cholelithiasis and cholecystitis, and complications of childbirth.

reverse inequalities, in which smoking rates are higher in groups with more education) are seen in the southern region. In the eastern and Baltic regions, the pattern is unclear. Large education-related inequalities in obesity are seen in the southern region, particularly among women, for whom the relative indexes of inequality are above 4, indicating that the prevalence of obesity among those with the least education is more than four times higher than that among those with the most education. By contrast, education-related inequalities in obesity tend to be smaller than average in the eastern and Baltic regions.

Discussion

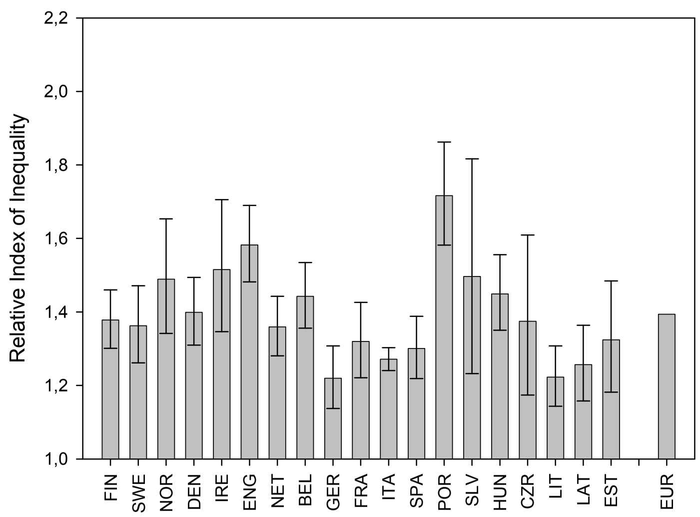
As compared with our study of inequalities in mortality and morbidity related to socioeconomic status in 10 western European countries during the 1980s[3], the present, more extensive study of the situation during the 1990s and early 2000s found much larger among-country variability in the magnitude of inequalities in health. Inequalities in mortality from selected causes suggest that some variations may be attributable to socioeconomic differences in smoking, excessive alcohol consumption, and access to health care. We also found among-country variations in the magnitude of inequalities in self-assessed health, but in a different pattern, precluding a generalization from inequalities in mortality to inequalities in overall health.

Our study had several limitations. International comparability of data on socioeconomic inequalities in health is still imperfect, and the degree of comparability is likely to decline with increasing geographical coverage. There are differences among countries in various aspects of data collection, and some of these might affect the size of inequalities in health, as we have shown previously[18]. We found smaller inequalities in mortality in some urban, relatively prosperous southern European populations that are not necessarily representative of the whole of Italy or Spain. Some studies have shown, however, that inequalities in health tend to be larger in urban than in rural areas[19]. Our previous study in the 1980s, which used national data for Italy and Spain from methodologically less-refined sources, also showed smaller inequalities in mortality in these countries[4, 5]. We found larger inequalities in mortality in the eastern and Baltic regions. All these countries except Slovenia, which has smaller inequalities in mortality, provided data from cross-sectional, non-census–linked studies. Although this may suggest bias[20], it is also possible that Slovenia, which is close to Italy, shares some of the favourable characteristics of the southern region.

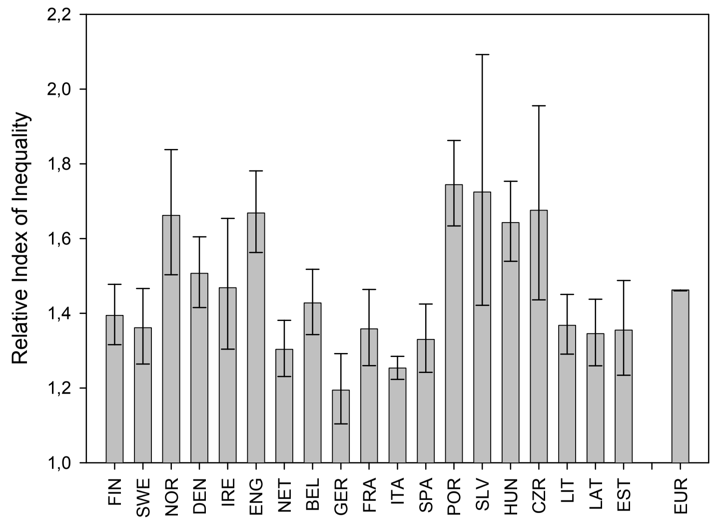
Internationally comparable data on inequalities in specific determinants of mortality and morbidity are scarce, and we could study only smoking and obesity. The contribution to inequality of other factors, such as alcohol consumption, use of health care, working and housing conditions, and psychosocial stressors, could not be studied directly.

Figure 3.2 Relative inequalities in the prevalence of poorer self-assessed health

A. Education, men



B. Education, women



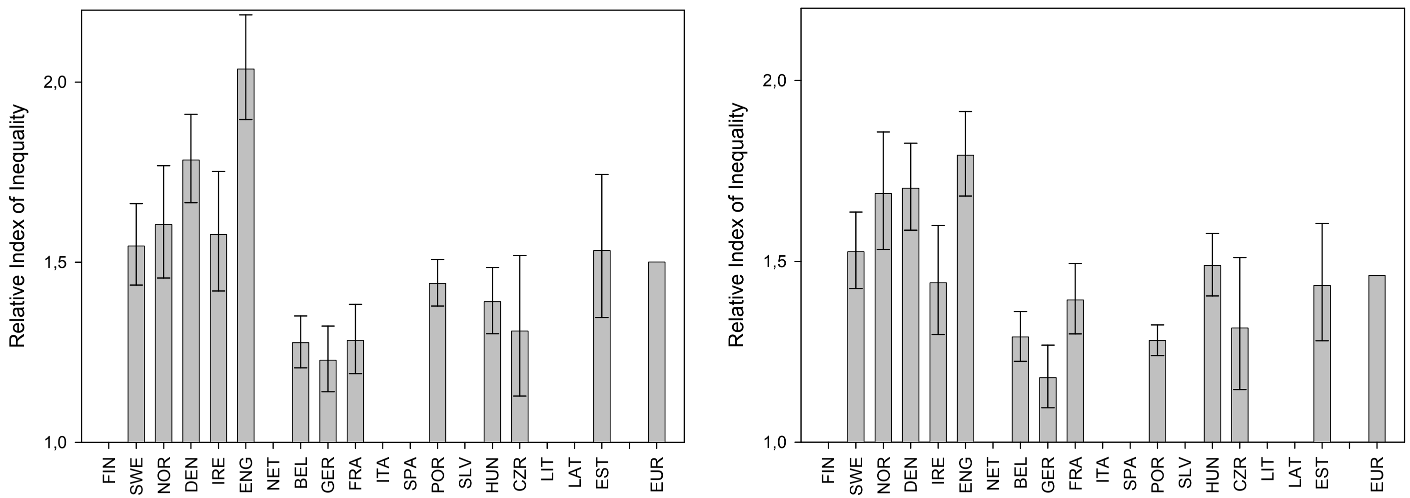
Panels A and B show inequalities between persons with the lowest and those with the highest level of education for men and women, respectively.

In order to make use of the full range of levels of self-assessed health, we calculated the estimated burden of disease associated with each level on the basis of the number of chronic conditions reported by respondents to these surveys. Relative differences in self-reported chronic conditions between answer categories of the self-assessed health question were remarkably similar between countries and varied only marginally around a multiplicative factor of 1.85 (i.e., each step down on the self-assessed health scale was found to be associated with 1.85 times more chronic conditions). On the basis of this analysis, we assigned a weight for burden of disease to each category of answer to the question "How is your health in general?" "Very good" was assigned a weight of 1.850 = 1, "good" a weight of 1.851 = 1.85, "fair" a weight of 1.852 = 3.42, and "poor" or "very poor" a weight of 1.853 = 6.33. Sensitivity analyses showed that the ranking of countries according to the magnitude of inequalities in self-assessed health did not change when these weights were varied within the range of observed values[15].

Figure 3.2 (Continued). Relative inequalities in the prevalence of poorer self-assessed health

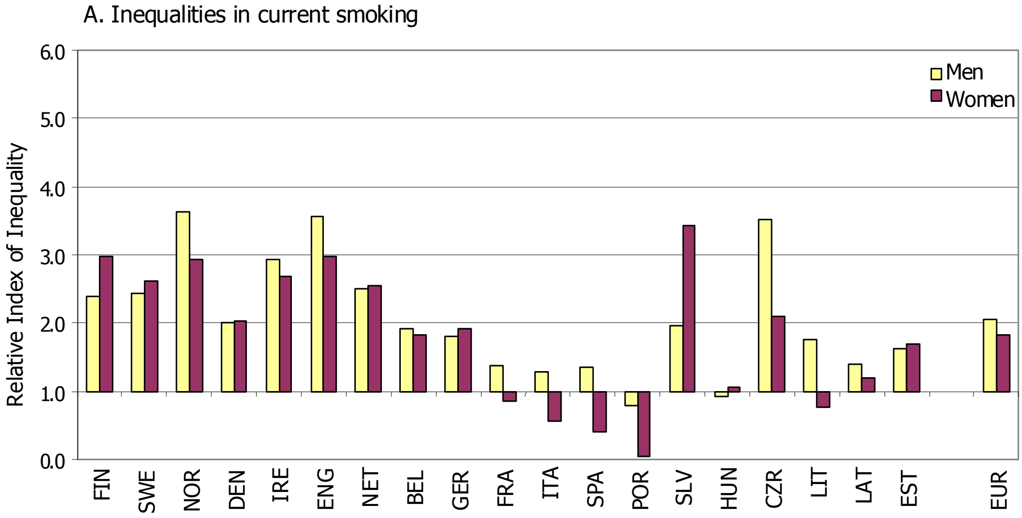
C. Income, men

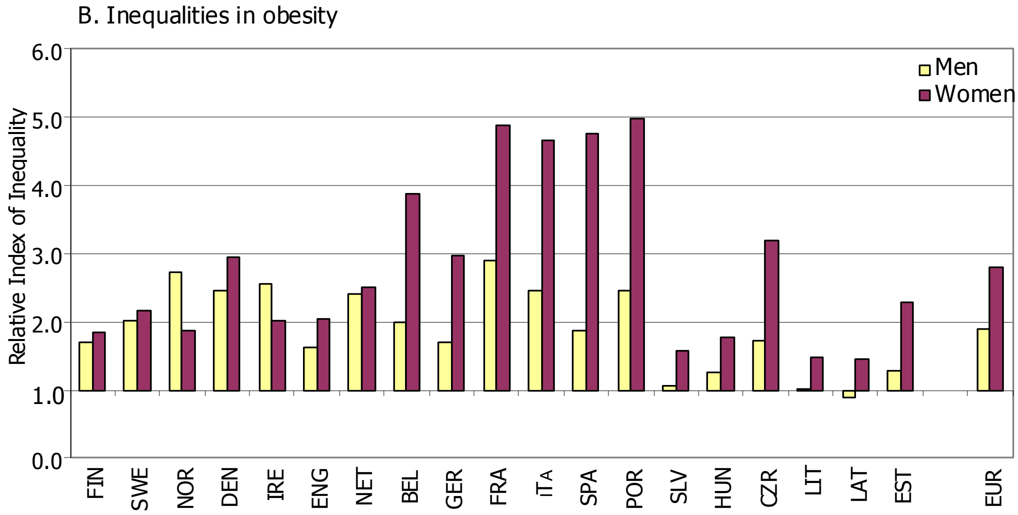
D. Income, women



Panels C and D show inequalities between persons with the lowest and those with the highest level of income for men and women, respectively.

Figure 3.3 Relative inequalities in the prevalence of current smoking (panel A) and obesity (panel B)





Panels A and B show inequalities between persons with the lowest and those with the highest level of education for men and women, respectively.

Both smoking and obesity have been shown to contribute to inequalities in health related to socioeconomic status in studies of individual persons in some countries[21-23]. Obesity, however, is unlikely to be a major contributor to international variations in inequalities in health, because inequalities in obesity related to socioeconomic status are large where inequalities in mortality related to socioeconomic status, particularly mortality from cardiovascular disease, are small (i.e., in the southern region). Smoking, on the other hand, does appear to be a major explanatory factor. It has been well documented that countries in the southern region are in an earlier stage of the smoking epidemic than countries in the northern, western, and continental regions[24, 25]. We still found reverse inequalities in smoking among women and small inequalities among men, findings that are consistent with the smaller inequalities in mortality in the southern region, particularly from conditions related to smoking. The history of the smoking epidemic is much less well documented for the eastern and Baltic regions[26, 27], and it is therefore difficult to determine why inequalities in mortality from smoking-related conditions are large, whereas inequalities in smoking are often small.

The role of hazardous drinking (daily consumption of large amounts of alcohol-containing beverages, binge drinking, or consumption of surrogate alcohols) in generating high mortality rates in eastern Europe, particularly among men, has been well documented[28-30]. We have not been able to find comparable survey data on inequalities in alcohol consumption related to socioeconomic status in eastern Europe, but our analysis of cause-specific mortality suggests that rates of hazardous drinking are substantially higher in the lower than in the higher socioeconomic groups, particularly among men. Low levels of social support, lack of control over one's life, and material hardship, combined with a culture that approves of excessive alcohol consumption, are likely to be involved[8, 9].

Although the role of deficiencies in health care in the high mortality rates of eastern Europe has been pointed out before[31, 32], our study demonstrates the magnitude of inequalities in mortality related to socioeconomic status from conditions amenable to medical intervention in this part of Europe. Our results suggest that inequalities in access to good-quality health care have a role in generating inequalities in mortality. Inequalities in access to health care leading to inequalities in survival from chronic conditions may also partly explain the discrepancy between our results for mortality and those for self-assessed health. Inequalities in the prevalence of poorer self-assessed health are the result of inequalities in both the incidence and the duration of health problems, which may be shortened by lower survival rates among less-educated persons in Eastern Europe.

Smoking, obesity, excessive alcohol consumption, and deficiencies in health care represent only some of the immediate determinants of inequalities in health, and both lifestyle choices and patterns of use of health care are likely to be constrained by inequalities in general living conditions, as structured by political, economic, social, and cultural forces. Within western Europe, there is little evidence that among-country variations in the magnitude of inequalities in health are related to variations in political factors. For example, Italy and

Spain have welfare policies that are less generous and less universal than those of northern Europe[33, 34], but they appear to have substantially smaller inequalities in mortality, perhaps partly because of cultural factors, such as the Mediterranean diet and the reluctance of women to take up smoking[35, 36]. Cultural factors seem to have prevented differences in access to material and other resources in these populations from translating into inequalities in lifestyle-related risk factors for mortality.

We also found no evidence for systematically smaller inequalities in health in countries in northern Europe. This is surprising, because these countries have long histories of egalitarian policies, reflected by, among other things, welfare policies. These policies provide a high level of social security protection to all residents of the country, resulting in smaller income inequalities and lower poverty rates[33, 34, 37]. Our results suggest that although a reasonable level of social security and public services may be a necessary condition for smaller inequalities in health, it is not sufficient. Lifestyle-related risk factors have an important role in premature death in high-income countries[38] and also appear to contribute to the persistence of inequalities in mortality in the northern region[39].

Our study shows that although inequalities in health associated with socioeconomic status are present everywhere, their magnitude is highly variable, particularly for inequalities in mortality. This result implies that there is opportunity to reduce inequalities in mortality. Developing policies and interventions that effectively target the structural and immediate determinants of inequalities in health is an urgent priority for public health research[40].

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Appendix Table 3.1 List of causes of death

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

Appendix Table 3.2 Distribution of the study populations by educational level (men and women, 30-74 years).

Country	Educational level (%)		
	Primary or lower secondary	Upper secondary	Tertiary
Finland	48,9	29.9	21.1
Sweden	39,6	42.3	18.1
Norway	32,2	48.3	19.5
Denmark	44,7	35.1	20.2
England	81,4	10,9	7,7
Belgium	64,0	20.5	15.5
Switzerland	29,7	54.9	15.5
France	55,4	32.8	11.8
Turin	71,4	19.8	8.7
Barcelona	69,1	14.7	16.1
Madrid region	70,3	14.8	14.9
Basque country	69,9	16.8	13.3
Slovenia	46.5	42.6	11.0
Hungary	64,3	23.3	12.4
Czech Republic	63,5	26.1	10.5
Poland	57,1	32.0	10.9
Lithuania	31,7	51.6	16.6
Estonia	30,6	51.9	17.5

Source: National or regional population census

Appendix Table 3.3 Distribution of the study populations by occupational class (men 30-59 years).

Country	Occupational class (%)		
	Manual	Non-manual	Other
Finland	34.6	46.6	18.8
Sweden	39.4	38.2	22.4
Norway	48.4	40.7	12.9
Belgium	38.0	33.3	28.7
Switzerland	53.3	24.9	21.8
France	46.2	34.5	19.3
Turin	37.3	42.8	19.9
Basque country	36.5	56.2	7.3

Source: National or regional population census

Appendix Table 3.4 Distribution of the study populations by income level (Men and women, 30-69 years).

Country	Income quintile	No. of respondents	%	Average income*	Country	Income quintile	No. of respondents	%	Average income*	Country	Income quintile	No. of respondents	%	Average income*
Sweden	Poorest	1205	12,1	n/a	Belgium	Poorest	3208	19,7	303	Czech Rep.	Poorest	386	19,0	53
	2	2092	21,1	n/a		2	3255	20,0	771		2	409	20,2	94
	3	2160	21,8	n/a		3	3131	19,2	1007		3	369	18,2	121
	4	2196	22,1	n/a		4	3240	19,9	1282		4	389	19,2	160
	Richest	2265	22,8	n/a		Richest	3207	19,7	1977		Richest	370	18,2	262
	Missing	0	0,0	n/a		Missing	227	1,4	-		Missing	105	5,2	-
		9918					16268					2028		
Norway	Poorest	1180	19,9	1355	Germany	Poorest	1002	15,6	556	Estonia	Poorest	401	11,4	n/a
	2	1181	20,0	1968		2	991	15,5	882		2	501	14,2	n/a
	3	1181	20,0	2398		3	1003	15,7	1095		3	452	12,8	n/a
	4	1181	20,0	2888		4	1033	16,1	1382		4	522	14,8	n/a
	Richest	1181	20,0	4503		Richest	1022	16,0	2226		Richest	422	12,0	n/a
	Missing	14	0,2	-		Missing	1352	21,1	-		Missing	1227	34,8	n/a
		5918					6403					3525		
Denmark	Poorest	2629	18,1	1130	France	Poorest	2078	15,1	582	Hungary	Poorest	1597	17,4	101
	2	2535	17,5	1945		2	2098	15,2	1009		2	1584	17,3	153
	3	2789	19,2	2665		3	2059	15,0	1318		3	1643	17,9	197
	4	2463	17,0	3411		4	2091	15,2	1698		4	1547	16,9	258
	Richest	2571	17,7	5247		Richest	2066	15,0	3185		Richest	1572	17,1	461
	Missing	1516	10,5	-		Missing	3379	24,5	-		Missing	1236	13,5	-
		14503					13771							
Ireland	Poorest	1208	22,8	n/a	England	Poorest	2233	16,0	610	Portugal	Poorest	5323	15,3	129
	2	1085	20,5	n/a		2	2320	16,6	1132		2	8358	24,0	320
	3	1037	19,6	n/a		3	2271	16,3	1777		3	7619	21,9	546
	4	985	18,6	n/a		4	2307	16,5	2735		4	6332	18,2	815
	Richest	979	18,5	n/a		Richest	2239	16,0	5794		Richest	7208	20,7	1545
	Missing	0	0,0	n/a		Missing	2590	18,6	-		Missing	0	0,0	-
		5294					13960					34840		

*Average monthly household income (in euros), including all income components received by any household member, after subtraction of taxes and social premiums. Total household income was corrected for household size through division by the number of household members raised to the power 0.36.
n/a = only percentile or categorical date were available in the original data source, which permitted a classification in approximate quintiles but not a calculation of mean income per quintile. Source: National health or multipurpose survey

Chapter 4

Convergence of cancer mortality among migrants in the Netherlands toward the rates of the native Dutch

Based on: Stirbu I, Kunst AE, Vlems FA et al
Cancer mortality rates among first and second generation migrants in the Netherlands: Convergence toward the rates of the native Dutch population Int J Cancer 2006;119(11):2665-72.

Abstract

Objectives
This study investigates the difference in cancer mortality rates between migrant groups and the native Dutch population, and determines the extent of convergence of cancer mortality rates according to migrants' generation, age at migration and duration of residence.

Methods
Data were obtained from the national cause of death and population registries in the period 1995–2000. We used Poisson regression to compare the cancer mortality rates of migrants originating from Turkey, Morocco, Surinam, Netherlands Antilles and Aruba to the rates for the native Dutch.

Results
All-cancer mortality among all migrant groups combined was significantly lower when compared to that of the native Dutch population (RR 5 0.55, CI:0.52–0.58). For a large number of cancers, migrants had more than 50% lower risk of death, while elevated risks were found for stomach and liver cancers. Mortality rates for all cancers combined were higher among second generation migrants, among those with younger age at migration, and those with longer duration of residence. This effect was particularly pronounced in lung cancer and colorectal cancer. For most cancers, mortality among second generation migrants remained lower compared to the native Dutch population. Surinamese migrants showed the most consistent pattern of convergence of cancer mortality.

Conclusions
The generally low cancer mortality rates among migrants showed some degree of convergence but did not yet reach the levels of the native Dutch population. This convergence implies that current levels of cancer mortality among migrants will gradually increase in future years if no specific preventive measures are taken.

Introduction

While molecular epidemiology has identified several examples of genetically determined differences between races, classical epidemiology has shown that the environment and lifestyle predominates in determining cancer incidence[1, 2]. The role of the environment and behaviour is particularly visible in the changing incidence and mortality rates of cancer among migrant populations. Many migrant studies on cancer have shown that the initially different levels of cancer incidence and mortality of migrant groups gradually converge towards the levels of the new host population [3-16]. At present, it is still not known how quickly the convergence develops, and how the pace of convergence may differ according to migrant group and type of cancer. This information would better position the role of environmental factors as well as provide knowledge for more rational planning of specific preventive and curative health services for migrant populations.

About 10% of the population of the Netherlands is currently of non-western foreign origin[17]. The largest migrant groups originate from Turkey, Morocco, and the former Dutch colonies in South America and the Caribbean (Surinam and Netherlands Antilles/Aruba). Turkish and Moroccans are mostly labour migrants followed by their immediate family and descendants for family reunification. Surinamese came to the Netherlands more recently with the independence of Surinam as a Dutch colony.

Existing cancer registries in the countries of origin of these migrant groups provide indication for lower cancer incidence and mortality for most cancers compared to the European population[18, 19]. In the Netherlands and other European countries, the overall cancer incidence and mortality among Turkish and Moroccan migrants was reported to be lower compared to the native population in the destination countries[5, 6, 20], although some variations depending on cancer type and country of origin were observed [21, 22]. Previous Dutch studies covered only a few types of cancer and were restricted to the first generation migrants living in specific regions. In addition, no information was available on the migrants' age at immigration. As a result, little is known about the rate of convergence of cancer mortality of migrants compared to the native Dutch population.

This knowledge is of particular importance in view of the increasing number of ageing migrant populations in the Netherlands in the forthcoming decades. Rapid and persistent convergence would imply that migrant populations would require a greater share in the use of the cancer care services. Therefore, information on the rate of convergence of cancer incidence is important to better estimate future developments in the burden of cancer mortality and morbidity and demand for specific oncologic care among migrant groups.

The objective of the study is to determine the extent and the rate of convergence of cancer mortality rates among 1st and 2nd generation immigrant population towards the rates of the native Dutch population. We use national level data on the mortality from the major cancer types according to migrants' generation, their age at migration and their duration of residence in the Netherlands.

Data and methods

We used data for the years 1995 through 2000. By means of personal identification numbers, we linked data from the cause of death registry to data of the municipal population registers. These data sources include all legal residents of the Netherlands. The population register in the Netherlands is based on an ongoing process of data update of population numbers by recording all births, deaths (regardless whether occurred in the Netherlands or abroad), immigrations, emigrations, and re-migrations. Deaths and corresponding population numbers are from the same source.

The causes of death were coded according to the ICD-9 for 1995, and according to ICD-10 for 1996-2000. We selected all major types of cancer from which the total number of death in the study period was close to or exceeded 2000 cases. The cancer types selected for the study and their ICD codes are given in Table 4.2.

Legal residents entered the study throughout the study period (open cohort design). For each legal resident, the amount of person time was calculated. All data on deaths and persons-years at risk were tabulated according to sex, date of birth (classified in 5 age-groups), country of origin, 6-digit postal code, and marital status. These socio-demographic indicators were previously shown to be related to cause-specific mortality[22]. All immigrants, in addition, were classified by generation and date of immigration, based on which we calculated age at immigration and duration of residence.

We used country of birth to identify ethnic groups. Residents were categorized as not-native if they or if one of their parents was born abroad. We thus followed a definition used by Statistics Netherlands widely accepted among health researchers in the Netherlands [17]. According to this definition, in mixed ethnic minority families, the country of birth of the mother predominated. Age at immigration and duration of residence were established on the basis of the latest known date of immigration into the Netherlands. If a person immigrated to the Netherlands, emigrated consecutively, and immigrated again to the Netherlands, the most recent date of immigration determined the year of immigration. We classified year of immigration in such manner that there was a substantive variation in duration of residence between the three groups (prior to 1980, 1980-89, and 1990 or later) while maintaining sufficiently large numbers of residents in each group.

Data included characteristics of neighbourhood of each person's place of residence that was based on the 6-digit postal code. For this paper, we used information on degree of urbanization (address-density per square kilometre, classified into five categories) and mean household equivalent income of all households in the neighbourhood (classified into the 10 deciles for the total population) [23].

The size of the difference in cancer mortality rates between migrant groups and the native Dutch population was calculated using Poisson regression (in Stata software, version 7). All relative risks (RR) were adjusted for age, sex, marital status, urbanization level, and area income.

To estimate the rate of change of cancer mortality we examined the difference in mortality rates according to generation, age at migration, and duration of residence within migrant groups. To determine the extent to which migrant groups have approached the cancer mortality rates of the native Dutch population, we compared the cancer mortality rates between Dutch and immigrant groups.

Results

Compared to the native Dutch, all migrant groups were much younger and lived in more urbanized and lower income areas (Table 4.1). More migrants belonged to the 1st generation and migrated at the age of 15-30 years. About 50% of Turkish and Moroccan migrants arrived before 1985. This percentage was slightly higher for Surinamese, but lower for Antilleans and Arubans.

Most deaths from malignant conditions occurred among the native Dutch people (172 007 deaths, 4.2 and appendix table A). Among migrants, Surinamese had the largest numbers of death (708), followed by Turkish (350 deaths), Moroccans (211 deaths), and Antillean/Aruban populations (185 deaths). Lung cancer was the most frequent cause of death for all population groups, with the exception of Antilleans/Arubans, among whom breast cancer caused most deaths.

The mortality rate from all cancers combined and for all migrant groups combined was significantly and substantially lower than the rate of the native Dutch population (RR=0.55 CI: 0.52-0.58, Table 4.2). Relative risks varied between 0.40 for Moroccans and 0.78 for Antilleans/Arubans. For a large number of cancers, migrants had 50% or lower risk of death compared to the native Dutch population. This included lung cancer (RR=0.33 CI: 0.36-0.45), colorectal cancer (RR=0.54 CI: 0.45-0.64), and breast cancer (RR=0.53 CI: 0.46-0.62). Similarly low levels were found for cancers of oesophagus, pancreas, cervix uteri, ovary, testis, urinary, haematopoietic and lymphoid tissue, and central nervous system. Patterns for migrant men and women were similar for all cancer types except lung cancer, where women had a significantly lower mortality (RR=0.21) compared to men (RR=0.52).

In contrast, some cancers had elevated risks of death among migrants compared to the native Dutch population. Liver cancer was significantly elevated among Turkish and Surinamese migrants (RR in both migrant groups above 2.20). Stomach cancer was

Table 4.1 Background characteristics by ethnic group and gender.

	Dutch	Turkish	Moroccans	Surinamese	Antillean / Aruban
Person years (*1000)					
Men	31,931	693	595	668	208
Women	39,262	753	628	865	258
Gender distribution					
% Men*	45	48	49	44	45
Age distribution:					
Men: % younger than 15 years	18.2	35.1	36.8	29.3	33.8
% 50+ years	28.9	8.3	9.2	10.3	6.6
Women: % younger than 15 years	17.0	36.7	40.6	26.4	31.7
% 50+ years	33.5	7.5	5.9	12.1	9.4
Distribution by generation					
%1st generation men	NA	56.9	59.4	58.9	58.6
%1st generation women	NA	54.8	54.5	62.3	61.0
Distribution by age at immigration:					
% men arrived at age<=14 yrs	NA	34.4	35.8	37.9	31.3
15-29 yrs		51.7	46.8	42.3	48.8
30+ yrs		14.0	17.5	19.8	19.9
% women arrived at age<=14 yrs	NA	33.8	40.1	34.6	29.4
15-29 yrs		50.3	42.0	44.4	47.0
30+ yrs		159	17.9	21.0	23.6
Duration of stay in the Netherlands:					
% men arrived before 1976 (20+ yrs)	NA	23.2	19.9	38.1	10.2
between 1976-85 (10-19 yrs)		32.7	32.5	29.3	20.7
after 1985 (0-9yrs)		44.1	47.6	32.6	69.1
% women arrived before 1976 (20+ yrs)	NA	15.7	7.6	38.0	9.6
between 1976-85 (10-19 yrs)		36.9	42.8	29.8	21.3
after 1985 (0-9yrs)		47.4	49.5	32.2	69.1

*all % are based on the total number of person years in the respective group

significantly elevated among Antilleans/Arubans (RR =2.06 CI:1.28-3.33) and among Turkish and Surinamese migrants (but not with statistical significance).

For all migrant groups combined, the total mortality from all cancers was lower among 1st generation compared to the 2nd generation migrants (RR=0.80 CI: 0.63-1.02, Table 4.3). This pattern was differed depending on country of origin. First generation Turkish migrants had a 30% higher risk of death from all cancers combined, while 1st generation Surinamese migrants had a lower risk of about 30%. Cancer mortality rate of Moroccans and Antilleans migrants were similar for both generations. Migrant groups, both individually and combined, had a lower death rate from cancer if they migrated at older age (RR at 30+ age between 0.52 and 0.95). Similarly, migrants had a lower mortality rate if they had a shorter duration of residence (RR at less than 10 years of residence between 0.64 and 0.95). Especially clear pattern of increasing death rates with younger age at arrival and longer duration of residence was observed among Surinamese migrants. While for other migrant groups the picture was more discordant.

Table 4.2 Absolute numbers and relative risks of death by type of cancer for first generation ethnic minorities

Malignant conditions	Absolute numbers				Relative risks (95% confidence interval) [b]		
(Corresponding ICD-10 code)	Dutch		All migrants		All migrants combined		
	Men	Women	Men	Women	Men	Women	Men & women
Total mortality	298769	351619	4025	3229	1.02 (0.99-1.05)	0.95 (0.91-0.98)	0.98 (0.96-1.01)
Total malignant mortality	90298	81709	707	629	0.59 (0.55-0.63)	0.51 (0.47-0.55)	0.55 (0.52-0.58)
Lung, bronchus, trachea (C33, C34)	30118	10188	220	57	0.52 (0.45-0.59)	0.21 (0.16-0.27)	0.40 (0.36-0.45)
Oesophagus (C15)	3341	1796	20	5	0.33 (0.21-0.51)	0.21 (0.09-0.50)	0.29 (0.20-0.44)
Stomach (C16)	4852	3560	65	49	1.05 (0.82-1.35)	1.35 (1.01-1.80)	1.16 (0.96-1.40)
Colorectal (C18-C21)	9375	11378	72	52	0.63 (0.50-0.79)	0.45 (0.34-0.59)	0.54 (0.45-0.64)
Liver (C22)	1015	908	33	28	1.95 (1.36-2.80)	2.49 (1.68-3.69)	2.19 (1.67-2.85)
Pancreas (C25)	3625	4836	43	27	0.80 (0.59-1.09)	0.48 (0.33-0.70)	0.63 (0.50-0.81)
Breast (C50)	125	18455	0	171	0	0.54 (0.46-0.62)	0.54 (0.46-0.62)
Uterus (C54, C55)	na	1981	na	21	-	1.02 (0.66-1.58)	1.02 (0.66-1.58)
Cervix uteri (C53)	na	2922	na	35	-	0.61 (0.44-0.87)	0.61 (0.44-0.87)
Ovary (C56)	na	5161	na	36	-	0.53 (0.38-0.74)	0.53 (0.38-0.74)
Prostate (C61)	10747	na	55	na	0.78 (0.60-1.02)	-	0.78 (0.60-1.02)
Testis (C62)	2104	na	6	na	0.32 (0.14-0.72)	-	0.32 (0.14-0.72)
Cancer of urinary system (C64-68)	6205	3753	24	8	0.31 (0.20-0.46)	0.20 (0.10-0.40)	0.27 (0.19-0.38)
Cancer of HLT[a] (C81-C85, C88, C90-96)	6820	7286	84	83	0.79 (0.64-0.99)	0.89 (0.72-1.12)	0.84 (0.72-0.98)
Skin, melanoma (C43)	1092	1104	2	1	0.07 (0.02-0.29)	0.04 (0.01-0.25)	0.05 (0.02-0.16)
Central nervous system (C70-C72)	2013	1823	27	12	0.49 (0.33-0.72)	0.30 (0.17-0.54)	0.42 (0.30-0.57)
Ill-defined cancer sites (C76, C80)	5668	6558	49	44	0.60 (0.45-0.80)	0.58 (0.43-0.79)	0.59 (0.48-0.73)

[a] Haematopoietic & lymphoid tissue
[b] All migrants combined compared to the native Dutch population (reference group)

Table 4.3. Relative risks of death by migrant's generation, age at immigration, duration of residence and ethnicity. All types of cancer combined.

		Relative risk [a b] (95% Confidence interval)				
		Turkish	Moroccans	Surinamese	Antillean/Aruban	All migrants
First generation M&W		1.34 (0.54-3.31)	1.04 (0.36-3.01)	0.76 (0.57-1.02)	0.97 (0.58-1.62)	0.80 (0.63-1.02)
First generation men		0.87 (0.25-3.01)	1.64 (0.32-8.35)	0.75 (0.49-1.14)	1.22 (0.54-2.74)	0.83 (0.58-1.17)
First generation women		2.09 (0.59-7.45)	0.81 (0.21-3.15)	0.77 (0.51-1.16)	0.82 (0.43-1.58)	0.79 (0.57-1.10)
Second generation		1.00	1.00	1.00	1.00	1.00
Age at immigration						
M&W	0-14 years	1.00	1.00	1.00	1.00	1.00
	15-29 years	1.07 (0.56-2.07)	1.26 (0.51-3.08)	0.81 (0.54-1.21)	0.58 (0.24-1.37)	0.85 (0.63-1.14)
	30+ years	0.95 (0.47-1.92)	0.84 (0.32-2.17)	0.73 (0.48-1.11)	0.52 (0.22-1.25)	0.72 (0.53-0.99)
Men	15-29 years	1.34 (0.49-3.64)	0.89 (0.22-3.60)	0.63 (0.34-1.17)	0.75 (0.18-3.06)	0.76 (0.48-1.20)
	30+ years	1.26 (0.44-3.60)	0.57 (0.13-2.44)	0.59 (0.31-1.12)	0.63 (0.15-2.65)	0.66 (0.41-1.05)
Women	15-29 years	0.93 (0.39-2.21)	1.64 (0.50-5.42)	0.94 (0.55-1.60)	0.45 (0.15-1.33)	0.94 (0.63-1.38)
	30+ years	0.89 (0.32-2.44)	2.00 (0.53-7.57)	0.85 (0.48-1.50)	0.45 (0.15-1.33)	0.85 (0.56-1.31)
Duration of residence						
M&W	0-9 years	0.95 (0.65-1.26)	0.64 (0.41-1.00)	0.83 (0.67-1.03)	0.77 (0.52-1.15)	0.85 (0.74-0.99)
	10-19 years	1.03 (0.78-1.38)	0.72 (0.49-1.07)	0.94 (0.77-1.16)	0.98 (0.65-1.50)	0.95 (0.82-1.09)
Men	0-9 years	1.12 (0.71-1.75)	0.86 (0.46-1.60)	1.03 (0.77-1.38)	0.75 (0.41-1.39)	1.03 (0.84-1.27)
	10-19 years	1.06 (0.69-1.63)	0.82 (0.48-1.43)	0.95 (0.71-1.29)	1.45 (0.79-2.65)	1.05 (0.86-1.29)
Women	0-9 years	0.92 (0.55-1.54)	1.03 (0.45-2.34)	0.65 (0.47-0.90)	0.78 (0.46-1.32)	0.78 (0.63-0.96)
	10-19 years	1.24 (0.81-1.90)	1.24 (0.57-2.68)	0.92 (0.70-1.21)	0.73 (0.41-1.32)	0.93 (0.77-1.12)
	20+ years	1.00	1.00	1.00	1.00	1.00

[a] Adjustment for age, sex, marital status, urbanization level, and area income
[b] Migrants compared to the native Dutch population (reference group)
M=men, W=women

The relative risks of death from all cancers combined increased with younger age at migration among all migrant groups, approaching the cancer death rates of the native Dutch population (Figure 4.1). The mortality rates for the 2nd generation migrants were in-between the mortality rates of the 1st generation migrants and the native Dutch population. At the same time, the risk of death for both generations remained lower compared to the native Dutch population.

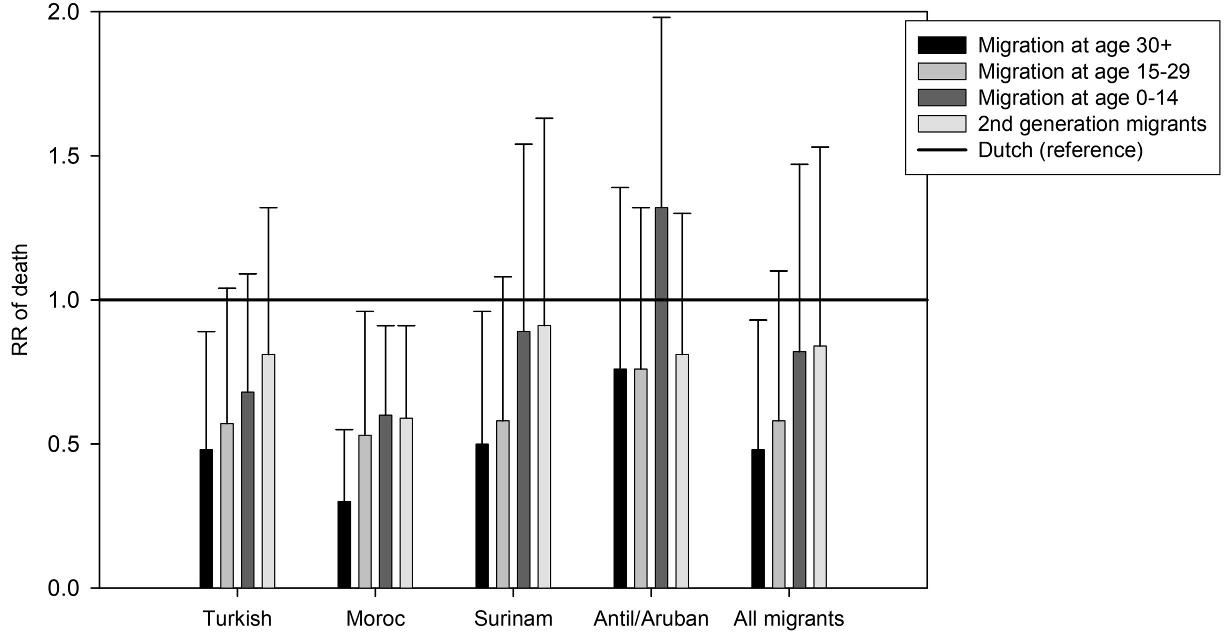
The relative risks of death for migrants by type of cancer are shown in Table 4.4 (in reference to the native Dutch population) and appendix Table B (comparisons within migrant groups). For the majority of the cancers, mortality rates tended to be lowest observed among migrants of 1st generation, those who migrated at older ages, and migrants with a shorter duration of residence. For lung cancer and colorectal cancer we observed a consistent pattern of increasing mortality for 2nd generation migrants, those with younger age at migration, and migrants with longer duration of residence. The high level of mortality from liver cancer, on the other side, had a tendency for decrease among the 2nd generation migrants and among those who resided longer in the Netherlands. For many specific types of cancers, the numbers of deaths were too small to estimate the effect of generation, age at migration or duration of residence.

Discussion

All-cancer mortality among all migrant groups combined was significantly lower compared to the native Dutch population. For a large number of cancers, migrants had more than 50% lower risk of death, while elevated risks were found for stomach and liver cancers. Within migrant groups, mortality risks for all cancers combined were the highest among 2nd generation migrants, those with younger age at migration, and those with longer duration of residence. This effect was particularly pronounced in lung cancer and colorectal cancer. Although cancer mortality rates among 2nd generation migrants approached the levels of the native Dutch population, they remained lower than the rates of the native Dutch population. Among all migrant groups Surinamese population showed the most consistent pattern of convergence towards native cancer mortality rates.

Some limitations of the data deserve consideration. First, due to the fact that the migrant populations are younger than the native Dutch population and, in addition, they have low cancer mortality rates, the statistical power was sometimes too limited to allow a detailed study of cancer mortality rates in relation to generation, age at migration or duration of residence. Second, comparison within migrant populations in relationship to generation is somewhat problematic due to highly different age structures of the groups that are compared. While age standardisation of rates should solve this problem, 1st and 2nd generations have limited overlap in age groups, and, therefore, the statistical power of the within-group comparisons was limited. The same applies, although to a lesser extent, to direct comparisons between groups with different age at immigration or duration of

Figure 4.1 Relative risks of death by migrant's age at immigration for all types of cancer combined. Men and women combined



Migrants compared to the native Dutch population (reference group)

Adjustment for age, gender, marital status, urbanization level, and area income

Table 4.4 Relative risks of death for migrants by age at migration, duration of residence and type of cancer. Men and women combined.

	Relative risk [a] (95% Confidence interval)						
	Age at migration			Dutch	Duration of residence		
	30+	15-29	0-14		20+	10-19	0-9
Total mortality	0.94 (0.91-0.96)	1.00 (0.95-1.04)	1.31 (1.20-1.42)	1.00	0.93 (0.90-0.96)	1.05 (1.00-1.10)	0.99 (0.95-1.04)
Total malignant mortality	0.50 (0.47-0.54)	0.59 (0.53-0.65)	0.82 (0.65-1.03)	1.00	0.54 (0.50-0.58)	0.54 (0.49-0.61)	0.51 (0.45-0.57)
Lung, bronchus, trachea	0.33 (0.28-0.39)	0.57 (0.47-0.68)	0.55 (0.23-1.32)	1.00	0.43 (0.37-0.50)	0.37 (0.28-0.49)	0.35 (0.26-0.47)
Oesophagus	0.35 (0.23-0.55)	0.19 (0.08-0.46)	0[b]	1.00	0.28 (0.17-0.47)	0.33 (0.15-0.74)	0.30 (0.13-0.73)
Stomach	1.07 (0.54-1.35)	1.22 (0.86-1.73)	2.79 (1.23-6.31)	1.00	1.02 (0.78-1.33)	1.59 (1.14-2.22)	1.02 (0.66-1.57)
Colorectal	0.45 (0.35-0.56)	0.67 (0.49-0.92)	1.51 (0.72-3.20)	1.00	0.56 (0.44-0.70)	0.59 (0.41-0.83)	0.37 (0.23-0.59)
Liver	2.37 (1.75-3.22)	1.67 (0.96-2.92)	3.14 (0.98-10.09)	1.00	2.25 (1.59-3.19)	2.50 (1.51-4.53)	1.80 (0.99-3.28)
Pancreas	0.69 (0.53-0.90)	0.47 (0.27-0.81)	0.55 (0.08-3.92)	1.00	0.62 (0.45-0.85)	0.76 (0.49-1.19)	0.52 (0.29-0.91)
Breast	0.45 (0.37-0.56)	0.66 (0.51-0.83)	0.62 (0.31-1.24)	1.00	0.57 (0.46-0.72)	0.47 (0.36-0.62)	0.53 (0.39-0.72)
Uterus	1.20 (0.77-1.88)	0[b]	0[b]	1.00	1.62 (0.97-2.71)	0.50 (0.16-1.56)	0.37 (0.09-1.49)
Cervix uteri	0.52 (0.36-0.76)	0.38 (0.20-0.71)	0.49 (0.12-1.96)	1.00	0.35 (0.21-0.58)	0.81 (0.50-1.30)	0.40 (0.20-0.81)
Ovary	0[b]	0.66 (0.36-1.19)	0.39 (0.05-2.76)	1.00	0[b]	0.57 (0.32-1.01)	0.45 (0.22-0.90)
Prostate	0.68 (0.50-0.93)	1.08 (0.59-1.95)	4.89 (1.21-19.72)	1.00	0.67 (0.47-0.95)	0.75 (0.38-1.51)	1.15 (0.68-1.95)
Testis	0.40 (0.17-0.97)	0[b]	0.71 (0.10-5.15)	1.00	0.38 (0.14-1.02)	0.28 (0.04-1.96)	0.23 (0.03-1.67)
Cancer of urinary system	0.20 (0.12-0.32)	0.43 (0.25-0.74)	0.99 (0.25-3.99)	1.00	0.26 (0.16-0.41)	0.28 (0.14-0.60)	0.30 (0.14-0.63)
Cancer of HLT [c]	0.71 (0.55-0.87)	0.87 (0.65-1.17)	1.35 (0.90-2.51)	1.00	0.77 (0.61-0.98)	0.85 (0.63-1.14)	0.91 (0.68-1.21)
Skin, melanoma	0.08 (0.02-0.33)	0.04 (0.01-0.28)	0[b]	1.00	0.04 (0.01-0.30)	0[b]	0.13 (0.03-0.51)
Central nervous system	0.37 (0.22-0.61)	0.48 (0.30-0.75)	0.32 (0.12-0.86)	1.00	0.58 (0.39-0.88)	0.11 (0.04-0.35)	0.45 (0.15-0.79)
Ill-defined cancer sites	0.59 (0.46-0.75)	0.52 (0.34-0.80)	1.49 (0.66-3.36)	1.00	0.51 (0.38-0.69)	0.66 (0.44-0.98)	0.72 (0.49-1.07)

[a] Migrants compared to the native Dutch population (reference group). Adjustment for age, sex, marital status, urbanization level, and area income
[b] No cases
[c] Haematopoietic & lymphoid tissue

residence. Third, a higher rate of death occurring abroad would lead to underestimation of migrant's cancer mortality in the Netherlands and, thus, potentially could have biased our results. Statistics Netherlands through various mechanisms ensures the registration of virtually all deaths including the ones that occurred abroad. Although the cause of death abroad is rarely known, special inquiry showed that about 50% of deaths that occurred abroad were due to injuries. The number of cancer deaths that occurred abroad is low. Therefore, we do not believe that our results of cancer mortality among migrants might have been largely influenced by the deaths that occurred abroad.

The 'healthy migrant' and 'unhealthy re-migrant' selection effects could play a larger role in case of cancer mortality compared to the overall mortality[24, 25]. Selection of healthier migrants might have explained the initially lower cancer mortality. However, this advantage wears off over time[26, 27]. Reduction of the healthy migrant selection effect would lead to higher cancer mortality among migrants with long duration of stay, compared to those with a shorter duration of stay. This could partly contribute to the convergence of cancer mortality rates observed in our study. The remigration of critically ill patients was observed in other countries[5, 28] and can not be completely ruled out in the Netherlands. Re-migration of patients dying from cancer would have underestimated cancer mortality rates observed in our study. This "salmon bias" is unlikely to be large and explain the patterns of convergence that we found in our study since re-migration generally is a rare event among migrants in the Netherlands[29]. In addition, a higher quality of cancer services in the Netherlands compared to the country of origin may provide a reason for cancer patients to stay.

The transition of the initially lower cancer mortality among migrants to the higher rates of the host population is not a surprise as it has been described worldwide[5, 10, 11, 13, 30]. Our study adds to this knowledge by comprehensively describing the changes that occur in cancer mortality among migrants according to generation, age at migration, and duration of residence. Several explanations can be offered for this convergence, including the uptake of smoking by migrants, changes in their traditional diet, and changes in reproductive behaviour. Converging rates of cancer mortality among migrants could in theory also be the consequence of lower quality of medical care provided to migrant cancer patients, leading to higher mortality. However, this mechanism would not explain the increase in cancer mortality with increasing length of residence in the Netherlands. In addition, studies in the Netherlands did not find gross inequalities in the medical care provided to migrant patients in comparison to the native Dutch patients[31-33]. Therefore, we will focus mostly on the role of behavioural factors.

In our study, lung cancer was the most frequent cause of death among all migrants with exception of Antilleans/Arubans. Our results indicate that the mortality rates from lung cancer were increasing among 2nd generation migrants and among migrants with longer duration of residence, although they remain lower compared to the native Dutch. Without doubt this is the result of trends in smoking among immigrants in the Netherlands, who have delayed their uptake of smoking and currently have a higher consumption of tobacco products[34, 35]. Similar results were found in Germany that hosts a large Turkish population[5] and in France that hosts a large migrant group from North Africa, including Morocco[28]. Although the level of lung cancer mortality still remains lower compared to the native Dutch, the increasing mortality trend indicates a growing contribution of lung cancer to the total cancer burden among migrant groups.

Colorectal cancer is the second leading cause of death from neoplasms among the Dutch population. It occupies only the 4th or lower position among migrants. We observed, however, a rather rapid convergence towards native levels of colorectal cancer mortality. Such a convergence was also found in other countries, including migrants originating from the Mediterranean region[14, 15, 36, 37]. Although there is no agreement yet on the most important causes of colorectal cancer[38], higher consumption of red meat and alcohol, lower consumption of vegetables, fruits, and micronutrients, and lower physical activity are likely to play an important role in the observed increase in incidence and mortality risks[39-42]. The traditional diet of migrants, rich in fruits and vegetables and with generally lower red meat consumption[34, 43], is likely to have had a persistent protective effect against colorectal cancer among migrants in the Netherlands. It is likely, however, that migrant groups gradually change their traditional diet influenced by western habits with a much higher red meat and other animal fat consumption, and lower vegetable and fruit consumption. Higher BMI among migrants compared to Dutch may be another factor contributing to the increase in colorectal cancer with increasing duration of residence and younger age at migration[34]. Comparison of the results between generations, age at migration, and duration of residence suggests that earlier years of life play an important role in setting the pattern for colorectal cancer risks in later life. This effect is likely to be the consequence of higher adaptability to the host culture and greater life style changes among migrants who arrived at younger age or were born in the host country[44]. Detailed empirical evidence on this issue is however still lacking.

Breast cancer mortality among women of all migrant groups combined was significantly lower compared to the native Dutch women, but increased with younger age at migration and among 2nd generation migrants. Lower breast cancer incidence and mortality among migrant populations from southern Europe and the Mediterranean basin was shown in Australia[4] [10, 14], Germany[5, 45], France[6], Canada[37], and the Netherlands[46]. Similar to our results, most of these studies reported that breast cancer mortality rates in the immigrant groups shifted towards the rate of the native-born population of the destination country. A higher parity, lower age at first birth, and longer breastfeeding practice was shown to play a protective role for immigrant women[47, 48]. Other studies also indicated that dietary factors, alcohol consumption, and smoking (often increasing after migration) could partly contribute to the increased risk of breast cancer[49]. Breast cancer was the most frequent cause of death among Antilleans/Arubans. Higher breast cancer mortality among this migrant group is likely to be the result of a higher incidence of breast cancer in the Antillean islands and Aruba[50]. An additional factor may be selective migration of higher educated women who might have had a higher incidence of breast cancer[46]. Increasing rates of breast cancer among migrant populations call for more attention for programs to increase the compliance to breast cancer screening, which was shown to be lower among migrants in the Netherlands compared to native Dutch[51].

The increased rates of hepatic cancer in migrants are consistent with other studies[14, 37] and are in accordance with the higher prevalence of liver cancer in migrants' countries of origin[52]. Evidence from Germany[53], France[54], and the Netherlands[55, 56] point to a higher prevalence of Hepatitis B surface antigen (HBsAg) among immigrant populations residing in these countries. The mortality rates remained high even in the groups of migrants who immigrated at younger ages, indicating that the infection occurred early in life. Hepatic cancer mortality rates are high as well among 2nd generation migrants possibly due to the vertical (mother to child) transmission of HbsAg.

We observed the most consistent pattern of convergence in cancer mortality by generation, age at migration, and duration of residence among Surinamese migrants. This may be due to the fact that Surinamese immigrants were generally older and provided the largest number of cancer deaths (702 deaths, 2 to 4 times more than other migrant groups). This may have increased the statistical power to detect patterns of convergence. In addition, this might be related to a stronger integration of the Surinamese into the Dutch society. With increasing length of stay, Surinamese migrant groups integrate more fully compared to the Turkish and Moroccan groups. The consistent convergence observed for Surinamese migrants might indicate the direction that cancer mortality will take in due time among other migrant groups when these groups will age and get more integrated into Dutch society.

Conclusion

The greater part of our findings supports the idea of ongoing transition of cancer incidence and mortality among migrant residents in the Netherlands. Our findings show that cancer is increasingly becoming an important cause of death in migrant groups. This has implications for both research and practice. The next step for research is to pinpoint specific environmental factors that cause change in cancer incidence (increase or decrease) upon migration, especially in cancers with particular public health concern such as lung, colorectal, and breast cancer. There is also a need for research from a life course perspective, in which critical ages of immigration and associated risk factors are identified more accurately.

Convergence of cancer mortality among migrants is important for future developments in the burden of cancer morbidity and demand for oncologic care. The ageing of migrant populations will lead to gradual increase in the absolute number of migrant cancer patients and thus a greater demand for oncologic services. Yet, the total share of oncologic services used by migrants in the Netherlands is currently low (about 1%) and the process of cancer convergence is relatively slow[19]. This implies that there is no immediate demographic pressure to increase and diversify facilities and expertise within oncology care. At the shorter term, most needed are measures to prevent an increase in cancer incidence in migrant populations, such as health promotion campaigns to preserve native diets, reinforced anti-smoking policies, and measures to improve screening compliance.

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Appendix

Table A. Absolute number of death (AN) and relative risk (RR) by ethnicity and type of cancer for 1st generation migrants. Men and women combined

	Dutch		Turkish		Moroccan		Surinamese		Antillean/Aruban	
	AN	RR	AN	RR[a]	AN	RR[a]	AN	RR[a]	AN	RR[a]
Total mortality	650388	1.00	2188	1.04 (0.99-1.09)	1477	0.81 (0.76-0.86)	4302	1.01 (0.98-1.05)	886	1.02 (0.95-1.10)
Total malignant mortality	172007	1.00	350	0.55 (0.50-0.61)	211	0.41 (0.35-0.46)	708	0.57 (0.53-0.62)	185	0.78 (0.68-0.91)
Lung, bronchus, trachea	40306	1.00	98	0.55 (0.45-0.67)	55	0.35 (0.27-0.46)	110	0.33 (0.27-0.41)	26	0.46 (0.31-0.69)
Oesophagus	5137	1.00	3	0.14 (0.05-0.44)	3	0.17 (0.05-0.51)	15	0.34 (0.20-0.59)	6	0.83 (0.37-1.86)
Stomach	8412	1.00	29	1.17 (0.81-1.69)	16	0.79 (0.48-1.30)	53	1.15 (0.87-1.51)	17	2.06 (1.28-3.33)
Colorectal	20753	1.00	16	0.28 (0.17-0.46)	15	0.33 (0.20-0.55)	84	0.70 (0.56-0.88)	16	0.78 (0.48-1.28)
Liver	1923	1.00	15	2.20 (1.32-3.69)	8	1.43 (0.71-2.88)	37	2.76 (1.97-3.88)	3	0.81 (0.20-3.26)
Pancreas	8461	1.00	21	0.79 (0.51-1.21)	11	0.52 (0.29-0.94)	34	0.60 (0.42-0.85)	8	0.72 (0.34-1.52)
Breast	18580	1.00	35	0.46 (0.33-0.64)	23	0.44 (0.29-0.66)	90	0.51 (0.41-0.63)	34	0.93 (0.66-1.31)
Uterus	1981	1.00	2	0.47 (0.12-1.87)	0	0[b]	16	1.32 (0.79-2.20)	6	1.74 (0.65-4.66)
Cervix uteri	6120	1.00	5	0.19 (0.07-0.52)	6	0.36 (0.16-0.81)	28	0.67 (0.46-0.98)	6	0.53 (0.20-1.41)
Ovary	5161	1.00	9	0.59 (0.31-1.14)	5	0.49 (0.20-1.18)	19	0.46 (0.28-0.75)	6	0.75 (0.34-1.67)
Prostate	10747	1.00	8	0.54 (0.27-1.09)	6	0.44 (0.20-0.99)	37	0.94 (0.68-1.32)	7	1.25 (0.56-2.79)
Testis	2104	1.00	0	0[b]	1	0.25 (0.03-1.76)	5	0.58 (0.24-1.39)	0	0[b]
Cancer of urinary system	9958	1.00	7	0.24 (0.11-0.51)	7	0.29 (0.14-0.60)	15	0.20 (0.11-0.36)	8	0.72 (0.34-1.51)
Cancer HLT	14106	1.00	56	0.88 (0.65-1.18)	27	0.52 (0.34-0.79)	90	0.92 (0.74-1.15)	24	1.11 (0.72-1.73)
Skin, melanoma	2196	1.00	1	0.06 (0.01-0.46)	2	0.16 (0.04-0.63)	0	0[b]	1	0[b]
Central nervous system	3836	1.00	21	0.56 (0.33-0.93)	13	0.41 (0.21-0.78)	26	0.33 (0.19-0.59)	6	0.35 (0.11-1.10)
Ill-defined cancer sites	12226	1.00	24	0.65 (0.44-0.97)	13	0.41 (0.23-0.72)	49	0.61 (0.46-0.82)	11	0.72 (0.39-1.35)

[a] Migrants compared to the native Dutch population (reference group). Adjustment for age, sex, marital status, urbanization level, and area income
[b] No cases

Table B. Relative risks of death for migrants by age at migration and duration of residence by type of cancer. Four ethnic minority groups combined, men and women combined

	Relative risk [a] (95% Confidence interval)							
	Generation		Age at migration			Duration of residence		
	1st	2nd	30+	15-29	0-14	0-9	10-19	20+
Total mortality	1.07 (0.97-1.18)	1.00	1.06 (0.84-1.05)	0.94 (0.84-1.05)	1.00	0.98 (0.92-1.04)	1.06 (1.00-1.12)	1.00
Total malignant mortality	0.80 (0.63-1.02)	1.00	0.72 (0.53-0.99)	0.85 (0.63-1.14)	1.00	0.85 (0.74-0.99)	0.95 (0.82-1.09)	1.00
Lung, bronchus, trachea	0.63 (0.35-1.15)	1.00	0.89 (0.34-2.30)	1.30 (0.51-3.31)	1.00	0.75 (0.53-1.05)	0.80 (0.58-1.10)	1.00
Oesophagus	0.43 (0.10-1.91)	1.00	0	0.37 (0.24-0.57)	1.00	1.21 (0.42-3.44)	1.58 (0.60-4.21)	1.00
Stomach	4.82 (0.66-35.17)	1.00	0.44 (0.16-1.22)	0.48 (0.18-1.29)	1.00	0.96 (0.57-1.61)	1.46 (0.93-2.27)	1.00
Colorectal	0.72 (0.33-1.58)	1.00	0.33 (0.13-0.81)	0.44 (0.18-1.08)	1.00	0.63 (0.37-1.07)	1.01 (0.65-1.57)	1.00
Liver	1.16 (0.25-5.49)	1.00	0.72 (0.17-3.05)	0.57 (0.15-2.26)	1.00	2.09 (0.82-4.09)	1.48 (0.65-3.11)	1.00
Pancreas	0.61 (0.21-1.73)	1.00	2.03 (0.22-18.70)	1.06 (0.12-9.53)	1.00	0.91 (0.46-1.79)	1.41 (0.80-2.49)	1.00
Breast	0.69 (0.37-1.29)	1.00	1.46 (0.63-3.39)	1.71 (0.79-3.70)	1.00	0.85 (0.58-1.24)	0.79 (0.55-1.15)	1.00
Uterus	0.36 (0.10-1.26)	1.00	0	0	1.00	0.19 (0.04-0.83)	0.41 (0.12-1.44)	1.00
Cervix uteri	0.69 (0.19-2.58)	1.00	0.89 (0.15-5.28)	0.87 (0.17-4.55)	1.00	0.89 (0.37-2.13)	1.92 (0.93-3.97)	1.00
Ovary	0.68 (0.18-2.55)	1.00	1.63 (0.17-15.72)	2.16 (0.25-18.47)	1.00	0.83 (0.35-1.99)	1.09 (0.50-2.40)	1.00
Prostate	0.88 (0.26-2.92)	1.00	0.10 (0.02-0.44)	0.18 (0.04-0.86)	1.00	1.54 (0.80-2.97)	1.04 (0.48-2.29)	1.00
Testis	0 [b]	1.00	0	0	1.00	0	0	1.00
Cancer of urinary system	0.27 (0.09-0.82)	1.00	0.16 (0.03-0.87)	0.30 (0.06-1.51)	1.00	1.39 (0.56-3.50)	1.09 (0.44-2.76)	1.00
Cancer of HLT	1.44 (0.79-2.61)	1.00	0.69 (0.34-1.40)	0.77 (0.42-1.42)	1.00	0.90 (0.60-1.36)	0.91 (0.61-1.36)	1.00
Skin, melanoma	0.34 (0.02-4.71)	1.00	0	0	1.00	1.58 (0.11-21.71)	0	1.00
Central nervous system	0.39 (0.17-0.91)	1.00	1.30 (0.22-7.77)	2.19 (0.44-10.86)	1.00	0.69 (0.31-1.57)	0.19 (0.06-0.67)	1.00
Ill-defined cancer sites	1.60 (0.48-5.33)	1.00	0.82 (0.26-2.58)	0.50 (0.17-1.52)	1.00	1.34 (0.79-2.25)	1.21 (0.72-2.03)	1.00

[a] Adjustment for age, sex, marital status, urbanization level, and area income
[b] No cases

Chapter 5

Injury mortality among migrants in the Netherlands

Based on: Stirbu I, Kunst AE, Bos V., and van Beeck E.
Injury mortality among ethnic minority groups in the Netherlands. J
Epidemiol Community Health 2006;60(3):249-55.

Abstract

Objectives
To prepare a comprehensive overview of differences in injury related mortality among migrants in the Netherlands and to determine the role of area income and urbanization degree.

Methods
Data for the period 1995-2000 were obtained from the population and cause of death registries. Injury related death rates were compared for persons from Turkish, Moroccans, Surinamese and Antillean/Aruban origin with the rates for the native Dutch population.

Results
Compared with the native Dutch population, all migrants combined had an increased mortality for all injuries together (RR=1.29). Migrant groups experienced a significantly higher risk of death from pedestrian accidents (RR=1.87), drowning (RR=2.58), poisoning (RR=1.76), fire& scalds (RR=1.95), and homicide (RR=3.24). Mortality for cyclists (RR=0.53) and motorcycle drivers (RR= 0.47) was significantly lower among migrants compared with the native Dutch. Adjustment for area income and urbanization decreased the mortality risk difference for most of the non-traffic injuries, but revealed a difference in risk for car-driver and passenger accidents (RR=1.37). Compared with the native Dutch inhabitants, Surinamese and Antillean/Aruban population had a higher risk of total injury mortality (RR=1.33 and 1.53 respectively), while Turkish and Moroccans had increased risk only for selected conditions. Inequalities in injury mortality were the highest among children and young adults, but persisted in the age group above 50 years old.

Conclusion
Differences in injury mortality among migrants in the Netherlands strongly depended on type of injury, ethnic group, sex, and age. Policies should be aimed at the prevention of high-risk injuries among the most vulnerable ages and ethnic groups.

Background

An accumulation of evidence over the past decade points to differences in morbidity and mortality of ethnic groups compared with the majority population in many countries.[1-3] Descriptive epidemiological data on injury incidence and mortality consistently indicate elevated rates among indigenous people,[4] such as Indians and Alaska natives in the USA,[5] Aboriginals in Australia,[6] and Maori in New-Zealand.[7] In addition, occasional evidence suggests that migrant populations, especially children, also experience a higher injury risks.[8-10] Elevated risks for ethnic minority groups are often ascribed to socioeconomic factors or inequalities in medical care.[11] In many instances, however, there is no clear-cut explanation. Few studies include national level data, or cover all age groups, genders, and ethnic minority groups.

About 10% of the population in the Netherlands is of non-Western origin with the largest representation of Turkish, Moroccan, Surinamese and Antillean/Aruban migrant groups. Migrants in the Netherlands more often live in low-income urbanized areas, which are known to have higher injury mortality rates.[12] Previous Dutch studies observed ethnic variations in mortality, including mortality from external causes.[2, 10] Children of foreign descent are particularly vulnerable to pedestrian injuries and drowning compared with the native Dutch children.[10] Ethnic variations in injury incidence and mortality beyond childhood have hardly been studied, although an elevated risk of homicides among adult immigrants has been reported.[2, 13] Limited to specific age groups, type of injuries and selected determinants, previous Dutch studies thus failed to provide a comprehensive picture of ethnic variations in injury mortality and its major risk factors.

This study is the first to investigate and measure the magnitude of ethnic differences in mortality from a broad range of injuries among different age groups and genders in the Netherlands. We also analyze the role that area income and urbanization play in this association and we estimate which part of injury mortality in the Netherlands would have been avoided if all migrant groups would have similar injury mortality rates as the native Dutch population.

Methods

Numbers of deaths and population at risk for the period 1995-2000 were obtained from the cause of death register and the Municipal Population Register that includes all inhabitants of the Netherlands with a legal status. These registers were linked using a personal identification number. An open cohort design was used: people were allowed to enter or leave the study (due to birth, death, migration, or administrative corrections) throughout the study period. All deaths that occurred abroad were excluded from the analysis. The data included information on the cause of death, sex, age, marital status, area income (household equivalent income of the neighbourhoods classified into deciles),[14] and urbanization degree (address density per square kilometre classified into 5 categories).

Country of birth of the person and both parents was used to measure ethnicity, according to the definition used by Statistics Netherlands.[15] If at least one parent was born abroad, the person was considered to be of non-Dutch origin. In mixed ethnic families, the country of birth of the mother prevailed. We compared deaths rates of the four largest migrant groups residing in the Netherlands (Turkish, Moroccan, Surinamese and Antillean/Aruban) to native Dutch.

All injuries were classified into 3 main categories with a further distinction in specific causes of death: traffic related injuries (car-driver& passenger, pedestrian, cyclist, motorcycle driver, other), non-traffic injuries (drowning, poisoning, fire and scalds, fall, other) and intentional injuries (suicide, homicide, undetermined event) (Table 5.2). All causes of death were coded according to the International Classification of Diseases (ICD), 9th revision for the year 1995 and 10th revision for the period 1996-2000. Although there is some variability in the codes between ICD revisions, the changes were judged small enough to affect comparability over time.

Relative risks that compared injury mortality rates of migrants to that of the native Dutch population were calculated using Poisson regression (Stata software, version 7). Relative risks were adjusted for 5-year age groups and sex. We performed an additional adjustment to estimate the contribution of area income and urbanization on ethnic differences in injury related mortality.

The population-attributable risk (PAR) was calculated to assess the reduction in cause specific injury mortality rates that would occur in case migrant groups would experience the injury mortality rates of the native Dutch population. To calculate PAR, we derived cause-specific relative risks for all minority groups combined from the Poisson regression analysis.[16]

Results

The native Dutch population contributed the most person time and the largest number of injury related deaths to the analysis (Table 5.1). Turkish, Moroccans and Surinamese groups were about equally large and Antilleans/Arubans were about 3 times smaller. All migrants were more likely to live in poor and more urbanized areas than the native Dutch population.

All migrants combined and the native Dutch population followed a similar general pattern with intentional injuries constituting the largest subcategory in absolute numbers of death (8630 for Dutch and 711 for migrants) and suicide being the most frequent cause of death (Table 5.2). Among both Dutch and migrants men experienced a 2-3 times higher number of deaths from injuries than women in most causes of death.

Table 5.1 Background characteristics by ethnicity and gender

	Dutch	Turkish	Moroccans	Surinamese	Antillean/ Aruban
Men					
Person years 1995-2000 (x1000)	38593.79	905.08	780.55	816.18	264.64
Total number of deaths	368882	2034	1325	2895	576
Total number of injury related deaths	13409	262	216	369	133
Urbanization: % living in highly urbanized area	33.2	74.8	77.3	80.0	68.8
Area income: % living in low income area	16.5	58.7	56.1	50.8	43.8
Women					
Person years 1995-2000 (x1000)	39592.23	812.04	667.16	878.59	268.16
Total number of deaths	369982	951	621	2395	487
Total number of injury related deaths	7770	71	62	144	35
Urbanization: % living in highly urbanized area	34.9	74.1	77.0	80.4	68.9
Area income: % living in low income area	16.7	58.2	55.6	49.4	43.0

Table 5.2 Absolute numbers of injury related deaths for migrants and the native Dutch population by gender

	ICD [a]-10 codes	Dutch		Ethnic groups combined	
		Men	Women	Men	Women
Total injury related mortality		13409	7770	980	312
Traffic injuries		4417	1673	253	72
Car-driver& passenger accidents	V40-V49 V50-V79 Y85	1960	736	148	31
Pedestrian accidents	V01-V09	366	245	33	21
Cyclists accidents	V10-V19	774	388	15	13
Motorcyclists accidents	V20-V29, V30-V39	819	125	33	2
Other traffic injuries	V80-V99	498	179	24	5
Non- traffic injuries		3298	3161	203	53
Accidental drowning	W65-W74	291	89	54	10
Accidental poisoning	X40-X49	307	81	38	8
Accidental fire & scalds	X00-X09, X10-X19	182	170	16	8
Accidental falls	W00-W19	1769	2422	46	16
Other non-traffic injuries	W20-49 W75-84 W85-99 X20-29, X30-39	749	399	49	11
Intentional injuries		5694	2936	524	187
Suicides	X60-X84, Y87.0	5036	2606	283	108
Homicides	X85-Y09, Y87.1	439	234	218	70
Events of undetermined intent	Y10-Y34, Y87.2, Y89.9	219	96	23	9

[a] International Classification of the Diseases

We found total injury related mortality for all migrants combined to be significantly elevated (RR=1.29) compared with the native Dutch population (Table 5.3). Among traffic injuries, only pedestrian accidents had higher relative risk (RR=1.87), while relative risks for almost all non-traffic and intentional injuries were significantly elevated for migrants. Mortality among cyclists and motorcycle drivers, on the opposite, had a significantly lower risk for migrants compared with the native Dutch population.

Additional adjustment for urbanization and area income produced several important effects. In some cases it explained a major part of the mortality difference: a reduction in relative risk of about 50% and more was observed in case of total injury related mortality (RR dropped from 1.29 to 1.11, when adjusted for all factors), the non-traffic injuries group (RR from 1.51 to 1.26), accidental fire/scalds (RR from 1.95 to 1.35), the intentional injuries group (RR from 1.57 to 1.11), homicides (RR from 6.41 to 3.24), and events of undetermined intent (RR from 2.11 to 1.22). In case of poisoning, full adjustment resulted in a complete disappearance of the higher relative risk for migrants (RR from1.76 to 0.76). For some other conditions, however, the relative risk increased as a result of full adjustment, as in case of car-driver and passenger related accidents (from RR=0.86 to 1.37). Inequalities in neither drowning nor pedestrian accidents were influenced by urbanization and area income.

Table 5.3 Relative risk by cause of death for migrants versus native Dutch population. Men and women combined (Person years total population = 83,578,420)

	Relative risk [a] (95% Confidence interval)			
	Adjusted for age & sex	Adjusted age, sex and area income	Adjusted age, sex and urbanization	Adjusted for all factors [b]
Total injury mortality	1.29 (1.22-1.37)	1.11 (1.04-1.17)	1.23 (1.16-1.31)	1.11 (1.04-1.18)
Traffic injuries	0.86 (0.77-0.96)	0.84 (0.75-0.94)	1.15 (1.02-1.29)	1.07 (0.95-1.20)
Car-driver& passenger accidents	0.99 (0.85-1.15)	1.00 (0.85-1.17)	1.48 (1.26-1.74)	1.37 (1.17-1.62)
Pedestrian accidents	1.87 (1.40-2.49)	1.65 (1.22-2.23)	1.86 (1.38-2.52)	1.71 (1.25-2.33)
Cyclists accidents	0.53 (0.36-0.78)	0.51 (0.34-0.74)	0.67 (0.45-0.98)	0.61 (0.42-0.91)
Motorcyclists accidents	0.47 (0.34-0.66)	0.46 (0.32-0.65)	0.62 (0.44-0.88)	0.58 (0.41-0.82)
Other traffic injuries	0.70 (0.48-1.01)	0.70 (0.48-1.03)	0.94 (0.64-1.38)	0.89 (0.60-1.31)
Non- traffic injuries	1.51 (1.33-1.72)	1.32 (1.16-1.50)	1.37 (1.20-1.56)	1.26 (1.11-1.44)
Accidental drowning	2.58 (1.96-3.39)	2.21 (1.65-2.97)	2.80 (2.09-3.77)	2.51 (1.84-3.41)
Accidental poisoning	1.76 (1.30-2.40)	0.97 (0.70-1.34)	1.03 (0.75-1.42)	0.76 (0.55-1.05)
Accidental fire, scalds	1.95 (1.27-2.99)	1.50 (0.97-2.35)	1.53 (0.98-2.37)	1.35 (0.86-2.11)
Accidental falls	1.07 (0.83-1.38)	0.99 (0.77-1.29)	0.98 (0.76-1.26)	0.95 (0.73-1.23)
Other non-traffic inj.	1.26 (0.97-1.65)	1.15 (0.87-1.51)	1.35 (1.03-1.78)	1.25 (0.95-1.65)
Intentional injuries	1.57 (1.45-1.69)	1.21 (1.12-1.32)	1.29 (1.19-1.39)	1.11 (1.03-1.21)
Suicides	1.00 (0.90-1.11)	0.80 (0.72-0.89)	0.85 (0.76-0.95)	0.75 (0.68-0.84)
Homicides	6.41 (5.56-7.39)	3.97 (3.39-4.65)	4.11 (3.53-4.79)	3.24 (2.75-3.80)
Events of undetermined intent	2.11 (1.46-3.06)	1.43 (0.97-2.11)	1.50 (1.02-2.20)	1.22 (0.82-1.81)

[a] Migrants compared with the native Dutch population
[b] Age, sex, area income, and urbanization degree

Overall, a higher risk of injury related mortality for migrants was observed among men, but not among women (RR 1.17 vs. 0.96, Table 5.4). After control for age, area income and urbanization men from ethnic minority groups had an excess risk of death from car-driver and passenger related accidents, pedestrian accidents, drowning, other non-traffic injuries and homicides. Migrant women only experienced a higher risk of death from pedestrian accidents, drowning and homicide.

If migrants would experience the same injury related death rates as the native Dutch population, the injury related mortality rate in the total Dutch population would remain almost constant (Table 5.4). A reduction of 1.2% in injury mortality would occur among men and 0.3% increase in injury mortality would occur among women in the total Dutch population. Across all injuries the population-attributable risk (PAR) varied from -5.2 to 15.4%. It was the highest for homicides and drowning in both men and women and took the highest negative values in accidents related to cyclists and motorcycle drivers.

Table 5.4 Relative risk and population attributable risk (PAR) by cause of death and gender for migrants versus native Dutch population

	Relative risk [a] (95% Confidence interval)		**PAR, %**	
	Men (PY=2,766,450)	Women (PY=2,625,950)	Men	Women
Total injury related mortality	1.17 (1.09-1.26)	0.96 (0.85-1.09)	1.2	-0.3
Traffic injuries	1.11 (0.97-1.27)	0.96 (0.75-1.24)	0.8	-0.3
Car-diver& passenger accidents	1.51 (1.26-1.81)	0.98 (0.67-1.44)	3.5	-0.1
Pedestrian accidents	1.54 (1.04-2.29)	2.04 (1.24-3.36)	3.7	6.5
Cyclists accidents	0.51 (0.30-0.86)	0.81 (0.45-1.45)	-3.6	-1.3
Motorcyclists accidents	0.63 (0.44-0.90)	0.26 (0.06-1.07)	-2.7	-5.2
Other traffic injuries	0.96 (0.62-1.48)	0.65 (0.26-1.63)	-0.3	-2.4
Non-traffic injuries	1.33 (1.14-1.55)	1.01 (0.76-1.34)	2.3	0.1
Accidental drowning	2.56 (1.82-3.59)	2.22 (1.06-4.64)	10.1	7.5
Accidental poisoning	0.73 (0.51-1.04)	0.94 (0.43-2.06)	-2.0	-0.4
Accidental fire and scalds	1.63 (0.93-2.86)	1.10 (0.51-2.35)	4.3	0.7
Accidental falls	1.07 (0.79-1.45)	0.68 (0.41-1.11)	0.5	-2.2
Other non-traffic injuries	1.38 (1.01-1.89)	0.98 (0.52-1.84)	2.7	-0.1
Intentional injuries	1.19 (1.08-1.31)	0.95 (0.81-1.11)	1.3	-0.3
Suicides	0.80 (0.70-0.90)	0.67 (0.54-0.81)	-1.5	-2.2
Homicides	3.54 (2.93-4.28)	2.51 (1.84-3.43)	15.4	9.1
Events of undetermined intent	1.10 (0.69-1.76)	1.57 (0.75-3.29)	0.7	3.6

[a] Migrants compared with the native Dutch population, adjustment for age, area income, and urbanization degree

There were large variations in the relative risks of death from injuries according to age group (Table 5.5). The excess risk of total injury related mortality among migrants was the highest in childhood and young adult age-group and gradually reduced with increasing age. Compared with the native Dutch population, migrant children were more vulnerable to non-traffic injuries, especially drowning (RR=2.90) and accidental fire and scalds (RR=3.66). Migrants aged 15-24, in contrast to the native Dutch group of the same age, experienced the largest inequalities in the risk of death from drowning (RR=5.51) and intentional injuries, especially homicides (RR=4.55). For the migrant adult population we also observed an elevated risk of death in traffic related injuries, especially in the car-driver and passenger and pedestrian death risks (RRs=1.58 and 2.92, respectively). The excess mortality from drowning among migrants groups was high in all age-groups, except the oldest. Homicide was high in all age groups except the youngest.

Table 5.5 Relative risk by cause of death and age-group for migrants versus native Dutch population. Men and women combined

	Relative risk [a] (95% Confidence interval)			
	0-14	15-24	25-49	50+
Total injury mortality	1.51 (1.20-1.88)	1.36 (1.19-1.56)	1.07 (0.98-1.16)	0.82 (0.70-0.97)
Traffic injuries	1.05 (0.68-1.62)	1.02 (0.82-1.26)	1.27 (1.07-1.52)	1.04 (0.75-1.43)
Car-driver& passenger accidents	1.65 (0.72-3.77)	1.18 (0.88-1.59)	1.58 (1.26-1.98)	1.29 (0.78-2.15)
Pedestrian accidents	1.20 (0.56-2.57)	1.53 (0.76-3.09)	2.92 (1.72-4.96)	1.71 (0.89-3.29)
Cyclists accidents	0.62 (0.26-1.48)	0.59 (0.23-1.52)	1.04 (0.53-2.06)	0.65 (0.30-1.37)
Motorcyclists accidents	0.76 (0.07-7.87)	0.76 (0.48-1.18)	0.47 (0.25-0.87)	0
Other traffic injuries	1.31 (0.29-5.99)	0.98 (0.48-2.01)	0.70 (0.38-1.28)	1.47 (0.64-3.39)
Non-traffic injuries	2.13 (1.57-2.89)	1.24 (0.76-2.01)	0.94 (0.76-1.17)	0.98 (0.74-1.28)
Accidental drowning	2.90 (1.84-4.58)	5.51 (1.70-17.84)	2.48 (1.44-4.25)	1.10 (0.39-3.07)
Accidental poisoning	0	0.69 (0.23-2.07)	0.71 (0.49-1.03)	1.79 (0.68-4.71)
Accidental fire, scalds	3.66 (1.47-9.12)	0.50 (0.07-3.89)	0.54 (0.19-1.55)	1.69 (0.78-3.69)
Accidental falls	1.89 (0.86-4.15)	0.83 (0.28-2.47)	0.71 (0.44-1.17)	0.75 (0.51-1.11)
Other non-traffic	1.25 (0.69-2.26)	1.68 (0.69-4.08)	1.26 (0.80-1.98)	1.14 (0.63-2.04)
Intentional injuries	0.99 (0.57-1.73)	1.83 (1.52-2.21)	1.04 (0.93-1.15)	0.64 (0.50-0.82)
Suicides	1.04 (0.33-3.27)	1.25 (0.98-1.60)	0.71 (0.62-0.81)	0.43 (0.31-0.59)
Homicides	1.04 (0.53-2.04)	4.55 (3.22-6.44)	3.44 (2.79-4.25)	2.44 (1.49-4.0)
Events of undetermined intent	0.72 (0.13-4.05)	0.54 (0.11-2.60)	1.24 (0.75-2.04)	1.41 (0.64-3.12)

[a] Migrants compared with the native Dutch population, adjustment for age, sex, area income, and urbanization degree

Not all migrant groups had similar rates of injury related mortality. As shown in Table 5.6, the Surinamese and Antillean population had an increased risk of the total injury related mortality (RRs above 1.30), while the total injury mortality of Turkish and Moroccan groups did not significantly differ from the native Dutch population (RR=0.91). Car-driver and passenger, pedestrian, drowning, and homicide mortality remained increased among almost all migrant groups. In contrast to Turkish and Moroccans, Antillean/Aruban and, especially, Surinamese populations had higher risks of death from almost all non-traffic injuries (most RRs above 1.20) and higher rates from suicides. Compared with other ethnic groups, Antillean/Aruban had an exceptionally high homicide rate (RR=7.13).

Table 5.6 Relative risk by cause of death and ethnicity. Men and women combined (Person years for all migrants combined=5,392,400)

	Relative risk [a] (95% Confidence interval)			
	Turkish	Moroccan	Surinam	Antillean/Aruban
Total injury mortality	0.91 (0.81-1.01)	0.91 (0.81-1.03)	1.33 (1.22-1.46)	1.53 (1.32-1.79)
Traffic injuries	1.05 (0.86-1.28)	1.15 (0.93-1.41)	0.93 (0.74-1.16)	1.31 (0.96-1.79)
Car-driver& passenger accidents	1.37 (1.05-1.78)	1.43 (1.07-1.90)	1.19 (0.88-1.61)	1.74 (1.16-2.61)
Pedestrian accidents	1.92 (1.19-3.10)	1.86 (1.11-3.12)	1.69 (1.02-2.78)	0.68 (0.17-2.74)
Cyclists accidents	0.42 (0.19-0.94)	0.95 (0.53-1.70)	0.35 (0.14-0.85)	1.13 (0.47-2.72)
Motorcyclists accidents	0.45 (0.23-0.87)	0.35 (0.16-0.80)	0.64 (0.35-1.16)	1.43 (0.74-2.77)
Other traffic injuries	1.03 (0.56-1.88)	1.26 (0.69-2.32)	0.61 (0.27-1.37)	0.30 (0.04-2.13)
Non-traffic injuries	1.02 (0.79-1.32)	0.98 (0.74-1.30)	1.68 (1.40-2.02)	1.14 (0.74-1.76)
Accidental drowning	2.28 (1.42-3.68)	2.43 (1.47-4.01)	3.11 (1.97-4.92)	1.77 (0.65-4.77)
Accidental poisoning	0.37 (0.17-1.78)	0.52 (0.26-1.06)	1.21 (0.79-1.85)	1.18 (0.52-2.65)
Accidental fire & scalds	1.09 (0.48-2.50)	0.86 (0.31-2.34)	1.95 (1.07-3.55)	1.24 (0.31-5.03)
Accidental falls	0.89 (0.53-1.49)	0.44 (0.20-0.99)	1.23 (0.88-1.71)	0.82 (0.34-1.99)
Other non-traffic injuries	0.90 (0.53-1.54)	1.01 (0.58-1.77)	1.89 (1.29-2.76)	0.91 (0.34-2.43)
Intentional injuries	0.83 (0.71-0.97)	0.81 (0.68-0.97)	1.41 (1.25-1.58)	1.83 (1.50-2.22)
Suicides	0.54 (0.43-0.67)	0.43 (0.33-0.56)	1.12 (0.97-1.30)	0.97 (0.73-1.30)
Homicides	2.57 (1.99-3.32)	2.73 (2.08-3.57)	3.18 (2.52-4.02)	7.13 (5.36-9.47)
Events of undetermined intent	0.48 (0.18-1.31)	1.47 (0.77-2.81)	1.58 (0.90-2.75)	1.79 (0.66-4.84)

[a] Migrants compared with the native Dutch population, adjustment for age, sex, area income, and urbanization degree

Discussion

Our results indicate that, compared with the native Dutch population, all migrants combined had an increased injury mortality rate. Migrant populations experienced a higher risk of death from pedestrian accidents, drowning, poisoning, fire and scalds, and homicides. Mortality for cyclists and motorcycle drivers was significantly lower among migrants compared with the native Dutch. Adjustment for urbanization and area income decreased the mortality risk difference for most non-traffic injuries, but revealed the difference in risk for car-driver and passenger accidents. Injury mortality among migrants was lower for cyclist accidents, motorcycle driver accidents, and suicides. Compared with the native Dutch inhabitants, Surinamese and Antillean/Aruban population had a higher risk of total injury mortality, while Turkish and Moroccans had increased risk only for selected conditions. Inequalities in injury mortality were the highest among children and young adults, but persisted in the age group above 50 years old.

In interpreting the results of our study, some potential limitations should be considered. First, the power of the study was too limited to demonstrate with statistical significance possible ethnic differences for specific injuries, age-sex groups, and ethnic groups. Second, all deaths that occurred abroad were excluded from the analysis. We should therefore stress that our results are restricted to injury related deaths that occurred within the Netherlands. Injury related deaths abroad, which may be considerably higher among ethnic groups, require specific research, as they require specific approaches for injury prevention

Several factors might have played a role in explaining the ethnic differences in injury mortality found in our study.

Higher levels of car-driver and passenger related accident mortality among migrants could probably be explained by a higher injury risk per kilometre travelled instead of a higher rate of exposure. Migrants, who mostly live in urban areas, possess and use cars less often than the native Dutch inhabitants. This may compensate for a potentially higher injury risk per kilometre travelled among ethnic groups. This higher risk is suggested by the increase in relative risk (from 0.99 to 1.48) after adjustment for urbanization and an excess risk among men (RR=1.51), primary car users, but not among women (RR=0.98).

A higher risk per kilometre travelled could be partly related to a more risky driving behaviour, such as speed limit excess and less common use of car safety equipment, as is frequently found among ethnic groups in other countries.[17, 18] This is supported by the general more risk taking behaviour as seen from the higher criminality among ethnic groups[19] and also could be related to less frequent use of vehicle injury protective measures in immigrants' countries of origin. Contrary to the findings in the US,[20] driving under the influence of alcohol is less likely among migrants in the Netherlands since alcohol consumption is consistently lower in these groups[21] due to religious reasons. Less frequent drink-driving behaviour is an important consideration for future interventions.

Mortality during traffic accidents is also highly dependent on the age of the car. Newer car models are more often equipped with functional built-in safety equipment such as multisided airbags, headrests, ABS systems, speed alerts, and other technologies that help to prevent the collision and to protect against death and severe injuries in case of a collision. Migrants might have fewer possibilities to procure newer car models due to their lower income, compared with Dutch. [22]

Bicycles and motorcycles serve as important means of transportation for the Dutch population, especially in densely populated areas. The amount of kilometres ridden by cyclists grows every year. According to CBS data, there were 187 billion km ridden by cyclists in 2000, which is an increase by 6% compared with 1995.[23] Bicycle and motorcycle use in countries where immigrant populations originate from is much less frequent than in the Netherlands. Migrants do not favour these types of transportation neither after immigration to the Netherlands. This might explain their lower risk of cyclist and motorcyclist mortality, compared with the Dutch population.

Less frequent use of bicycles and motor vehicles makes immigrant groups, especially women, take more often the role of pedestrians. High pedestrian exposure among ethnic groups might explain their increased mortality, a phenomenon that has been observed also in other countries.[24-26] The observed higher risk among migrant women compared with men (RR=2.04 and 1.54 respectively) provides additional support to the above suggestion.

Drowning was more frequent among migrants of all ages up to 50, with the highest relative risk found among young adults aged 15-24 (RR=5.51). The ability to swim seems an obvious explanation for the observed difference in drowning mortality risks. In Amsterdam only 56% of the 13-14 year old Turkish and Moroccan girls had a swimming certificate compared with over 95% of the native Dutch children.[27] Although swimming is a part of the school curriculum, not every school has appropriate facilities and lessons often have to be arranged and covered privately, which is not always an option for the migrant families. Because higher risks of drowning are not only restricted to younger age-groups, but persist at older ages, swimming educational programs for ethnic groups of all ages are warranted.

Differences in risk of death from traffic and, especially, non-traffic injuries could be also related to differential mortality from occupational accidents. Since migrants are more often employed in low-skilled manual jobs where they are often exposed to occupational hazards, it is plausible that there are differences in mortality from occupational injuries between ethnic groups and the native Dutch population. This suggestion is supported by the fact that we observed an excess of risk of death from fire, scalds and non-traffic injuries especially among migrant men.

The high homicide mortality risks for ethnic groups found in our study are in line with the data from earlier Dutch publications.[2, 28-31] Several factors could be involved. First, homicide is related to criminal affairs,[28] and therefore, higher involvement in criminal acts might partly explain the above observation. According to the court registries, 31% of prosecutions in the year 2000 occurred among the first generation migrants who were directly involved in criminal acts (an 11 times higher rate than that of the Dutch population)[32] Turkish people were the least involved in criminal acts, while Antilleans were the most involved.[30, 32] Second, a lower socioeconomic position of migrants, stress associated with work, discrimination, and culture shock were previously suggested to explain high homicide rates among ethnic groups[30, 31] Third, psychosocial disorders, especially frequent among Surinamese and Antilleans could add to the explanation of the increased homicide risks.[33] Fourth, family attitudes and rearing practices could lead to a more aggressive behaviour. A study of adolescents in Rotterdam found that only 30% of Antilleans and 52% of Surinamese teenagers were growing in a full (with two parents) family, whereas that was the case for 77% of the Dutch.[34] Additionally, ethnic teenagers, especially Antilleans, more often expressed an aggressive and violent behaviour, committed vandalism or theft, or possessed a weapon.[34]

Compared with the native Dutch population, the risk of death from suicides is consistently lower among Turkish and Moroccan minorities. Cultural norms, higher religiousness, and strong and supportive family ties could play an important role in explaining the low risks. The situation is different for the young adults of Surinamese and Antillean descent, for who the suicide mortality risks are higher compared with the native Dutch population (RR=1.58 and 1.38 respectively, data not shown). The latter could be partly associated with the higher rates of mental disorders in these populations.[33]

We observed an increased risk of death from events of undetermined intent among ethnic groups (RR unadjusted =2.11). This observation might be partly attributed to a slightly less accurate cause of death registration among migrants than among the native population. Differential misclassification of causes of death by ethnic origin could have resulted in an incorrect estimate of the difference in homicide and suicide mortality between ethnic groups and the native Dutch population. Apart from intentional injuries, we do not have reasons to suspect occurrence of differential misclassification among other causes of death.

Access to health care is an important factor for injury mortality, as prompt and high quality emergency services may prevent death. In the Netherlands no gross inequalities in access to health care facilities were found for ethnic groups,[35, 36] therefore, such inequalities are unlikely to play a role in explaining ethnic differences in injury mortality.

The results of this study point to areas that require priority attention from both researchers and policy makers. Activities should be aimed at prevention of car and pedestrian accidents, drowning and homicides among ethnic groups most at risk. Up to 15% of homicide deaths and 10% of drowning would have been avoided in the general Dutch population if migrants had the same mortality rates for these causes as the native Dutch inhabitants. Additional research is needed to establish the specific determinants for the increased mortality among ethnic groups and to identify ways to effectively address them.

The study also indicates opportunities for preventive activities that target the native Dutch population. A substantial percentage of lives of bicycle and motorcycle riders would have been saved among the native Dutch people if they had mortality rates similar to the ones of ethnic groups. Although safety helmets were demonstrated to protect cyclists against heavy injuries and death,[37-39] their use among native Dutch is still low,[40] thus warranting appropriate interventions.

The results of our analysis cannot be directly generalised to other countries due to differences in migrants groups and national context. Nonetheless, similar patterns may be observed, for example, among the Turkish and Moroccan migrants living in Germany and France. In addition, some of the priority areas identified in our study, such as the high mortality from pedestrian accidents, poisoning and fire, may be similar in other countries with a different configuration of migrant groups. Our study, therefore, needs replication in other European countries where injuries among migrant groups have not yet been described in detail. International cooperation and exchange of findings may contribute to explaining these inequalities and developing effective ways to reduce them.

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PART III

INEQUALITIES IN MORTALITY RELATED TO HEALTH CARE FUNCTIONING

Chapter 6

Educational inequalities in avoidable mortality in Europe: inferences about the role of health care

Based on: Stirbu I,.Kunst AE, Bopp, M et al
Educational inequalities in avoidable mortality in Europe.
Submitted

Abstract

Background

Inequalities in avoidable mortality can pinpoint to shortcomings in the health care system in different countries. We compared the magnitude of educational inequalities in avoidable mortality in different European countries and determined the contribution of inequalities in avoidable mortality to inequalities in temporary life expectancy (TLE) in Europe.

Methods

Mortality data for men and women aged 30-64 years were obtained from national longitudinal and cross-sectional mortality studies in 16 European populations. Level of education classified in 4 standard educational groups was used as socioeconomic indicator. To estimate the magnitude of inequalities between lower and higher educated groups in each country we calculated age-standardized mortality rates and the Relative Index of Inequality for selected avoidable causes of death separately and combined. Life table analysis was used to calculated the contribution of some causes of death to the inequalities between lower and higher educated groups.

Results

Educational inequalities in avoidable mortality were present in all countries of Europe and in all types of avoidable causes of death. Especially large educational inequalities were found for infectious diseases and conditions that require acute (operative) care in all countries of Europe. Inequalities were larger in Central Eastern European (CEE) and Baltic countries, followed by Northern and Western European countries, and smallest in the Southern European regions. This geographic pattern was present in almost all types of avoidable causes of death. Avoidable mortality contributed between 11 and 24% to the inequalities in TLE between high and low educated groups. Infectious diseases and cardio-respiratory conditions were main contributors to this difference in TLE.

Conclusions

Inequalities in avoidable mortality existed in all countries of Europe. Reduction of inequalities in cardio-respiratory and infectious diseases will largely contribute to the reduction of inequalities in life expectancy in most European countries. Priority should be given to reducing inequalities in avoidable mortality in CEE and Baltic countries through improving access and quality of health care for people of lower socioeconomic position.

Introduction

There are worldwide indications that health status and mortality differ among socioeconomic groups, with those less educated and economically less affluent groups in society being in more disadvantaged position[1-3]. It has been suggested that these inequalities may be due, in part, to inequalities in access and quality of health services[4-6].

Avoidable mortality is a concept introduced in 1970th by Rutstein and Charlton to measure the performance of the health care system[7-9]. It represents mortality from conditions amenable to medical interventions i.e. deaths that should have been averted given a timely application of the current medical knowledge and technology. Since its introduction the term 'avoidable mortality' has evolved. Many researchers distinguish between avoidable causes of death related to medical care and those related to health policy[10-12]. Levels and trends of avoidable mortality were widely documented[12-20]. Most researchers showed that levels of avoidable mortality were substantially decreasing over the past 50 years[17, 21-23]. Some studies also observed higher levels in avoidable mortality among people disadvantaged in terms of ethnicity or socioeconomic position [15, 24-26]. Significant excess mortality from several amenable conditions among African American compared to whites was observed in US[27]. In New Zealand mortality rates from conditions amenable to medical care were about 2.5 times higher among Maori compared to non-Maori population[15]. Similarly, in Sweden, Finland, and Austria significant differences by socioeconomic position were found for avoidable mortality[24, 28, 29].

Evidence on inequalities in avoidable mortality in Europe remains fragmentary with studies limited to particular countries and population groups. In addition, previous studies have limited comparability due to differences in the definition of avoidable mortality, studied periods and age-groups, and use of different socioeconomic indicators. It is of interest to learn whether there are specific causes of death for which inequalities are large in all European countries. Such causes would point to specific problems with health care delivery that require extra attention throughout Europe. In addition, country differences in avoidable mortality can indicate a possible role of specific national health care systems, and thus suggest priority areas for more in depth investigations into the situation of specific countries.

The objective of this study was to estimate the magnitude of educational inequalities in avoidable mortality in different European countries and to prepare such an overview for a wide array of "avoidable" causes of death. In addition, we measured the contribution of avoidable causes of death to the inequalities in life expectancy in different countries. We focused on causes amenable primarily by medical care (i.e. through secondary and tertiary prevention), thus aiming to obtain indications on the role of the health care system in causing socioeconomic inequalities in health.

Methods

Data

Mortality data from 16 populations were selected for this study (Table 6.1). They included four North European countries (Finland, Sweden, Norway, and Denmark), two West European countries (Belgium and Switzerland), two South European countries (Italy and Spain), four Central Eastern European (CEE) countries (Slovenia, Hungary, the Czech Republic, and Poland) and two Baltic countries (Lithuania and Estonia). All data cover whole national populations, with the exceptions of mortality data for Italy (data for Turin city only) and Spain (data for the Madrid and Basque regions, and Barcelona city only). Subpopulations were excluded in two datasets: foreigners in Switzerland and people deceased outside Catalonia in Barcelona. Mortality data for CEE and Baltic countries, except Slovenia, come from cross-sectional unlinked mortality studies, in which information on socioeconomic data is derived separately from death certificates and census records. Numbers from mortality registries and censuses determined the numerator and denominator of mortality, respectively. Data for other European countries came from longitudinal follow up studies, in which socioeconomic position as determined during a census has been linked to mortality.

Selection of causes of death

For this study, we selected causes of death that could be averted mainly through medical interventions i.e. conditions that are amenable to treatment. For that reason we excluded causes of death that were avoidable through mainly primary prevention such as lung cancer or injuries. We based our list of avoidable causes of deaths on the original list developed by Rutstein[8]. Specifically, our list included diseases of infectious origin (Tuberculosis [A15-19, B90], Pneumonia/Influenza [J10-18], and other infectious & parasitic diseases [A00-09, A20-99, B00-89, B91-99]); selected types of cancer (cervix uteri [C53], testis [C62], Hodgkin & Leukaemia [C81, C91-95]); selected conditions that require acute, often operative care (Appendicitis, hernia & peptic ulcer [K25-28, K35-38, K40-46, K56] and Cholecystitis, -lithiasis [K80-83]); and selected cardio-respiratory conditions (Hypertension and Cerebro-vascular conditions [I10-15, I60-69], Chronic Rheumatic Heart Disease [I00-09], and Asthma [J45-46]).

The list of potentially avoidable cause of death includes ischemic heart disease, colorectal cancer, and diabetes[15, 30, 31]. These conditions are to a considerable extent related to lifestyle factors such as smoking, alcohol consumption, obesity, etc which are known to largely determine socioeconomic inequalities in mortality from these conditions. For the causes of death with strong effect of life style factors, it would be very difficult to separate the extent that the observed inequalities are caused by the inequalities with regards to medical care instead of inequalities in lifestyle factors. For that reason we have excluded these causes of death from our study.

Table 6.1 Countries included in the analysis and sources of data

Country	Type of data	Follow up period	No. of person years at risk	Educational level (%)		
				Lower secondary or less	Upper secondary	Post secondary
Finland	Longitudinal	1990-2000	22606143	47.2	30.9	21.8
Sweden	Longitudinal	1991-2000	36137338	37.3	43.7	19.0
Norway	Longitudinal	1990-2000	16666847	30.2	49.4	20.4
Denmark	Longitudinal	1996-2000	11959629	43.1	36.0	20.9
Belgium	Longitudinal	1991-1995	22349533	61.6	21.9	16.5
Switzerland	Longitudinal	1990-2000	23663177	28.1	56.0	15.9
Turin	Longitudinal	1991-2001	4147548	70.6	20.4	8.9
Barcelona	Longitudinal	1992-2001	6733310	68.0	15.2	16.8
Madrid region	Longitudinal	1996-1997	3216098	63.3	18.9	17.8
Basque region	Longitudinal	1996-2001	5426107	67.2	18.4	14.4
Slovenia	Longitudinal	1991-2000	8598967	45.5	43.2	11.2
Hungary	CS* unlinked	1999-2002	17926668	60.4	25.9	13.7
Czech Republic	CS unlinked	1999-2003	22181655	59.5	29.1	11.4
Poland	CS unlinked	2001-2003	47673756	53.2	34.5	12.3
Lithuania	CS unlinked	2000-2002	4436508	22.5	59.5	18.0
Estonia	CS unlinked	1998-2002	2950765	23.3	58.0	18.7

* CS = Cross-sectional

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

Analysis

The analysis of data from longitudinal studies with about 10 years of follow-up was performed among people aged 30-64 at the start of follow-up. To approximate all populations in terms of average age at death, we performed our analysis on slightly older age-groups for all studies with cross-sectional design (35-69 years) and for longitudinal studies with shorter follow up period (35-69 for Madrid with a 2-year follow up period, and 30-69 for Belgium and the Basque region with a 5-year follow up).

We used educational level as a measure of socioeconomic position. Education was categorized into four classes that corresponded to the International Standard Classification of Education (ISCED): (1) no education or primary education, (2) lower secondary education, (3) upper secondary education, and (4) post-secondary and tertiary education. For unlinked cross-sectional mortality data, we distinguished only three educational classes (by combining the two lowest educational groups) in order to cope with the numerator/denominator bias problem (see Discussion section). Information on education was missing on average for 1.2% of the population. These subjects were excluded from the analysis.

The linkage between census data and mortality registries was achieved for more than 96% of all deceased persons in almost all populations except Madrid (70%), the Basque region

(93%) and Barcelona (94.5%). Evaluations in Madrid and Barcelona observed no variation in this percentage according to age, sex, or socioeconomic position. Therefore, estimates of relative inequalities in mortality are not likely to be biased to an important extent. In addition, we adjusted estimates of the absolute mortality rates by increasing these with correction factors (1/0.70, 1/0.93 and 1/0.945 respectively).

To estimate the mortality level per educational level, we computed age-standardized mortality rates (ASMR) using European population as a standard (OECD, 1995). To estimate the extent of inequalities across educational levels, we computed Relative Indices of Inequality (RII). The RII is a regression-based measure that takes into account the distribution of the population by educational groups[32]. It assesses the association between mortality rate and the relative position of each educational group. This relative position is measured as the cumulative proportion of each educational group within the educational hierarchy with 0 and 1 as the extreme values. The resulting measure, the RII, can be interpreted as the risk of death at the very top of the educational hierarchy as compared to the very lowest end of the educational hierarchy. This measure can be compared between age groups and countries, provided that a detailed and hierarchical classification of educational levels is used in each country. For this paper, the RII was estimated with log linear regression with control for 5-year age group and gender. The regression model had a log link function and assumed a Poisson error distribution, using the Genmod procedure of SAS. Analyses were conducted for each population separately and combined.

In addition we use life table analysis to estimate the temporary life expectancy (TLE) between the 35th and 70th birthday (with a maximum of 35 years), for higher and lower educational groups. We estimated the contribution of each avoidable condition to inequalities in TLE using the cause elimination life table.

Results

Inequalities in total avoidable mortality were present in all European populations included in this study (Table 6.2). Compared to the inequalities in total mortality, inequalities in total avoidable mortality were slightly larger in all populations separately and combined. Smaller inequalities in avoidable mortality were observed in South European populations, while larger inequalities were found in CEE and Baltic countries. Relative inequalities were the largest in the Czech Republic and Hungary (5.34) and the smallest in the region of Madrid (1.70). Similarly to relative inequalities, larger absolute inequalities in avoidable mortality were observed in CEE and Baltic countries and smaller absolute inequalities were observed in the Spanish regions and Turin.

We observed large inequalities favouring more educated people in the group of infectious diseases (Table 6.3). For all infectious diseases combined inequalities were larger in CEE and Baltic countries and were relatively large also in Denmark (RII 5.04). Nearly all

Table 6.2 Age and sex standardized mortality rates (ASMR), and Relative index of inequality (RII) for all cause mortality and total avoidable mortality by country

Country	All cause mortality					Total avoidable mortality				
	No of deaths	ASMR Lower** education	ASMR Higher** education	RII*	95% Confidence Interval	N	ASMR Lower education	ASMR Higher education	RII*	95% Confidence Interval
Finland	141248	778.1	529.0	**2.42**	(2.37-2.48)	18085	102.0	65.0	**2.78**	(2.60-2.97)
Sweden	165512	564.7	404.5	**2.01**	(1.97-2.05)	17874	62.6	42.5	**2.26**	(2.14-2.39)
Norway	87559	702.1	490.2	**2.36**	(2.30-2.42)	9836	82.6	52.5	**2.78**	(2.57-3.01)
Denmark	65510	673.6	492.3	**2.30**	(2.23-2.37)	6602	70.0	48.3	**2.47**	(2.24-2.72)
Belgium	155304	730.6	563.2	**1.95**	(1.90-1.99)	16801	79.1	58.4	**2.10**	(1.97-2.24)
Switzerland	120137	581.4	486.2	**2.28**	(2.23-2.33)	13012	70.0	50.0	**2.72**	(2.54-2.92)
Turin	25579	581.6	475.6	**1.66**	(1.59-1.75)	2868	64.9	51.7	**1.81**	(1.56-2.10)
Barcelona	39101	561.7	488.5	**1.72**	(1.65-1.79)	4591	66.0	53.5	**1.85**	(1.64-2.10)
Madrid region	17180	569.7	532.1	**1.56**	(1.47-1.66)	1944	66.1	55.6	**1.70**	(1.41-2.06)
Basque region	22681	427.3	442.9	**1.37**	(1.29-1.46)	2762	56.0	49.3	**2.04**	(1.70-2.44)
Slovenia	62944	845.5	691.0	**2.29**	(2.23-2.36)	9501	137.6	92.3	**2.97**	(2.75-3.20)
Hungary	201568	1351.6	687.0	**4.21**	(4.12-4.31)	31045	211.7	96.4	**5.35**	(5.05-5.68)
Czech Republic	171397	969.6	505.9	**4.36**	(4.26-4.47)	23048	134.5	63.9	**5.34**	(4.99-5.71)
Poland	394919	1124.4	551.2	**4.07**	(4.01-4.13)	57100	164.6	77.6	**4.61**	(4.44-4.80)
Lithuania	46291	1859.2	839.9	**3.50**	(3.37-3.64)	7325	293.2	128.4	**4.08**	(3.69-4.51)
Estonia	36374	1851.8	997.1	**2.90**	(2.79-3.03)	6777	350.7	178.2	**3.46**	(3.14-3.81)
All countries	1753304	885.8	573.5	**2.76**	(2.74-2.77)	229171	125.7	72.7	**3.28**	(3.22-3.34)

* RII is a regression-based measure of relative differences in mortality rates between the lowest and the highest ends of the socioeconomic scale. RIIs were adjusted for age and sex,

**Lower education group is a combination of primary or no education and lower secondary education; Higher education group is a combination of upper secondary education and tertiary education.

Table 6.3 Age and sex standardized mortality rates (ASMR), and Relative index of inequality (RII) for group of diseases of infectious origin by country

Country	All diseases of infectious origin					Tuberculosis		Pneumonia/ Influenza		Other infectious	
	No of deaths	ASMR Lower ** education	ASMR Higher** education	RII*	95% Confidence Interval	RII*	95% Confidence Interval	RII*	95% Confidence Interval	RII*	95% Confidence Interval
Finland	4053	24.4	13.1	**4.21**	(3.65-4.86)	**2.73**	(1.68-4.44)	**5.72**	(4.79-6.84)	**2.00**	(1.50-2.68)
Sweden	2955	11.5	6.4	**3.17**	(2.75-3.66)	**4.75**	(2.09-10.77)	**3.80**	(3.15-4.57)	**2.30**	(1.83-2.90)
Norway	1536	13.2	8.0	**2.96**	(2.42-3.62)	**10.94**	(4.36-27.43)	**3.10**	(2.34-4.10)	**2.35**	(1.72-3.21)
Denmark	1136	14.0	6.8	**5.04**	(3.95-6.44)	**14.39**	(4.07-50.81)	**6.21**	(4.18-9.22)	**3.99**	(2.89-5.51)
Belgium	3646	17.2	12.2	**2.26**	(1.97-2.60)	**3.14**	(1.74-5.67)	**4.03**	(3.21-5.04)	**1.37**	(1.13-1.66)
Switzerland	3950	23.4	14.9	**3.77**	(3.32-4.28)	**7.47**	(3.05-18.30)	**5.51**	(4.36-6.97)	**3.08**	(2.64-3.59)
Turin	336	8.3	4.9	**3.84**	(2.43-6.05)	**6.71**	(1.56-28.87)	**4.12**	(2.22-7.65)	**2.90**	(1.35-6.22)
Barcelona	1001	15.9	10.9	**3.32**	(2.52-4.36)	**9.89**	(4.47-21.87)	**2.65**	(1.68-4.19)	**2.89**	(1.97-4.23)
Madrid region	550	19.2	15.3	**2.04**	(1.42-2.91)	**4.42**	(1.09-17.90)	**2.46**	(1.37-4.39)	**1.61**	(1.00-2.60)
Basque region	965	23.0	14.7	**4.55**	(3.42-6.04)	**1.98**	(0.38-10.21)	**1.39**	(0.61-3.19)	**5.32**	(3.92-7.21)
Slovenia	1253	19.8	10.7	**5.16**	(4.18-6.37)	**13.55**	(7.23-25.41)	**5.38**	(4.18-6.92)	**2.18**	(1.31-3.61)
Hungary	2268	16.6	5.7	**9.07**	(7.21-11.42)	**15.38**	(10.18-23.22)	**10.13**	(7.11-14.45)	**3.07**	(1.95-4.84)
Czech Republic	3298	19.4	8.0	**7.62**	(6.34-9.16)	**24.05**	(10.52-55.00)	**7.38**	(6.03-9.04)	**5.06**	(3.01-8.52)
Poland	7724	23.5	8.4	**8.12**	(7.23-9.10)	**45.47**	(32.39-63.83)	**8.22**	(7.02-9.64)	**2.98**	(2.44-3.63)
Lithuania	1541	106.4	20.9	**19.05**	(14.94-24.30)	**39.46**	(27.82-55.97)	**12.12**	(8.23-17.86)	**3.53**	(1.84-6.78)
Estonia	1378	98.9	33.4	**6.81**	(5.44-8.53)	**12.97**	(8.39-20.05)	**5.82**	(4.42-7.65)	**2.09**	(0.90-4.86)
All countries	37590	28.4	12.2	**4.69**	(4.48-4.90)	**14.68**	(12.77-16.88)	**5.46**	(5.12-5.82)	**2.52**	(2.34-2.71)

* RII is a regression-based measure of relative differences in mortality rates between the lowest and the highest ends of the socioeconomic scale. RIIs were adjusted for age and sex,

**Lower education group is a combination of primary or no education and lower secondary education; Higher education group is a combination of upper secondary education and tertiary education.

countries had consistently larger inequalities in Tuberculosis mortality than for other infectious diseases. Inequalities in Tuberculosis mortality were the largest in CEE and Baltic countries, Norway, and Denmark were RIIs peaked at values 10.94 and higher.

Smaller, but persistent inequalities were found in total avoidable malignant conditions (RII for all countries combined = 1.84 CI: 1.75-1.93, Table 6.4). RIIs were slightly lower in the Southern regions, except Madrid and tended to be slightly higher in CEE and Baltic countries, except Slovenia and Estonia. Relative and absolute inequalities (last not shown) were the largest for cervix cancer among women, while inequalities for leukaemia and Hodgkin's disease were not consistently present in all countries.

All countries except Basque region had inequalities by education for all cardio-respiratory conditions combined (Table 6.5). These inequalities varied between around 1.5 in Southern population; around 2.5 in Northern and Western European countries and around 4.0 in CEE and Baltic countries. In each country inequalities were approximately equally large for all cardio-respiratory conditions combined, cerebro-vascular conditions, and CRHD, but were slightly larger for asthma.

Large relative inequalities in total avoidable acute conditions favouring higher educated people were present in all countries of Europe (Table 6.6). The magnitude of inequalities did not vary considerably between specific acute diseases for each country, but it fluctuated largely between countries. Finland, Turin, Hungary, the Czech Republic, and Poland, had larger than European average inequalities in total avoidable acute conditions combined (all RIIs above 5.00 compared to European average RII=4.50).

Differences in temporary life expectancy (TLE) between high and low educational groups were the largest in CEE and Baltic countries where it varied between 1.72 years in the Czech Republic to 5.07 years in Lithuania (Table 6.7). Slovenia made an exception from above with TLE similar to Nordic countries. Notable that the TLE of high educated people in CEE and Baltic countries was only about 1 year shorter than TLE of high educated people in other European countries, while the difference in TLE between lower educated people in CEE/Baltic countries and other European countries accounted for more than 3 years. The smallest difference in TLE between lower and higher educated groups was in the Basque region (62 days). Avoidable causes of death made a large contribution to these small inequalities (53%). In other countries, the contribution of avoidable causes of death to the difference in TLE was between 11% and 24%. Acute and malignant conditions generally contributed little to the difference in TLE (17% and less, except in Madrid). Cardio-respiratory and infectious diseases contributed most to the difference in TLE in all European countries. In Nordic countries, Belgium, Turin, Barcelona and CEE countries cardio-respiratory conditions contributed the most to the difference in TLE for total avoidable mortality, while in Denmark, Switzerland, Madrid and Basque regions, and Baltic countries diseases of infectious origin prevailed.

Table 6.4 Age and sex standardized mortality rates (ASMR) and Relative index of inequality (RII) for group of malignant diseases by country

Country	**Total avoidable malignant**					**Cervix cancer**		**Leukemia & Hodgkin disease**	
	No of deaths	ASMR Lower** education	ASMR Higher** education	RII*	95% Confidence Interval	RII*	95% Confidence Interval	RII*	95% Confidence Interval
Finland	1584	8.3	6.5	**1.66**	(1.35-2.05)	**5.08**	(2.91-8.80)	**1.37**	(1.09-1.72)
Sweden	2751	8.5	7.4	**1.39**	(1.21-1.60)	**2.93**	(2.19-3.93)	**1.09**	(0.93-1.28)
Norway	1461	11.6	8.3	**1.70**	(1.39-2.09)	**4.58**	(3.32-6.33)	**0.90**	(0.68-1.17)
Denmark	1130	11.1	8.8	**1.44**	(1.15-1.81)	**2.28**	(1.55-3.34)	**1.05**	(0.78-1.41)
Belgium	2351	10.9	9.7	**1.40**	(1.19-1.66)	**3.27**	(2.24-4.79)	**1.12**	(0.93-1.35)
Switzerland	2048	10.1	8.3	**1.47**	(1.23-1.75)	**2.03**	(1.39-2.97)	**1.27**	(1.03-1.56)
Turin	397	9.0	8.5	**1.25**	(0.84-1.85)	**3.68**	(1.08-12.52)	**1.13**	(0.74-1.73)
Barcelona	690	9.6	9.1	**1.23**	(0.90-1.68)	**1.95**	(0.98-3.88)	**1.11**	(0.78-1.57)
Madrid region	316	11.0	7.9	**2.06**	(1.28-3.31)	**3.23**	(1.07-9.72)	**1.86**	(1.09-3.18)
Basque region	307	6.0	5.4	**1.56**	(0.90-2.70)	**3.66**	(0.91-14.79)	**1.27**	(0.70-2.33)
Slovenia	965	12.6	10.7	**1.31**	(1.03-1.67)	**1.89**	(1.25-2.86)	**1.14**	(0.84-1.54)
Hungary	3112	19.2	13.9	**2.01**	(1.72-2.36)	**3.35**	(2.60-4.32)	**1.60**	(1.30-1.97)
Czech Republic	3239	17.0	11.8	**2.24**	(1.91-2.62)	**4.12**	(3.11-5.46)	**1.70**	(1.41-2.07)
Poland	7532	19.2	12.8	**2.83**	(2.57-3.13)	**5.21**	(4.51-6.02)	**1.68**	(1.47-1.92)
Lithuania	919	33.0	17.7	**3.29**	(2.48-4.37)	**8.27**	(5.40-12.68)	**1.58**	(1.08-2.31)
Estonia	440	16.5	14.8	**1.61**	(1.11-2.32)	**4.32**	(2.40-7.76)	**0.84**	(0.52-1.35)
All countries	29242	13.3	10.1	**1.84**	(1.75-1.93)	**3.90**	(3.59-4.24)	**1.32**	(1.23-1.40)

* RII is a regression-based measure of relative differences in mortality rates between the lowest and the highest ends of the socioeconomic scale. RIIs were adjusted for age and sex,

**Lower education group is a combination of primary or no education and lower secondary education; Higher education group is a combination of upper secondary education and tertiary education.

Table 6.5 Age and sex standardized mortality rates (ASMR) and Relative index of inequality (RII) for cardio-respiratory conditions by country

Country	All cardio-respiratory conditions					Cerebrovascular disease		Chromic rheumatic heart disease		Asthma	
	No of deaths	ASMR Lower** education	ASMR Higher** education	RII*	95% Confidence Interval	RII*	95% Confidence Interval	RII*	95% Confidence Interval	RII*	95% Confidence Interval
Finland	10947	60.1	40.9	**2.40**	(2.20-2.60)	**2.35**	(2.15-2.56)	**2.36**	(1.22-4.57)	**5.13**	(3.04-8.63)
Sweden	10883	34.8	22.1	**2.21**	(2.06-2.38)	**2.14**	(1.99-2.31)	**2.48**	(1.50-4.09)	**4.00**	(2.88-5.55)
Norway	6226	37.5	26.2	**3.03**	(2.74-3.35)	**2.69**	(2.42-2.99)	**4.71**	(2.28-9.74)	**7.45**	(5.42-10.23)
Denmark	3697	52.6	33.0	**2.25**	(1.97-2.56)	**2.08**	(1.82-2.38)	**3.82**	(3.82-3.82)	**6.19**	(3.61-10.61)
Belgium	9971	37.8	28.2	**2.21**	(2.03-2.41)	**2.20**	(2.01-2.41)	**1.24**	(1.24-1.24)	**2.54**	(1.92-3.37)
Switzerland	6399	33.0	24.6	**2.59**	(2.34-2.86)	**2.47**	(2.22-2.74)	**3.87**	(1.99-7.52)	**4.03**	(2.81-5.79)
Turin	1964	43.6	36.7	**1.58**	(1.32-1.89)	**1.60**	(1.33-1.92)	**1.56**	(1.56-1.56)	**1.41**	(0.47-4.27)
Barcelona	2687	37.4	31.1	**1.64**	(1.39-1.93)	**1.53**	(1.29-1.81)	**2.43**	(1.39-4.22)	**3.66**	(1.45-9.23)
Madrid region	997	33.0	31.1	**1.43**	(1.10-1.86)	**1.21**	(0.91-1.60)	**4.52**	(1.85-11.06)	**3.99**	(0.69-22.95)
Basque region	1372	24.9	26.6	**1.01**	(0.78-1.30)	**1.02**	(0.78-1.33)	**0.79**	(0.32-1.96)	**-**	-
Slovenia	6647	95.8	64.7	**3.01**	(2.75-3.29)	**3.07**	(2.80-3.38)	**1.97**	(1.27-3.05)	**2.84**	(1.62-5.00)
Hungary	23555	161.5	69.8	**6.08**	(5.68-6.52)	**6.12**	(5.70-6.57)	**4.57**	(2.93-7.14)	**6.69**	(3.77-11.90)
Czech Republic	15059	89.5	40.5	**6.02**	(5.53-6.56)	**6.12**	(5.61-6.68)	**3.76**	(2.45-5.78)	**7.29**	(4.02-13.24)
Poland	38946	113.2	52.8	**4.57**	(4.36-4.80)	**4.55**	(4.33-4.78)	**4.20**	(3.35-5.27)	**6.90**	(5.05-9.43)
Lithuania	4501	140.3	82.8	**2.76**	(2.45-3.12)	**2.63**	(2.31-2.99)	**3.91**	(2.52-6.04)	**6.83**	(2.69-17.33)
Estonia	4645	217.8	121.8	**3.08**	(2.74-3.45)	**3.11**	(2.77-3.50)	**2.11**	(1.14-3.91)	**3.14**	(1.51-6.51)
All countries	148496	75.8	45.8	**3.34**	(3.26-3.41)	**3.30**	(3.22-3.38)	**3.54**	(3.07-4.07)	**4.50**	(4.00-5.05)

* RII is a regression-based measure of relative differences in mortality rates between the lowest and the highest ends of the socioeconomic scale. RIIs were adjusted for age and sex,
**Lower education group is a combination of primary or no education and lower secondary education; Higher education group is a combination of upper secondary education and tertiary education

Discussion

Educational inequalities in avoidable mortality were present in all countries of Europe and in most types of avoidable causes of death with exception of avoidable malignant conditions. Especially large educational inequalities were found, in relative terms, for infectious diseases and acute conditions. Inequalities were larger in CEE and Baltic countries, followed by Northern and Western European countries and smaller in the Southern European regions. This geographic pattern was present in almost all types of avoidable conditions. Avoidable mortality inequalities contributed between 11 and 24% to the difference in TLE between high and low educated groups. Infectious diseases and cardio-respiratory conditions were main contributors to this difference in TLE.

In our data, education was available in a comparable form for a large number of countries. Advantages of this measure are that it allows for classification of individuals regardless of whether they are inside or outside of the labour force market and it largely averts reverse causation since most people acquire their education early in life. We observed large differences between countries in the distribution of population by educational level. These differences mainly reflect true variations between countries of Europe in educational systems and attained levels of education. To cope with these differences, we used RII, a measure that takes educational distributions into account. RII estimates can be compared between countries, provided that a detailed and hierarchical classification of educational levels is used in each country.

We distinguished 4 educational groups in most countries, except Denmark and Finland where only 3 educational groups were distinguished in the basic data, and all countries with cross-sectional design where we had to combine the two lowest educational groups. We evaluated whether the results were sensitive to the number of educational levels that were distinguished by conducting a similar analysis with 3 educational groups in all countries and we did not observe major changes of the results.

Data from CEE (except Slovenia) and Baltic countries had cross-sectional unlinked design, while all other European countries and Slovenia were census-linked mortality follow-up studies. In a study that compares linked and unlinked mortality estimates in Lithuania, Shkolnikov et al demonstrated that mortality inequalities based on unlinked mortality data were overestimated. However, this overestimation was more pronounced in the older age-groups (70 and above) and was rather small in the age-group 30-69[33]. Overestimation is also possible in other CEE and Baltic countries with unlinked mortality data. In addition, we combined the two lowest educational levels, where numerator denominator bias is most likely to occur, thus minimizing possible overestimation of mortality inequalities by education in CEE and Baltic countries. Although residual bias might have remained in the cross-sectional studies, it is unlikely to explain the considerably larger inequalities in avoidable mortality that we consistently observed in most Baltic and CEE countries.

Table 6.6 Age and sex standardized mortality rates (ASMR), and Relative index of inequality (RII) for group of acute conditions by country

Country	**Total avoidable acute conditions**					**Appendicitis, hernia, ulcer**		**Cholecistitis**	
	No of deaths	ASMR Lower education	ASMR Higher education	RII*	95% Confidence Interval	RII	95% Confidence Interval	RII	95% Confidence Interval
Finland	1479	9.1	4.4	**5.21**	(4.06-6.67)	**5.28**	(4.05-6.88)	**4.72**	(2.38-9.36)
Sweden	1265	5.0	2.6	**3.77**	(3.03-4.68)	**3.82**	(3.02-4.84)	**3.44**	(1.92-6.16)
Norway	597	5.1	3.0	**3.62**	(2.61-5.02)	**3.89**	(2.72-5.56)	**2.46**	(1.09-5.55)
Denmark	632	7.0	4.4	**3.28**	(2.36-4.55)	**3.23**	(2.26-4.61)	**3.60**	(1.56-8.30)
Belgium	811	4.0	2.4	**3.03**	(2.22-4.14)	**3.02**	(2.13-4.28)	**3.08**	(1.50-6.32)
Switzerland	600	3.4	2.1	**3.97**	(2.87-5.50)	**3.94**	(2.76-5.63)	**4.13**	(1.89-9.05)
Turin	170	4.0	1.5	**5.80**	(2.92-11.54)	**-**	-	**-**	-
Barcelona	210	3.0	2.3	**2.29**	(1.27-4.14)	**2.40**	(1.20-4.83)	**2.03**	(0.67-6.14)
Madrid region	80	2.6	2.7	**1.98**	(0.77-5.13)	**3.39**	(0.98-11.69)	**-**	-
Basque region	105	1.9	2.4	**1.55**	(0.58-4.09)	**0.92**	(0.30-2.80)	**5.74**	(0.74-44.55)
Slovenia	626	9.2	6.3	**2.98**	(2.22-4.00)	**3.05**	(2.23-4.18)	**2.50**	(1.09-5.71)
Hungary	2086	14.2	6.8	**5.19**	(4.15-6.49)	**5.63**	(4.43-7.17)	**2.81**	(1.56-5.09)
Czech Republic	1438	8.4	3.6	**7.72**	(5.83-10.22)	**7.32**	(5.45-9.82)	**12.29**	(4.84-31.21)
Poland	2879	8.6	3.5	**6.64**	(5.53-7.98)	**6.61**	(5.44-8.03)	**6.67**	(3.82-11.62)
Lithuania	357	13.4	6.9	**2.75**	(1.79-4.22)	**2.99**	(1.87-4.79)	**1.72**	(0.60-4.89)
Estonia	303	17.2	7.9	**3.36**	(2.13-5.29)	**3.94**	(2.41-6.44)	**1.23**	(0.38-3.98)
All countries	13638	7.3	3.9	**4.50**	(4.17-4.86)	**4.63**	(4.27-5.03)	**3.62**	(2.96-4.43)

* RII is a regression-based measure of relative differences in mortality rates between the lowest and the highest ends of the socioeconomic scale. RIIs were adjusted for age and sex,

**Lower education group is a combination of primary or no education and lower secondary education; Higher education group is a combination of upper secondary education and tertiary education

Table 6.7 Contribution of causes of death to the difference between low and high educational groups in temporary life expectancy (TLE) between ages 35-69

	TLE, lower education	TLE, higher education	Δ TLE, days	Total avoidable mortality	Diseases of infectious origin	Malignant diseases	Cardio-respiratory conditions	Acute conditions
				Δ TLE days (%*)	Δ TLE days (%**)	Δ TLE days (%**)	Δ TLE days (%**)	Δ TLE days (%**)
Finland	31.95	33.00	382	59 (15)	21 (35)	3 (5)	28 (47)	8 (13)
Sweden	32.90	33.57	244	32 (13)	10 (31)	2 (7)	16 (51)	4 (11)
Norway	32.42	33.31	322	45 (14)	8 (17)	8 (17)	27 (60)	3 (6)
Denmark	32.52	33.36	304	39 (13)	16 (42)	4 (12)	14 (36)	4 (11)
Belgium	32.96	33.50	197	22 (11)	4 (18)	4 (17)	13 (59)	2 (7)
Switzerland	32.72	33.23	187	41 (22)	22 (54)	4 (11)	13 (32)	2 (4)
Turin	32.87	33.37	182	23 (13)	5 (22)	2 (9)	14 (60)	2 (10)
Barcelona	32.71	33.19	176	27 (15)	12 (45)	1 (5)	13 (46)	2 (6)
Madrid region	32.80	33.12	116	25 (22)	12 (46)	8 (32)	6 (22)	0 (1)
Basque region	33.59	33.76	62	33 (53)	32 (99)	3 (9)	-3 (-8)	0 (0)
Slovenia	31.78	32.61	305	72 (23)	16 (22)	5 (7)	46 (64)	6 (8)
Hungary	29.86	32.46	947	167 (18)	21 (13)	10 (6)	125 (75)	13 (8)
Czech Republic	31.58	33.30	629	96 (15)	20 (21)	10 (10)	59 (62)	8 (9)
Poland	30.78	33.02	816	125 (15)	27 (22)	12 (10)	79 (63)	8 (7)
Lithuania	26.56	31.63	1849	357 (19)	219 (61)	36 (10)	96 (27)	15 (4)
Estonia	27.28	31.16	1418	335 (24)	165 (49)	7 (2)	152 (45)	21 (6)

Δ TLE – Difference in TLE between the higher and lower educated groups
* % from the total mortality
** % from total avoidable mortality

Although all data came from populations with reliable cause-of-death registries, potential influences of national diagnosing practices should also be considered. The results of our study would be biased only to the extent that coding practices are associated with educational level within populations. The diagnosing and coding practice may have depended on the medical care received before death. Although there are no specific indications for variations in coding according to the educational level of the deceased, we can not completely rule out such bias for some specific smaller causes of death. However, such bias is unlikely to explain the results for broader groups as analysed here.

Despite some limitations, our results are in line with findings from Finland and Sweden that also show that mortality from avoidable causes of death is higher for people with lower socioeconomic position[24, 28]. The generalised existence of socioeconomic inequalities in all European countries indicates that the causes for these inequalities may go beyond specific characteristics of the individual health care systems.

One of the potential explanations of inequalities in mortality is inequalities in incidence of the diseases[34-36]. Social and geographical variations in incidence could partly contribute to the explanation of variations in mortality. Even though inequalities in incidence may be fundamental, this do not always justify the occurrence of inequalities in mortality. Death from many conditions could be prevented (e.g. infectious diseases) or considerably delayed even after the condition has developed, provided that appropriate and timely treatment is applied. In addition, occurrence of some diseases can be prevented by medical intervention, e.g. cervical cancer, influenza and cerebro-vascular disease. In these cases, variations in incidence of some conditions may be considered as a possible indication of variations in the quality of preventive care[35].

Extremely large inequalities in TB mortality observed in our study are most likely to be the reflection of higher incidence and prevalence of TB among people with lower socioeconomic position. These inequalities could also be related to delays in initiating anti-TB treatment as observed in health services in several countries[37-39]. Diagnostic delays might be reduced through a well-organized rigorous screening system of people from high-risk groups (such as migrants, homeless, drug users and prisoners), an adequate access to care for those who are sick, and a high index of alertness among health care professionals.

Cardio-respiratory conditions, of which cerebro-vascular mortality is the leading cause of death, were the largest contributors to the inequalities in avoidable mortality in many countries. Although the contribution of behavioural factors such as alcohol consumption, diet, and physical activity to stroke incidence can not be neglected, a well organized hypertension detection and control system is a key measure to prevent deaths from stroke in the population[40, 41]. Additional opportunities within the health care system lie in providing better access to, and quality of, services for people with alcohol-related problems and obesity and improving access to emergency care once the condition has developed. The smaller inequalities in cerebro-vascular mortality observed in Southern populations are probably related to a smaller inequalities with regards to diet, smoking, and alcohol consumption[42], and are less likely to be connected to particular achievements of the health care system in these countries.

Large inequalities observed in mortality from acute conditions in all European countries suggest problems with the accessibility, utilization or quality of surgical care for people with lower education. For example, in USA both children and adults with public insurance or uninsured had a significantly greater chance of having an appendiceal rupture than patients with private insurance [43, 44]. It remains unclear what kind of barriers people with lower education in European countries with more universal health coverage might experience. Confidential case reviews might serve as a way to identify and correct possible deficiencies in surgical care.

The geographical scope of our study is substantially broader than that of other studies because we incorporated a large number of countries from all parts of Europe, including the eastern part, for which data on socioeconomic inequalities in mortality have been hardly documented. We observed that socioeconomic inequalities in avoidable mortality in CEE (except Slovenia) and Baltic countries are larger than in the other European countries. These countries inherited the Soviet health care model in the early 90s and had to deal with limited financing, a lack of efficiency and poor quality of health services during the 1990's. These may partly explain the substantially smaller improvements in the mortality from avoidable causes in the East as compared to the rest of Europe [31, 45]. We observed larger inequalities in CEE and Baltic countries compared to the rest of Europe. In addition, we observed that inequalities in life expectancy (Table 6.7) between higher educated people in CEE /Baltic countries and North/West/South European countries is smaller than that for lower educated people. All these facts may indicate that the benefit achieved during the last decade in CEE and Baltic countries primarily was limited to people with higher education, while the health status of those in lower education at best stagnated[3]. Evidence also suggest that access and quality of heath care services in these countries may play an important role in cause the observed inequalities[46]. If true, a special priority should be given to improving access and quality of health services for those of lower education in CEE and Baltic countries.

In conclusion, inequalities in avoidable mortality are universally present in all countries of Europe. Reduction of inequalities in cardio-respiratory and infectious diseases will largely contribute to the reduction of the total avoidable mortality in Europe, especially in CEE and Baltic countries. The large inequalities in avoidable mortality may in part reflect inequalities with regards to health care services. Although socioeconomic inequalities in health are a function of more complex factors that go beyond the sphere of influence of health care policies and services, the latter may nevertheless contribute to reducing socioeconomic inequalities in mortality.

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Chapter 7

Avoidable mortality among migrants in the Netherlands: what is the role of the Dutch health care system?

Based on: Stirbu I, Kunst AE, Bos V., et al
Differences in avoidable mortality between migrants and the native Dutch in The Netherlands. BMC Public Health. 2006;6 p.78

Abstract

Background
The quality of the healthcare system and its role in influencing mortality of migrant groups can be explored by examining ethnic variations in 'avoidable' mortality. This study investigates the association between the level of mortality from 'avoidable' causes and ethnic origin in the Netherlands and identifies social factors that contribute to this association.

Methods
Data were obtained from cause of death and population registries in the period 1995-2000. We compared mortality rates for selected 'avoidable' conditions for Turkish, Moroccan, Surinamese and Antillean/Aruban groups to native Dutch.

Results
We found slightly elevated risk in total 'avoidable' mortality for migrant populations (RR=1.13). Higher risks of death among migrants were observed from almost all infectious diseases (most RR > 3.00) and several chronic conditions including asthma, diabetes and cerebro-vascular disorders (most RR > 1.70). Migrant women experienced a higher risk of death from maternity-related conditions (RR=3.37). Surinamese and Antillean/Aruban population had a higher mortality risk (RR=1.65 and 1.31 respectively), while Turkish and Moroccans experienced a lower risk of death (RR=0.93 and 0.77 respectively) from all 'avoidable' conditions compared to native Dutch. Control for demographic and socioeconomic factors explained a substantial part of ethnic differences in 'avoidable' mortality.

Conclusions
Compared to the native Dutch population, total 'avoidable' mortality was slightly elevated for all migrants combined. Mortality risks varied greatly by cause of death and ethnic origin. The substantial differences in mortality for a few 'avoidable' conditions suggest opportunities for quality improvement within specific areas of the healthcare system targeted to disadvantaged groups.

Background

One of the factors described in the literature that influences mortality rates in developed countries is ethnic origin. For some migrants a higher mortality is observed, while others benefit from lower mortality rates compared to native population [1]. Factors like socio-economic status, the healthy migrant effect, and lifestyle risk factors were shown to partly explain the differences in levels of mortality among migrant groups and the native population [2, 3]. However, they do not explain the full variation in mortality outcomes.

Some researchers suggested that the healthcare system might influence mortality outcomes for migrant populations. Unequal access opportunities and sub-optimal quality of services were suggested in some studies to have contributed to ethnic disparities in mortality [4-6]. Learning more about these factors will enable health authorities to adjust the healthcare system in ways that would reduce ethnic inequalities in health.

The quality of the healthcare system and its contribution to ethnic differences in mortality could be explored by investigating 'avoidable' mortality levels [7-9]. A premature death is considered avoidable if effective measures exist (by applying appropriate preventive measures and treatment procedures on time) to avert the death of the patient [8]. Previous researches showed that mortality from 'avoidable' causes has significantly declined in the past decades in many countries [10-12] most likely due to the increased effectiveness of the healthcare services. However, a persistent ethnic gap has been shown for some countries [13, 14]. An overview covering a broad range of conditions would allow pinpointing important potential problems in the delivery of health services to migrant populations.

About 10% of the population in the Netherlands is of non-Western origin with the largest representation of Turkish, Moroccan, Surinamese and Antillean/Aruban immigrant groups[15]. Recent studies have shown that Moroccans generally benefit from lower all cause mortality, while Turkish, Antilleans, and Surinamese have higher mortality rates compared to native Dutch[16, 17]. Differences in avoidable mortality between migrant populations have not been documented. Thus, this study is the first to investigate the association between avoidable mortality and ethnic origin of the population in the Netherlands. We also analyze the role of socio-economic and demographic factors in this association and the influence of the duration of residence in the Netherlands on the risk of death from 'avoidable' conditions. Based on the results we will reflect on the extent to which ethnic inequalities in mortality in the Netherlands may be related to the specific problems in the Dutch healthcare system.

Methods

Data

The population studied comprised all inhabitants who legally resided in the Netherlands in the period 1995-2000. Data on death and population for the period 1995-2000 were obtained from the cause of death register and the Municipal Population Register that includes all inhabitants of the Netherlands with a legal status. The available data included information on sex, age, ethnicity, marital status, socio-economic status (estimated using mean household equivalent income of the neighbourhoods [18]), region of residence, and urbanization degree.

Country of birth of the person and both parents was used to measure ethnicity, according to the definition used by Statistics Netherlands. If at least one parent was born abroad, the person was considered to be of non-Dutch origin. In mixed ethnic families, the country of birth of the mother prevailed [19]. We compared deaths rates of the four largest migrant groups residing in the Netherlands (1^{st} and 2^{nd} generation Turkish, Moroccan, Surinamese and Antillean/Aruban) to native Dutch.

Selection of 'avoidable' conditions

Our selection of conditions considered avoidable was based on the original list of Rutstein et al further enlarged by Tobias and Jackson [13]. We concentrated on the role of the curative medical services, i.e. secondary and tertiary levels of care. Therefore, we included all conditions for which current evidence show that the death could be avoided by applying modern treatment, but we excluded conditions for which the outcome largely depends on primary prevention and for which curative medical care is able to play only a limited role to avoid death. The contribution of primary, secondary and tertiary levels of care for each disease was previously estimated by Tobias and Jackson [13]. Based on this information, we decided to exclude all types of injuries, smoking-related and alcohol-related conditions, and skin cancer. We included HIV/AIDS and suicides considering current evidence of effective treatment that avoids death and substantially prolongs life [20, 21].

All causes of death were coded according to International Classification of the Diseases (ICD), ninth revision for the year 1995 and 10^{th} revision for the period 1996-2000. Although there is some variability in the codes between ICD revisions, the changes were not judged large enough to affect comparability over time.

All conditions were grouped into 5 subcategories depending on the type of medical service required: conditions with infectious origin, suicides, malignant neoplasms, other acute and chronic diseases, and conditions related to maternity and neonatal period (Table 7.2). Following Tobias and Jackson [13], the age limit 0-74 was chosen for the analysis for all causes of death.

Analysis
Mortality levels in each population group were estimated using age-standardized mortality rates. The direct method was used with the four studied migrant groups combined as a standard population. We used pooled numbers from all migrant populations as a reference for age standardization because it better reflects the age structure of the migrant population in the Netherlands. The Dutch population is older with a considerable share of age groups above 70 years, where migrants are virtually absent. We analyzed total avoidable mortality by summing all selected causes of death.

The size of the difference in avoidable mortality rates between migrants and the Dutch population was calculated using Poisson regression (in STATA software, version 7). The resulting relative risks estimates were adjusted for age and for sex when both sexes were investigated together. Additional adjustment for marital status, urbanization level, and neighbourhood area income was performed separately. These indicators were included because they were available in our dataset and because in previous analyses they were related to cause-specific mortality rates.

To estimate the role of the duration of residence, an additional regression analysis was performed determining the risk of mortality for recent immigrants as compared to those that arrived to the Netherlands more than 15 years ago.

Results

Turkish, Moroccans and Surinamese groups were about equally large in terms of person years at risk, while Antilleans/Arubans were about 3 times as small (Table 7.1). All migrant groups were more likely to live in more urbanized and low-income areas. Turkish and Moroccans were more often married than native Dutch.

We found total avoidable mortality for all studied migrant groups combined to be slightly elevated compared to the native Dutch population (RR=1.15 for men and 1.10 for women, Table 7.2). The overall risk of mortality from infectious diseases was about two times higher for ethnic minorities compared to Dutch population. The relative risk for most infectious diseases was significantly elevated compared to the native Dutch. The excess risk for tuberculosis (RR=5.10 for men and 12.98 for women) and hepatitis (RR about 8.00) was the highest, although, in absolute terms liver cancer and HIV were the two largest causes of deaths.

Compared to the native Dutch population, ethnic minorities experienced a lower risk of death from the majority of malignant conditions. Exceptions are cervical cancer and Hodgkin's disease among women, for which relative risks were insignificantly elevated. The relative risk of death for all 'avoidable' malignant conditions combined was significantly lower (RR around 0.60 for both men and women) in comparison with native Dutch.

Table 7.1 Background characteristics by ethnicity and gender

	Dutch	Turkish	Moroc cans	Surina mese	Antillean / Aruban
Person Years (*1000)					
Men	36831	904	780	810	264
Women	36315	810	666	866	266
Total number of deaths					
Men	178131	1967	1293	2388	520
Women	108602	837	585	3013	355
Total number of avoidable deaths					
Men	62605	560	381	984	183
Women	45687	272	211	698	145
Marital status: % single aged 25-44					
Men	41.9	12.4	26.6	48.8	67.7
Women	29.8	6.5	8.9	39.3	56.9
Duration of stay in the Netherlands: % arrived before 1980					
Men	-	63.3	59.1	69.9	45.6
Women	-	60.2	55.1	67.8	43.5
Urbanization level: % of living in highly urbanized area					
Men	32.8	74.8	77.3	80	66.8
Women	34	74.1	77	80.3	69
SES: % living in low income area					
Men	16.3	58.7	56.1	50.8	43.8
Women	16.3	58.2	55.6	49.4	43.0

For acute and chronic conditions combined, the mortality excess of migrant groups ranged between 22% for men and 67% for women. The risks of death from acute conditions (appendicitis, hernia, and ulcer) did not differ substantially from the Dutch population with exception of cholecysitis/cholelithiasis where the risk was three times higher among migrant men. Among chronic conditions, ethnic minorities experienced a significantly elevated risk of death from diabetes (RR above 3.00), and hypertensive and cerebro-vascular disorders (RR above 1.60). The excess risk of death from both asthma and epilepsy was significantly elevated among men, but did not reach significance level among women. Ischemic heart disease, on the other hand, was significantly higher among women (RR=1.21 CI:1.06-1.37), but significantly lower among men (RR=0.89 CI:0.82-0.96).

The overall risk of death from conditions related to maternity and neonatal period was 21% higher for migrant women compared to the native Dutch. Women of ethnic origin experienced an especially high mortality risk from maternity related conditions (RR=3.37 CI:2.02-5.62). As compared to native Dutch children, children from migrant groups had higher mortality from neural tube defects (RR=1.55 for girls with insignificantly higher levels for boys), but lower mortality from birth trauma and asphyxia (RR=0.41 for girls with insignificantly lower levels for boys).

Table 7.2 Absolute numbers (AN) and relative risks of death from avoidable causes for migrant versus native Dutch population by gender

List of conditions (International Classification of Diseases, 10th revision)	**AN of death** [a]		**Relative risk** [b] **(95% Confidence interval)**	
	Men	Women	Men	Women
Total mortality	6168	3316	1.18 (1.15-1.21)	1.12 (1.08-1.16)
Total avoidable mortality	2088	1318	1.15 (1.09-1.20)	1.10 (1.04-1.17)
Diseases of infectious origin	*243*	*103*	*2.06 (1.81-2.35)*	*1.86 (1.53-2.27)*
Pneumonia & flu (J10-18)	77	42	1.25 (0.99-1.57)	1.13 (0.83-1.54)
HIV/AIDS (B20-24)	80	8	3.03 (2.39-3.85)	2.20 (1.05-4.64)
Liver cancer (C22)	46	26	2.33 (1.72-3.14)	2.49 (1.67-3.71)
Hepatitis A, B, C, D, E (B15-19)	23	8	8.54 (5.28-13.8)	7.82 (3.50-17.49)
Tuberculosis (A15-19, B90)	13	12	5.10 (2.80-9.28)	12.98 (6.85-24.61)
Chronic rheumatic heart dis. (I 00-09)	4	7	3.28 (1.17-9.19)	5.71 (2.59-12.60)
Suicides (X60-X84, Y87)	280	105	1.04 (0.92-1.17)	0.89 (0.73-1.09)
Malignant diseases	*151*	*286*	*0.63 (0.54-0.74)*	*0.56 (0.50-0.63)*
Breast cancer (C50)	0	172	- [c]	0.52 (0.45-0.6)
Colorectal cancer (C18-21)	89	42	0.57 (0.46-0.70)	0.40 (0.29-0.54)
Leukemia (C91-95)	54	31	0.82 (0.63-1.08)	0.75 (0.52-1.07)
Cancer cervix uteri (C53)	NA	35	NA	1.29 (0.92-1.81)
Hodgkin Disease (C81)	4	6	0.52 (0.19-1.41)	1.26 (0.55-2.89)
Cancer of testis & prostate hyperplasia (C62, N40)	4	NA	0.39 (0.15-1.06)	NA
Acute & chronic conditions	*1258*	*665*	*1.22 (1.15-1.29)*	*1.67 (1.55-1.81)*
Appendicitis & hernia (K35-38, K40-46, K56)	10	10	0.85 (0.45-1.60)	1.39 (0.73-2.64)
Cholecystitis & lithiasis (K80-83, K91.5)	15	3	3.04 (1.79-5.17)	0.80 (0.26-2.53)
Peptic ulcer (K25-28)	9	5	1.05 (0.54-2.03)	1.02 (0.42-2.48)
Ischemic heart disease (I20-22, I24-25)	646	253	0.89 (0.82-0.96)	1.21 (1.06-1.37)
Hypertension & cerebrovascular accident (I10-15, I61- 66, I67.4)	281	187	1.64 (1.45-1.85)	1.71 (1.48-1.98)
Diabetes (E10-14)	254	184	3.10 (2.73-3.53)	3.99 (3.43-4.65)
Epilepsy (G40-41)	32	15	1.51 (1.05-2.18)	1.15 (0.68-1.96)
Asthma (J45-46)	11	8	2.72 (1.43-5.19)	1.76 (0.85-3.64)
Conditions related to maternity and neonatal period	*156*	*159*	*0.94 (0.84-1.15)*	*1.21 (1.04-1.46)*
All Maternal deaths (O 00-99)	NA	19	NA	3.37 (2.02-5.62)
Congenital anomalies (P10-15, P20-21, P50-51, P95)	75	59	0.98 (0.77-1.25)	1.23 (0.93-1.61)
Other neonatal deaths (P08, P22, P25-26, P28, P52-P94, P96)	34	29	0.38 (0.25-0.60)	0.97 (0.66-1.43)
Neural tube defects (Q00-07)	25	35	1.12 (0.74-1.69)	1.55 (1.08-2.22)
Birth trauma and asphyxia (Q10-23.3, Q23.8-28, Q35-84)	22	17	0.90 (0.58-1.40)	0.41 (0.2-0.84)

[a] For all migrant population combined
[b] All migrant groups combined compared to the native Dutch population, adjustment for age
[c] No cases

Socio-demographic factors (marital status, urbanization, and area income) contributed largely to the explanation of the excess mortality risks among migrant populations (Table 7.3). Adjustment for these factors explained about 50% of the total excess risk and for some causes of death fully explained the difference. This effect was primarily caused by control for area income instead of control for urbanization and marital status (results not shown). After these adjustments, relative mortality risks remained significantly elevated for some causes of death, including conditions of infectious origin (RR=1.50), hypertension and cerebro-vascular diseases (RR=1.46), and diabetes (RR=2.65).

Table 7.3 Relative risks of death from groups of conditions for all migrant groups combined compared to native Dutch population. Men and women combined

	Relative risk [a] (95% Confidence interval)	
	Adjusted for age and sex	Adjusted for all factors [b]
Total mortality	1.16 (1.13-1.18)	0.98 (0.96-1.00)
Total avoidable mortality	1.13 (1.09-1.17)	0.97 (0.94-1.01)
Diseases of infectious origin	2.00 (1.79-2.23)	1.50 (1.32-1.70)
Suicides	0.99 (0.90-1.10)	0.83 (0.74-0.93)
Malignant diseases	0.58 (0.53-0.64)	0.55 (0.50-0.61)
Acute and Chronic conditions	1.36 (1.29-1.42)	1.17 (1.11-1.23)
Ischemic heart disease	0.97 (0.90-1.03)	0.81 (0.76-0.87)
Asthma	2.20 (1.36-3.56)	1.66 (0.99-2.76)
Hypertension& cerebro-vascular accident	1.67 (1.53-1.84)	1.46 (1.32-1.60)
Diabetes (age 0-74)	3.45 (3.13-3.81)	2.65 (2.38-2.94)
Diabetes (age 0-49)	3.13 (2.48-3.96)	2.54 (2.22-2.87)
Conditions related to maternity & neonatal period	1.10 (0.99-1.24)	1.04 (0.92-1.20)

[a] Migrant groups compared to the native Dutch population, adjustment for age
[b] Adjustment for age, gender, marital status, urbanization level, and area income

Not all migrant groups carried an equal burden of 'avoidable' mortality risk. As shown in Figure 7.1 and Table 7.4, the Antillean/Aruban and Surinamese migrants were in a far more disadvantaged position with 23 to 50% increased risk of total avoidable mortality, while the Moroccan and Turkish population had 7 to 23% lower risk compared to the Dutch population. Adjustment for socio-economic and geographic factors explained a large portion of the excess risk of Antilleans and Surinamese populations, although some excess risk remained in the Surinamese population (RR=1.19 CI:1.13-1.25). The lower relative risk of death for the Turkish and Moroccan population decreased even more.

All four migrant groups had a substantially elevated risk of death from infectious diseases (RRs above 1.30), but a substantially decreased mortality risk from malignant conditions (most RRs < 0.85, non significant for Antilleans/Arubans). Surinamese and Antillean/Aruban people had a significantly higher risk of death from the group of acute and chronic conditions (RR about 1.50 for men and about 2.00 for women), while Moroccan men had a significantly lower risk of death in the same group of conditions (RR=0.68 CI:0.59-0.78). A significant excess mortality from asthma and cerebro-vascular disorders was found only among the Surinamese and Antillean/Aruban populations (RRs above 1.60). The risk of death from ischemic heart disease was increased among Surinamese migrants (RR=1.18 for men and 1.52 for women), but decreased among Moroccan men (RR=0.45) and insignificantly among women (RR=0.78). A considerable excess risk of death from diabetes was found among all four migrant groups (most RRs above 2.00). Mortality risk from maternal and child conditions, on the other hand, was higher only in Turkish and Moroccan populations.

Figure 7.1 Age standardized mortality rates by condition group and ethnicity. Men and women combined

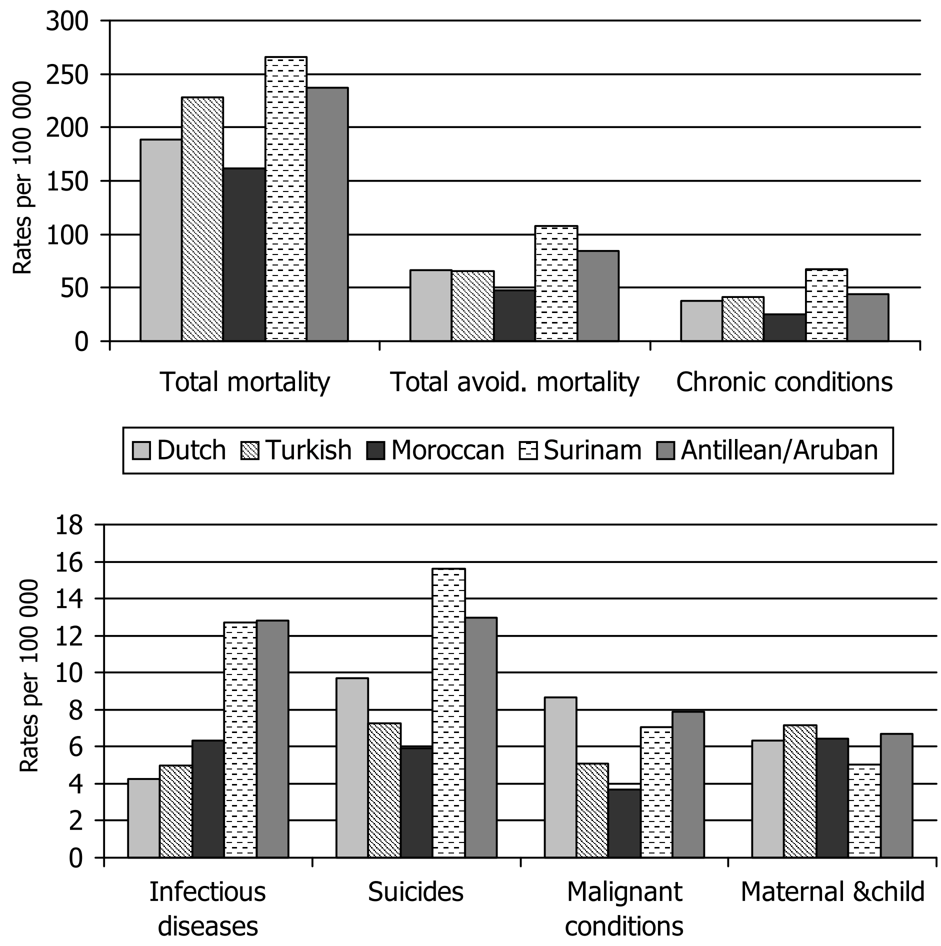

Table 7.4 Relative risk of death from groups of conditions for different migrant groups compared to native Dutch population

	Relative Risk [a] (95% Confidence interval)			
	Turkish	Moroccans	Surinamese	Antillean/Aruban
Men & women				
Total mortality	1.15 (1.11-1.20)	0.90 (0.86-0.94)	1.33 (1.29-1.37)	1.27 (1.18-1.35)
Total avoidable mortality	0.93 (0.86-0.99)	0.77 (0.71-0.84)	1.50 (1.43-1.57)	1.23 (1.13-1.4)
Total avoidable mortality adjusted for all factors [b]	0.86 (0.81-0.93)	0.72 (0.66-0.78)	1.19 (1.13-1.25)	1.00 (0.90-1.11)
Men				
Total mortality	1.22 (1.16-1.27)	0.86 (0.81-0.90)	1.40 (1.34-1.45)	1.35 (1.24-1.47)
Total avoidable mortality	0.99 (0.91-1.07)	0.72 (0.65-0.80)	1.64 (1.54-1.75)	1.36 (1.18-1.57)
Conditions of infectious origin	1.28 (0.95-1.71)	1.48 (1.12-1.98)	2.89 (2.40-3.47)	3.56 (2.51-5.05)
Suicides	0.77 (0.60-0.98)	0.61 (0.46-0.83)	1.58 (1.33-1.88)	1.38 (0.99-1.93)
Malignant diseases	0.58 (0.40-0.78)	0.42 (0.29-0.60)	0.81 (0.64-1.04)	0.88 (0.53-1.46)
Acute and chronic conditions	1.08 (0.97-1.20)	0.68 (0.59-0.78)	1.79 (1.65-1.93)	1.25 (1.02-1.55)
Ischemic heart dis.	1.00 (0.87-1.14)	0.45 (0.37-0.55)	1.18 (1.05-1.32)	0.80 (0.59-1.10)
Asthma	0.77 (0.11-5.57)	1.77 (0.43-7.25)	3.20 (1.16-8.79)	11.23 (4.05-31.14)
Hypertension and CVA [d]	1.25 (0.97-1.60)	0.80 (0.58-1.10)	2.61 (2.23-3.05)	1.68 (1.07-2.64)
Diabetes	1.72 (1.27-2.32)	1.96 (1.47-2.62)	5.29 (4.48-6.25)	3.25 (2.04-5.17)
Conditions related to neonatal period	1.14 (0.90-1.44)	1.01 (0.78-1.31)	0.78 (0.54-1.11)	1.01 (0.60-1.72)
Women				
Total mortality	1.04 (0.97-1.11)	1.00 (0.92-1.08)	1.23 (1.17-1.29)	1.16 (1.05-1.29)
Total avoidable mortality	0.83 (0.73-0.93)	0.89 (0.78-1.02)	1.34 (1.24-1.44)	1.15 (0.98-1.36)
Conditions of infectious origin	1.45 (0.95-2.22)	1.97 (1.27-3.04)	1.97 (1.49-2.61)	2.12 (1.23-3.67)
Suicides	0.59 (0.38-0.92)	0.56 (0.33-0.95)	1.29 (1.00-1.67)	0.98 (0.55-1.73)
Malignant diseases	0.46 (0.36-0.59)	0.44 (0.33-0.60)	0.61 (0.51-0.72)	0.84 (0.62-1.12)
Acute and chronic conditions	1.09 (0.90-1.32)	1.09 (0.86-1.39)	2.18 (1.98-2.40)	1.46 (1.14-1.88)
Ischemic heart dis.	0.89 (0.66-1.19)	0.78 (0.52-1.15)	1.52 (1.30-1.77)	1.10 (0.74-1.63)
Asthma	0.77 (0.11-5.56)	0.99 (0.14-7.13)	3.35 (1.46-7.65)	- [c]
Hypertension and CVA	0.99 (0.67-1.46)	1.08 (0.68-1.72)	2.26 (1.90-2.71)	1.60 (1.02-2.52)
Diabetes	2.17 (1.46-3.22)	2.29 (1.42-3.70)	5.54 (4.62-6.64)	3.63 (2.28-5.78)
Conditions related to maternity and neonatal period	1.31 (1.01-1.70)	1.52 (1.19-1.96)	0.89 (0.61-1.30)	1.32 (0.78-2.23)

[a] Migrant groups compared to the native Dutch population, adjustment for age, adjustment for age
[b] Adjustment for age, gender, marital status, urbanization level, and area income
[c] No cases
[d] CVA = Cerebro-vascular accidents

We observed a difference in risks for recent immigrants compared to those that arrived more than 15 years ago (Table 7.5). Recent immigrants had higher risk of death from infectious diseases and hypertension and cerebro-vascular disorders (men only) while 'older' immigrants more often died from suicides. Altogether, recent male immigrants experienced a somewhat higher risk of death from all avoidable conditions combined, while recent female immigrants had a lower risk.

Table 7.5 Relative risk of death from groups of conditions for recent [a] migrants compared to migrants residing in the Netherlands 15 years or longer

	Relative Risk [b] (95% confidence interval)		
	Men	Women	Men & women
Total mortality	1.08 (1.02-1.15)	0.94 (0.87-1.01)	1.02 (0.98-1.07)
Total avoidable mortality	1.13 (1.02-1.25)	0.88 (0.78-0.98)	1.01 (0.94-1.09)
Conditions of infectious origin	1.64 (1.24-2.18)	1.42 (0.96-2.11)	1.62 (1.29-2.03)
Suicides	0.72 (0.57-0.93)	0.59 (0.39-0.87)	0.68 (0.55-0.84)
Malignant diseases	1.09 (0.74-1.60)	0.90 (0.71-1.15)	0.92 (0.75-1.13)
Acute and chronic conditions	1.19 (1.04-1.36)	0.84 (0.72-0.98)	1.04 (0.94-1.15)
Ischemic heart disease	1.09 (0.91-1.32)	0.90 (0.70-1.16)	1.04 (0.89-1.21)
Asthma	0.50 (0.12-2.05)	0.37 (0.07-1.92)	0.46 (0.16-1.34)
Hypertension& cerebro-vascular accidents	1.49 (1.14-1.93)	0.67 (0.49-0.91)	1.04 (0.85-1.28)
Diabetes	1.29 (0.96-1.72)	1.05 (0.78-1.41)	1.17 (0.95-1.44)
Conditions related to maternity & neonatal period	1.36 (0.56-3.30)	1.0 (0.52-1.93)	1.12 (0.65-1.91)

[a] Arrived less than 15 years ago to the Netherlands
[b] Recent migrants compared to migrants residing in the Netherlands 15 years or longer. Adjustment for age and gender (column men & women)

Discussion

We found total avoidable mortality to be slightly elevated for all migrant groups combined compared to the native Dutch population. Cause specific examination showed a higher risk of death among migrants from infectious and several chronic conditions and lower risk of death from malignant conditions. Ethnicity specific investigation showed that the Surinamese and Antillean groups had higher risks of death and Turkish and Moroccan groups had generally lower risks of death from ‘avoidable’ conditions compared to the native Dutch population. Control for demographic and socioeconomic factors explained a substantial part of ethnic differences in ‘avoidable’ mortality. Recent immigrants had higher risks of death from infectious diseases, but lower risk from suicides compared to those who resided longer than 15 years in the Netherlands.

Some potential limitations of the data should be considered. First, the power of the study was too limited to allow examination of all causes of death for each ethnic group separately. Second, there is a possibility of an insufficient adjustment for socioeconomic status (SES) since an ecological measure of SES based on income matched on postcode was used. It is likely that further adjustment for SES would provide additional explanation of the higher mortality for some causes in ethnic groups [22]. Third, the definition of ethnicity is based on available information on country of birth of the subject and both parents. Even though this definition is largely applied in the Netherlands, it does not take into account factors such as ethnic identity, culture, language or ancestry. As a result, it was impossible with our data to describe mortality differences within the four broad migrants groups distinguished in our study. Finally, two selection effects, 'the healthy migrant effect' and 'the unhealthy remigration effect', may have influenced the observed results. Recent studies, however, showed that they fail to explain differences in mortality between ethnic groups in Europe [17, 23].

Our selection of causes of death was based on the recent work of Tobias and Jackson, and it aimed to focus on conditions that are primarily avoidable through secondary and tertiary prevention. Despite our effort to prepare a selection in a consistent way, some choices had to be made. One example is our decision to include suicide, which is based on recent evidence on the effectiveness of mental health care services to prevent a considerable part of suicides[21, 24, 25]. We also included ischemic heart disease (IHD) and stroke, although the contribution of non-medical factors (smoking, nutrition) to the prevention of death from IHD and stroke is large. This decision was based on the advancement in medicine that may have made the healthcare system an important determinant in shaping the patterns of IHD and stroke mortality. In absolute terms, the role of the healthcare system in preventing death from IHD and stroke is higher than for many other conditions combined. Important for the present paper is to note that any modification that may be made to our selection of causes of death, would probably not change the general conclusion that the relative level of mortality greatly varies according to 'avoidable' death, with overall levels being close to the Dutch average.

For diabetes mellitus and leukaemia, our standard age interval of 0 to 74 years may be too high, as death at ages of 50 years and over becomes less 'avoidable'. The increased age-limit for diabetes and leukaemia, thus, to some extent, overestimates the number of 'avoidable' deaths from diabetes and leukaemia. However, it might equally overestimate the mortality risk for both the native Dutch and migrant populations. Our paper focuses on the difference in risk of death from Diabetes between native Dutch and migrant populations. We re-calculated this difference in relative risks of death from diabetes and leukaemia for reduced age-limits. We found that this does not substantially change our results and still supports the conclusion that migrant populations have a significantly higher risk of death from diabetes. More specifically, the RR for diabetes in the age-group 0-49 was equal to 3.13, while in the age-group 0-74 this RR=3.45 (Table 7.3). Similar results were found for leukaemia (RR for age-group 0-44=0.90 CI: 0.68-1.21 vs. RR for age-group 0-74=0.81 CI: 0.60-1.15).

Additional care should be taken when interpreting the role of the healthcare system. Mortality levels are influenced by a series of factors and activities of which health care is only a part. One of the largest effects on ethnic variation in mortality may be produced by variation in incidence of the selected diseases [26]. Unfortunately, we did not have the incidence data that would be needed to perform additional adjustment for ethnic differences in incidence of infectious diseases. Furthermore, some of avoidable death could be the late consequence of inadequate care in the earlier stages of the disease before arrival to the Netherlands. Despite the problems with the validity and interpretation of the results, our overview could help identify some potential shortcomings in the healthcare system and justify further investigations in particular areas.

The decreased risk of death from ischemic heart disease among Moroccans (RR=below 0.78) might be a reflection of the healthier lifestyle that Moroccan migrants lead as compared to the native Dutch population [17]. Levels of tobacco consumption were much lower in first generation Moroccans, which is also testified by relatively low levels of lung cancer mortality. Similarly, lower levels of alcohol use and possibly a healthier traditional diet may have protected this migrant group from "western" common cardio-vascular diseases. Similar findings were reported earlier among immigrants in the Netherlands and Germany [27, 28]. Given current changes in diet and smoking [29], a higher mortality may however be expected in the future and especially among second generation migrants.

Control for demographic and socioeconomic factors explained a substantial part of ethnic differences in avoidable mortality, sometimes completely abolishing the excess risk. A more comprehensive socioeconomic measure could have explained excess mortality even more substantially [22]. This indicates that socio-economic factors are important in explaining ethnic differences in mortality in the Netherlands. Similar conclusions were reached earlier by other researchers [30, 31]. For a few "avoidable" causes of death, however, the situation is more complex, and adjustment for social factors only somewhat attenuated the considerably higher risks. We will discuss in more detail the possible explanations for these causes of death.

The higher risk of mortality from tuberculosis, hepatitis and chronic rheumatic heart disease among ethnic minorities in the Netherlands is likely to be the result of a higher exposure to infectious agents in the migrants' country of origin and, as a result, a higher incidence of these diseases among the migrants [32, 33]. The high mortality risk can be explained, at least in part, by ethnic differences in the incidence of infectious diseases. Additional factors contributing to the higher risks of death might be substandard housing, overcrowding and poor sanitation that migrants often experience [34], partly ineffective screening programs[35], and limited access to healthcare services in the first years after migration. Although generally access in the Netherlands was found to be quite adequate [16, 36], access in the first years after migration could be hampered due to financial barriers, unclear legal status and limited entitlements to healthcare, and low knowledge on the use of healthcare services. The elevated risk of death from infectious diseases among recent immigrants compared to 'older' immigrants also supports this suggestion.

The observed increased risks of death from diabetes among all four migrant groups is not a surprise and was described earlier in the Dutch literature [37]. Genetic and behavioral factors were suggested to explain the differences, among them higher low birth weight prevalence [38] and nutritional differences with higher intake of fat and carbohydrates [39]. However, some features of the present healthcare system may play an additional role by functioning less adequately for migrant groups and, thus, increasing ethnic differences in health outcomes. These include: (a) lower rate of referrals to the specialists [40] (b) somewhat less frequent use of primary healthcare facilities and poorer secondary prevention, especially among Surinamese [40]; (c) difference in the relative importance of risk factors for prediction of outcomes [41], which is not taken into account in current clinical guidelines [42]; (d) less efficient communication between providers and patients of non-Dutch origin due to cultural differences in attitudes towards health and healthcare , and illiteracy or inadequate command of Dutch language [43].

Elevated maternal mortality among migrant women is another point of concern. It may be related to fertility patterns (migrant women on the average give more often birth to children and, therefore, have a higher risk of maternal mortality per 100,000 person years), but also be related to medical services, such as reported substandard care [44], delayed prenatal care, higher frequency of unassisted births [45], and lower use of maternity home care [36]. Underreporting of maternal [46] and child [47] mortality (the last found to be associated with ethnicity) might have hindered assessment of the full extent of the ethnic gap. Elevated maternal mortality is characteristic particularly to Turkish and Moroccan groups and is not elevated among Surinamese and Antilleans. The last observation could be attributed to on average a better integration into the local Dutch society, higher local language proficiency, and more advanced education level of Surinamese and Antilleans compared to Turkish and Moroccans [48].

Conclusions

Even though we found ethnicity to be associated with higher mortality from 'avoidable' conditions, elevated risks were confined only to specific diseases and/or separate ethnic groups. In many cases, these elevated risks were largely explained by socioeconomic and demographic factors. The role of health care system remains uncertain and is possibly weak in general. The current healthcare system in the Netherlands ensures equal financial access to healthcare services, with relatively small differences between socioeconomic groups in health care utilization [30, 31]. These findings are similar to those from Sweden [49], Canada [50] and UK [6, 51] where no gross ethnic inequalities in access to and utilization of the healthcare system were observed.

Nevertheless, the substantially elevated mortality levels for some 'avoidable' conditions among some migrant groups present a challenge for the healthcare system and suggest that, even though medical services may not be directly responsible, there are opportunities for quality improvement within specific areas. Areas that deserve particular attention are the control of infectious disease, care for patients with diabetes, asthma, hypertension, and maternal and neonatal care. In depth research is needed to determine more precisely the problems that migrant groups face in these areas of health care, and to develop appropriate strategies to address them.

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PART IV

INEQUALITIES IN UTILISATION AND QUALITY OF HEALTH CARE SERVICES

Chapter 8

Inequalities in utilisation of GP and specialist services in 9 European countries

Based on: Stirbu I, Kunst A, Mielck A, et al.
Inequalities in utilisation of GP and specialists' services in 9 European countries. Submitted

Abstract

Objectives

To describe the magnitude of educational inequalities in utilisation of general practitioner (GP) and specialist services in 9 European countries.

Methods

Data on the use of GP and specialist services were derived from national health surveys of 9 European countries (Belgium, Estonia, France, Germany, Hungary, Ireland, Latvia, the Netherlands and Norway). For each country and education level the prevalence of having at least one visit to the GP or specialist was calculated. In addition, relative inequalities by education in utilisation of GP and specialist services were calculated for the general population and for those with chronic diseases. In order to account for the need for care, the results were adjusted by the measure of self-assessed health.

Results

People with a lower education level used GP services equally often in most countries (except Belgium and Germany) compared with those with a higher level of education. At the same time people with a higher education level used specialist care services significantly more often in all countries, except in the Netherlands. In some countries, educational inequalities in utilisation of specialist care among women were slightly larger than among men, although the general pattern of usage was similar for both men and women. Inequalities in utilisation of specialist care were equally large in Eastern European and in Western European countries, except for Latvia where the inequalities were somewhat larger. Similarly, large inequalities were found in the utilisation of specialist care among patients with chronic diseases, diabetes, and hypertension.

Conclusion

In this study, large inequalities in the utilisation of specialist care were found. These inequalities were not compensated by utilisation of GP services. Of particular concern is the presence of inequalities among patients with a high need for specialist care, such as those with chronic diseases, which raises important issues regarding access to care among vulnerable subgroups.

Background

Access to health care for all in need is a basic social right. At first sight, all European countries have universal insurance coverage and, thus, it is often assumed that these countries also enjoy universal and equitable access to health care services. However, a number of studies indicate that that is not the case[1-7]. Although utilisation of general practitioner (GP) services is distributed fairly equally, independent of income, less well-off people appear to be much less likely to see a specialist than their wealthier counterparts, despite their higher need for such care. This phenomenon is universal in Europe, but seems to be stronger in countries where either private insurance or private practice options are offered[1].

Although a number of international studies have documented inequalities in utilisation of health care services in European countries, this information remains incomplete. Previously only income inequalities in utilisation were studied internationally, thus information is lacking regarding educational inequalities in the use of health services. A theoretical argument in favour of also using education is its growing importance in relation to the relative position of the individual in the distribution of other important assets such as paid labour, occupational status and income level. Additionally, previous studies largely focused on West European countries, missing the growing "new" European populations for which the magnitude of socioeconomic inequalities has hardly been studied[8]. Inequalities in Eastern European countries might be larger than in Western European countries due to recent disruptions in social and health care systems in those countries[8-10]. Finally, all studies on inequalities in utilisation were mainly based on the general population, thus not taking into account people with special needs, such as those with chronic diseases. Large inequalities in the utilisation of health care services in this vulnerable group might indicate specific potential shortcomings within the health care system and support hypotheses about the role of access in explaining differential outcomes of care among people with different socioeconomic status.

The aim of the present study is to describe the magnitude of educational inequalities in utilisation of GP and specialist services in 9 European countries. In addition to West European countries, we have included 3 Eastern European countries: Hungary, Estonia and Latvia. Special attention is also paid to the magnitude of inequalities among patients with chronic conditions.

Methods

Data

Data on utilisation of GP and specialist services were derived from micro-level data of national health surveys in 9 European countries (Norway, Ireland, Netherlands, Belgium, Germany, France, Hungary, Estonia, and Latvia). Most surveys were conducted in or after the year 2000, except for the German survey which was conducted in 1998 (Table 8.1).

Sample sizes were above 7000 persons for all surveys, except those from Estonia and Norway. Non-response percentages ranged from about 18% in Ireland up to 42% in the Netherlands and Belgium, while percentages in most other countries were around 30%. Data from 104,503 respondents were included in the analyses.

In all surveys, utilisation of GP and specialist services was self-reported. All participants were asked how many times they visited a GP or a specialist in a specified period of time. In all countries the recall period for utilisation of GP and specialist services was 12 months, except for the Netherlands and Belgium where the recall period was only 2 months.

In order to take the need for care into account we have included the measure of self-assessed health. Self-assessed health was rated according to 5 answer categories from the healthiest to the least healthy. The exact answer categories ranged in most countries from "very good" to "very bad", although there were some variations between countries. Additionally, the utilisation of services was investigated among people with chronic diseases. In all surveys the presence of chronic diseases was self-reported, except for Ireland that had no data on chronic diseases. Because each survey varied depending on the type and number of chronic diseases included, we selected only those chronic disease that were present in at least 6 of the 9 surveys: angina pectoris, arthritis, asthma, bronchitis, cancer, diabetes, hypertension, myocardial infarction, stroke, and ulcers. Information on diabetes and hypertension was included in all surveys, and prevalence rates were high in all countries; this allowed us to use these diseases for a more in-depth analysis.

Table 8.1 Countries included in the analysis and sources of data.

Country	Survey name	Year(s)	Non-response (%)	Final sample
Norway	Norwegian Survey of Living Conditions	2002	29.6	6820
Ireland	Living in Ireland Panel Survey	1995, 2002	18.0 / 22.0*	15051
Netherlands	General social survey (POLS)	2003-2004	41.7 - 38.7	15803
Belgium	Health Interview Survey	1997, 2001	41.5 / 38.6*	18481
Germany	German National Health Examination and Interview Survey	1998	38.6	7124
France	Health, Health Care and Insurance Survey (IRDES)	2004	30.0*	17828
Hungary	National Health Interview Survey Hungary	2000, 2003	21.0 - 28.0	10532
Estonia	Health Behavior among Estonian Adult Population	2002, 2004	33.0 / 38.0*	4376
Latvia	Finbalt Health Monitor	1998; 2000; 2002; 2004	20.0 - 40.0	8488
Europe				104503

* Percentage non-response households

Socioeconomic position was measured using the level of education, which represents the highest level of completed education of the respondent. The level of education was initially classified according to national categories, which were subsequently reclassified into three levels of the International System of Classification of Educations (ISCED): primary or no education and lower secondary education; higher secondary education; tertiary education.

Analysis
First, we assessed educational inequalities in utilisation of GP and specialist services using prevalence rates of having made at least one visit to a GP or specialist. Prevalence rates were calculated for each type of service by education group and participating country. The prevalence rates were standardized by 5-year age groups and gender to the total survey population, as a representative sample for the standard European population.

Second, we estimated relative inequalities in utilisation of GP and specialist services among higher and lower educational groups of the general population using the relative index of inequality (RII). The RII is a regression-based index used to measure socioeconomic inequalities in health in a comparable way in different countries[11, 12]. The RII quantifies the relative position of each educational group within the hierarchy of all educational groups. This rank measure is related to health indicators by means of log-binomial regression. The RII results in a ratio that can be described as the prevalence ratio of preventive services utilisation at the very bottom of the educational hierarchy compared to the very top of the hierarchy.

Third, we estimated relative inequalities by education in utilisation of GP and specialist services among persons with chronic diseases, hypertension and diabetes.

All calculations were done using log-binomial regression analysis in SAS statistical package (version 8.02). We included categorical variables in the regression models, representing 5-year age groups and gender, to control for demographic confounders. To take the need for care into account, we adjusted our results by the ranked measure of self-assessed health, which quantifies the relative position of each group of people in one answer category in the hierarchy of all answer categories. Ranked measure of self-assessed health was calculated on the basis of the cumulative relative frequencies of the valid cases and allows for better comparison between countries.

Results

The study populations in the different European countries did not differ greatly regarding age and gender distribution (Table 8.2), except for the Baltic countries where there were slightly more younger female respondents. In contrast, there was a considerable difference in educational distribution between the countries, with Norway and the Netherlands having fewer people with lower education, and Germany, Hungary and Ireland having fewer people with higher education. In most countries, the percentage of people reporting visiting a GP ranged from 67% to 80%; it was substantially lower in Latvia, the Netherlands and Belgium (range 35% to 46%). In the latter 2 countries the lower rates of GP visits is probably related to the shorter recall period (2 and 3 months, respectively, versus 12 months in all other countries). The highest report for visiting a specialist was in Germany (75%) and the lowest was in Norway (17%).

Table 8.2 Background information on the study populations.

Country	Age above 50 yrs (%)	Gender distribution (% men)	Distribution by education			People reporting visiting a GP (%)	People reporting visiting a specialist (%)
			Lower secondary education and below	Upper secondary education	Tertiary education		
Norway	39.8	50.0	17.5	56.6	25.9	74.8	17.0
Ireland	37.5	49.5	55.9	29.8	14.3	72.8	24.8
Netherlands	42.7	48.5	39.3	37.7	22.9	35.6	18.0
Belgium	42.0	48.5	41.0	30.0	29.0	46.8	22.9
Germany	42.7	48.4	43.0	43.1	13.9	67.9	74.7
France	39.5	49.1	53.7	18.9	27.4	80.5	56.9
Hungary	42.8	44.6	57.6	29.0	13.4	74.1	51.7
Estonia	30.1	42.3	47.9	34.5	17.6	67.3	44.6
Latvia	28.9	43.5	44.3	34.6	21.1	44.5	29.1
Europe	39.4	47.8	46.0	32.3	21.7	59.2	35.7

Only in Belgium and Germany were lower educated people significantly more likely to report a visit to a GP (RII is 1.29 and 1.20, respectively; Table 8.3A). After adjustment for self-assessed health the RII slightly decreased in all countries. Although utilisation of GP care was fairly equally distributed between educational groups, there was a general tendency of lower use by the lower educated (RIIs just below 1 in all countries except Belgium and Germany). In Belgium and Germany significantly higher utilisation of GP services by lower educated groups remained, although weakened. On the other hand, after adjustment for self-assessed health, in Hungary higher educated people used GP services significantly more often compared to the lower educated group (RII=0.87 CI: 0.80-0.95).

The prevalence of specialist services use was more diverse compared with GP services, with higher utilisation in Germany, France, Hungary and Estonia (above 40% for both higher and lower educated groups; Table 8.3B). Higher educated people reported using specialist services significantly more often than lower educated people in almost all countries, except for the Netherlands (RII=1.05) where utilisation was equal for higher and lower educated groups. After adjustment for self-assessed health, people with higher education reported using specialist services significantly more often in all countries, without exceptions. Relative inequalities were smaller in the Netherlands and Germany (RIIs around 0.86) and were very pronounced in Latvia (RII=0.47).

Table 8.3 Prevalence rate (PR) and Relative index of inequality (RII) in utilisation of GP and specialist services.

(A) Utilization of GP services

Country	PR GP visits [a] Men & Women			Men & Women		Men & women, adjusted for SAH [b]		Men, adjusted for SAH		Women, adjusted for SAH	
	Lower secondary education and below	Upper secondary education	Tertiary education	RII	95% Confidence interval	RII	95% Confidence interval	RII	95% Confidence interval	RII	95% Confidence interval
Norway	75.1	75.8	73.3	1.07	(0.96-1.20)	0.98	(0.87-1.10)	1.06	(0.90-1.26)	0.92	(0.78-1.08)
Ireland	74.7	69.7	71.3	1.07	(0.95-1.20)	0.97	(0.87-1.09)	0.87	(0.74-1.04)	1.07	(0.92-1.26)
Netherlands	35.6	35.8	33.6	1.08	(0.98-1.20)	0.93	(0.84-1.04)	0.96	(0.81-1.14)	0.98	(0.84-1.13)
Belgium	52.1	44.3	39.1	1.29	(1.19-1.40)	1.13	(1.03-1.23)	1.10	(0.96-1.25)	1.17	(1.04-1.32)
Germany	70.6	71.4	62.1	1.20	(1.07-1.34)	1.16	(1.04-1.30)	1.22	(1.04-1.42)	1.10	(0.93-1.30)
France	79.7	81.5	81.0	0.98	(0.91-1.06)	0.93	(0.86-1.01)	0.89	(0.79-1.01)	0.99	(0.88-1.10)
Hungary	73.2	73.1	74.8	0.97	(0.89-1.06)	0.87	(0.80-0.95)	0.82	(0.72-0.94)	0.92	(0.82-1.03)
Estonia	69.0	70.0	67.2	0.98	(0.85-1.13)	0.91	(0.79-1.05)	0.82	(0.65-1.03)	0.97	(0.81-1.18)
Latvia	47.3	45.3	46.8	0.97	(0.85-1.10)	0.92	(0.80-1.04)	1.00	(0.81-1.23)	0.87	(0.74-1.03)
Europe	62.4	61.4	58.9	1.09	(1.06-1.13)	1.00	(0.97-1.04)	1.00	(0.95-1.05)	1.02	(0.97-1.07)

(B) Utilization of specialist services

Country	PR Specialist visits [a] Men & Women			Men & Women		Men & women adjusted for SAH [b]		Men, adjusted for SAH		Women, adjusted for SAH	
	Lower secondary education and below	Upper secondary education	Tertiary education	RII	95% Confidence interval	RII	95% Confidence interval	RII	95% Confidence interval	RII	95% Confidence interval
Norway	14.0	17.7	18.5	0.72	(0.57-0.91)	0.61	(0.48-0.78)	0.66	(0.46-0.96)	0.59	(0.43-0.81)
Ireland	25.6	22.5	27.1	0.84	(0.70-1.02)	0.59	(0.49-0.72)	0.57	(0.43-0.76)	0.62	(0.47-0.80)
Netherlands	17.9	18.1	17.2	1.05	(0.91-1.21)	0.86	(0.73-1.00)	0.90	(0.72-1.13)	0.88	(0.71-1.09)
Belgium	20.8	22.1	25.5	0.73	(0.65-0.82)	0.59	(0.52-0.67)	0.73	(0.59-0.89)	0.54	(0.46-0.64)
Germany	74.2	78.6	76.2	0.90	(0.80-1.00)	0.87	(0.78-0.97)	0.93	(0.80-1.09)	0.86	(0.74-1.00)
France	51.9	58.7	66.5	0.60	(0.55-0.66)	0.55	(0.51-0.61)	0.55	(0.47-0.64)	0.59	(0.52-0.66)
Hungary	47.4	54.0	59.6	0.72	(0.65-0.80)	0.58	(0.52-0.65)	0.60	(0.51-0.72)	0.61	(0.53-0.70)
Estonia	42.5	45.6	51.4	0.76	(0.64-0.91)	0.68	(0.57-0.81)	0.62	(0.46-0.84)	0.72	(0.57-0.90)
Latvia	26.0	29.0	39.3	0.51	(0.44-0.60)	0.47	(0.40-0.55)	0.51	(0.38-0.68)	0.46	(0.38-0.55)
Europe	33.1	36.4	40.2	0.74	(0.71-0.77)	0.65	(0.62-0.67)	0.70	(0.65-0.75)	0.66	(0.62-0.69)

[a] Per 100 persons, age and gender standardized to the total survey population; [b] SAH = Self-assessed health

The pattern of utilisation of GP and specialist services for patients with chronic diseases, diabetes and hypertension was similar to that of the general population: lower and higher educated persons with chronic diseases were equally likely to use GP services in most countries (Table 8.4A). Only in Belgium and Germany did lower educated patients report using GP services slightly more often. On the other hand, higher educated patients with chronic conditions used specialist services significantly more often than lower educated patients (RII=0.87 and lower), except in the Netherlands (RII=0.92; Table 8.4B). These inequalities tended to be larger in Norway, Belgium, France, Hungary and Latvia, and were somewhat smaller in the other countries.

Table 8.4 Relative index of inequality (RII) in utilisation of GP and specialist services among patients with chronic diseases; men and women combined.

(A) Utilisation of GP services

Country	Chronic diseases		Diabetes		Hypertension	
	RII [a]	95% Confidence interval	RII [a]	95% Confidence interval	RII [a]	95% Confidence interval
Norway	0.99	(0.79-1.24)	0.99	(0.57-1.69)	0.96	(0.71-1.31)
Netherlands	0.92	(0.78-1.08)	0.71	(0.47-1.07)	0.97	(0.77-1.23)
Belgium	1.15	(1.00-1.31)	1.27	(0.86-1.88)	1.19	(0.98-1.44)
Germany	1.11	(0.94-1.32)	1.74	(1.02-2.97)	1.14	(0.90-1.44)
France	1.03	(0.89-1.19)	0.98	(0.66-1.46)	1.03	(0.86-1.24)
Hungary	0.91	(0.78-1.06)	0.93	(0.69-1.24)	0.90	(0.74-1.10)
Estonia	0.99	(0.81-1.22)	1.10	(0.61-1.98)	1.00	(0.75-1.33)
Latvia	0.97	(0.75-1.25)	0.71	(0.31-1.67)	1.04	(0.75-1.44)
Europe	1.03	(0.97-1.09)	1.03	(0.88-1.20)	1.05	(0.96-1.14)

(B) Utilisation of specialist services

Country	Chronic diseases		Diabetes		Hypertension	
	RII [a]	95% Confidence interval	RII [a]	95% Confidence interval	RII [a]	95% Confidence interval
Norway	0.55	(0.36-0.84)	0.62	(0.25-1.57)	0.50	(0.28-0.90)
Netherlands	0.92	(0.74-1.13)	0.71	(0.43-1.18)	0.86	(0.62-1.18)
Belgium	0.64	(0.52-0.78)	0.50	(0.29-0.87)	0.65	(0.48-0.87)
Germany	0.87	(0.74-1.02)	0.83	(0.52-1.34)	0.87	(0.69-1.09)
France	0.68	(0.54-0.85)	0.77	(0.49-1.20)	0.64	(0.51-0.79)
Hungary	0.63	(0.52-0.75)	0.72	(0.52-1.00)	0.60	(0.47-0.77)
Estonia	0.76	(0.59-0.97)	0.77	(0.38-1.57)	0.74	(0.51-1.07)
Latvia	0.60	(0.43-0.84)	0.83	(0.25-2.70)	0.66	(0.43-1.01)
Europe	0.71	(0.66-0.77)	0.72	(0.59-0.86)	0.69	(0.62-0.77)

[a] Adjustment for age, gender, and self-assessed health

Discussion

People with a lower education level used GP services slightly less often as those with a higher level of education in most countries (except for Belgium and Germany). At the same time, higher educated people used specialist care services significantly more often in all countries (except for the Netherlands). Educational inequalities in utilisation of specialist care among women were slightly larger than among men in some countries, although the general pattern of use was similar for both men and women. Inequalities in utilisation of specialist care were equally large in Eastern European and in Western European countries, except for Latvia where the level of inequalities was somewhat larger. Similarly large was the level of inequalities in utilisation of specialist care among patients with chronic diseases, diabetes, and hypertension.

The high percentage of non-response in some countries could have biased our results if both the educational level and the reported utilisation of services had been unequally distributed among respondents and non-respondents. Although some studies reported that non-response is related to socioeconomic status[13-15], previous evaluations showed that the association between utilisation of services and socioeconomic status would not greatly change if non-respondents were included with respondents[16, 17]. Nevertheless, in the present study we cannot exclude the possibility that an over-representation of sicker lower educated people in the non-response group may have led to some underestimation of the pro-rich inequalities in prevalence rates of utilisation reported here.

We used education as an indicator of socioeconomic position. Education allows the classification of individuals who do not work, prevents reverse causation, and facilitates international comparisons due to its relative ease of measurement. In addition, recent studies suggest that in some countries education has an independent effect and is more strongly related to the likelihood of health services utilisation than income and employment status[18, 19]. On the other hand, educational level might not accurately indicate an older person’s current socioeconomic position since it is acquired early in life and may inadequately reflect changes in socioeconomic position during adult life[20].

There were large differences between countries in the educational distribution. These differences reflect, in part, the real situation of educational attainment in different countries of Europe[21]. However, there is a possibility that the ISCED classification is not flexible enough to accommodate different national schemes. To cope with the differences in educational classification we used the RII, a measure that takes educational distribution into account[11, 12]. Additionally, RII has the advantage that it can be applied in a comparable way to all countries provided that the educational classifications are strictly hierarchical.

The recall period for use of GP and specialist services was shorter in the Netherlands and Belgium than in the other countries. A longer recall period would have influenced the overall utilisation rates for the total population. It is, however, unlikely that it would have a differential effect on utilisation of services by different educational groups.

Self-assessed health was used in order to control for the health care needs of the population. Although the measure of self-assessed health is often used in health care research due to its wide availability and good comparability, it does not completely encompass the full spectrum of need. A better control for need would likely result in greater inequalities in specialist visits, while inequalities in GP visits might have also emerged in some countries.

Most European countries have achieved universal access to health care. However, the results of the present study show that universal access does not mean equal use. One might argue that differences in utilisation do not directly reflect inequalities in access to care. The decision to use health care services and the type of provider is, after all, a personal choice. Nevertheless, this personal choice is affected to a large extent by various enabling and predisposing factors. People from lower socioeconomic strata are likely to have fewer enabling factors and more barriers to use specialist care.

European countries have very different health care systems. For example, some countries operate with GP gate keeping (e.g. the UK, the Netherlands), others have more direct access to specialists and hospital care (France); some countries use only public insurance (Germany, the Netherlands), others only private or a combination of the two (Spain, Portugal); some countries use co-payments, others do not; etc. Regardless of the way the system is organised, we find a generalised pattern of differential access to primary and secondary care for people with different socioeconomic positions. Such a universal pattern indicates that patients with a lower socioeconomic position encounter barriers that are common in all countries, and thus lie beyond the national structure and organisation of the health care system.

Proper communication between the patient and health provider where the patient not only receives information about his disease, diagnostic procedures, and treatment, but also feels understood and helped is essential. Successful communication contributes to both patient outcomes[22, 23] and general satisfaction with services[24, 25]. People with a lower socioeconomic position may better appreciate communication with the GP than with a specialist, as the former may be clearer in discussing the disease, be better at understanding and addressing the needs of the patient and, thus, be perceived as more trustworthy. On the other hand, patients with a higher socioeconomic position may trust a "higher specialised" provider and request contact with the specialist, or seek this contact directly thus avoiding the primary care provider. It is suggested that patients with lower education, lower income and ethnic background express more preference to see a GP for their initial care than better educated, higher income white patients[26], although research in this area is very limited and sometimes contradictory[27]. Higher educated patients that chose a GP for their initial contact (either as personal choice or due to organisational enforcement, as in countries with a gate keeping system) are usually better able to articulate their needs for the specialist and have greater assertiveness regarding being referred to one[28, 29], leading to a higher number of referrals.

One may suggest that a simple substitution of care occurs i.e. equal quality care for the same problem, which is performed by one type of provider instead of another without any consequences for the health outcomes of the patient. Our data, however, indicate that lower-educated people use GP services slightly less often compared to higher-educated people in most European countries, while inequalities in the use of specialists are large. A better control for need of care may even reveal pro-rich inequalities in the use of GP services. Thus, we do not find evidence for the substitution of care. Others also showed that the likelihood to consult a specialist increases given a consultation with the general practitioner[2].

Another common feature of the health care system is its enormous complexity: whichever type of organisation exists in a country it is never easily understood, particularly by those with a lower socioeconomic position. This complexity is often coupled with constant changes in the way the system operates that may disorient even well-educated patients. Since primary care (GP practices) is the easiest, most accessible and least changeable type of care, people with a lower socioeconomic position may not feel inclined to go further up the hierarchy of the health care organization, in order to avoid this confusing complexity.

Within the generalised pattern of differential utilisation of different types of services, there remain some variations that indicate that national health care systems may play an additional role in (dis-)motivating patients to use particular types of care. For example, compared to other countries, we observed larger inequalities in the use of specialist care in Latvia and smaller inequalities in the Netherlands. Similar differences were also observed in studies on income inequalities in utilisation of care[30]. It is plausible that these variations in the magnitude of inequalities are driven by differences in health system characteristics, such as sources of finance and service delivery practices. For example, in the Netherlands there is a stronger GP gate keeping system compared to other countries included in this study. A strong GP gate keeping system may allow a better control of the patient flow to specialists that is in accordance with clinical guidelines (and needs of the patients), thus leaving less room for inequalities in the utilisation of specialist care to occur compared to a more free-way system[31].

We hypothesized that inequalities in access to care in East European countries would be larger than in the West European countries due to disruption of the social protection and health care systems that occurred during the 1990s in many former Soviet countries. Our data do indicate larger inequalities in use of specialist care in Latvia. Compared to the neighbouring countries, Latvia has implemented a system with larger co-payment mechanisms for public health services. Thus, the financial barriers met by the population for the use of health services might have resulted in much lower utilisation rates and the highest level of inequalities observed in the present study. Also in Hungary, in addition to large inequalities in utilisation of specialist care, there were significant pro-rich inequalities in the use of GP services, indicating gross general inequalities in utilisation of health services. Our findings are supported by studies reporting larger inequalities in mortality amenable to medical care found in East European countries compared to West European countries [32-34]. However, in Estonia the magnitude of inequalities in utilisation of care was similar to that of West European countries, which indicates that the problem is limited to particular countries and can not be generalised to all East European countries.

The present study paid particular attention to people with chronic diseases. The results show large inequalities in utilisation of specialist services in this vulnerable group. Hampered access to specialist care might have a more severe impact on the health status of patients with high need, such as the chronically diseased, compared to the general population. Thus, there is an urgent need to investigate and remove barriers to the use of specialist care among patients with chronic diseases.

In summary, large inequalities were observed in the utilisation of specialist care that are not compensated for by the use of GP services. Of particular concern is the presence of inequalities among patients with a high need for specialist care, such as those with chronic diseases, which raises important issues regarding the access to care among vulnerable subgroups.

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Chapter 9

Inequalities in utilization of preventive services in Europe: a matter of organization?

Based on: Stirbu I, Kunst AE, Mielck A, et al
Educational inequalities in utilization of preventive services among elderly in Europe. Submitted

Abstract

Objective
To document inequalities by education in utilization of preventive services among elderly in 11 European countries and to explore whether these inequalities exist in Europe at large or are characteristic for specific countries only.

Methods
A cross-sectional Survey of Health, Ageing and Retirement in Europe collected in 2004 that comprises individuals aged 50 and older in 11 European countries (Denmark, Sweden, the Netherlands, Belgium, Austria, Germany, Switzerland, France, Spain, Italy, and Greece). We assessed the level of inequalities of flu vaccination, eye examination, breast and colon cancer screening procedures. For each type of services we estimated utilization prevalence rates and measured both relative and absolute level of inequality.

Results
For all countries of Europe combined, there were no inequalities present for utilization of flu vaccination (Relative Index of Inequality [RII]=0.94 95% CI: 0.84-1.04), but large inequalities were observed for colon cancer screening (RII=0.71 CI: 0.63-0.80), eye examination (RII=0.74 CI: 0.68-0.80), and mammography (RII=0.80 CI: 0.72-0.90). Among all preventive services the largest relative and absolute inequalities were observed in Germany, Greece and Italy, while the smallest inequalities were present in the Netherlands. Significant inequalities in utilization of all preventive services, except flu vaccination, were present in all age groups and both genders.

Conclusions
Inequalities in preventive services are not a generalized phenomenon. Large international variations in the size of inequalities in utilization of preventive services indicate that these inequalities might be rooted at structural and provider levels of individual national health care systems.

Background

An increasing body of literature continues to reveal unequal utilization of some preventive services by people of different socioeconomic status. Most researchers conclude that more disadvantaged people tend to underutilize a variety of preventive services, although, for some services socioeconomic variation in utilization was not consistently shown. Lower uptake of flu vaccination among older people was reported in deprived areas in Britain[1]. Similarly, high inequalities favouring the rich for mammography and cervical screening were found in Belgium[2], France[3], and Germany[4]. Underutilization of preventive services by more disadvantaged people contradicts with their increased needs for prevention expressed by the generally poorer health status, higher morbidity and mortality, all largely documented in the literature[5-7].

Documentation of inequalities in utilization of preventive services is yet fragmentary. Previous studies were done in only one country, were focused on limited number of services, and did not consistently take into account age-related needs. Thus, little is known about the overall level of inequalities in utilization of preventive services in Europe among population aged 50 and above. It remains unclear whether inequalities in preventive services are a generalized phenomenon, or whether these inequalities are observed only for some services, countries and demographic groups.

Effectiveness of flu vaccination in prevention of influenza is well established. Elderly people and those with chronic diseases are particularly vulnerable for influenza and its consequences and therefore they form the main target group for vaccination in the majority of European countries[8]. Breast cancer screening and colon cancer screening procedures were consistently shown to be effective in reducing mortality from breast and colon cancers[9-11]. Almost all people in senior years experience presbyopia and many are at risk of developing macular degeneration, cataracts, glaucoma, and diabetic retinopathy. Elderly persons who have regular eye examinations may experience slower decline in vision and functional status[12]. Major guidelines recommend periodic comprehensive evaluation of older adults by an eye care professional[13, 14].

This study is the first to review and document the magnitude of socioeconomic inequalities by education in utilization of preventive services among elderly in 10 European countries. We explore whether inequalities in preventives services exist in Europe at large (with distinction by different types of services) and to what extent these inequalities differ by country. We also investigate whether the extent of inequalities in utilization varies among men and women and different age groups. Our study is based on the Survey of Health, Ageing and Retirement in Europe that provides a unique opportunity for cross-country evaluation of utilization of preventive services in a comparable manner. Finally, based on the results, we discuss how international variations in the delivery of preventive health services may influence inequalities in utilization of preventive services.

Methods

Data

We used the Survey of Health, Ageing and Retirement in Europe (SHARE) release-2 as our main source of data. Using probability samples in all participating countries, SHARE represents the non-institutionalized population aged 50 and older. There were 18243 persons in 11 European countries (Denmark, Sweden, the Netherlands, Belgium, Austria, Germany, Switzerland, France, Spain, Italy, and Greece) included in our data. The SHARE main questionnaire consists of 20 modules that cover socio-demographic characteristics, physical health, behavioural risk factors, cognitive function, mental health, physical disabilities, social support and financial and housing situation. The main questionnaire is supplemented by the self-administered questionnaire that focuses on aspects related to mental health, social support, and utilization and quality of medical services. The complete methodology of SHARE survey is described elsewhere[15]. For this study we derived information from self-administered questionnaire and complemented it by the information from the main questionnaire. The individual response rates of the main sample varied between 73.7% in Spain and 93.3% in France, total weighted average for Europe being 85.3%.

Outcome variables

We studied the utilization of four types of preventive services: flu vaccination, eye examination, mammography, and colon cancer screening. The participants were asked whether they had flu vaccination in the past year, whether they had eye examination performed by an eye care professional (such as an ophthalmologist or optometrist) in the last two years, whether in the past ten years they had a sigmoido- or colonoscopy, or stool blood test examination, and whether in the last 2 years women participants had a mammogram. In addition to the utilization of the preventive services, all participants were asked whether their health care provider ever in the past 10 years referred them to sigmoido- or colonoscopy.

Socioeconomic variables

We used educational level as an indicator of socioeconomic status. Individuals were first classified into national education schemes based on the highest level of education reported and then reclassified into three equivalent categories: levels 0-2 (pre-primary, primary and lower secondary education), 3 (upper secondary education) and 4-6 (post-secondary education) of the international standard classification of education (ISCED). In the USA system, lower secondary education corresponds to grades 10-12 of High School or equivalent programs graduated with respective diplomas[16].

Analysis

We assessed socioeconomic disparities in utilization of preventive services by three types of measures: (a) prevalence rates of utilization of preventive services, (b) relative index of inequality (RII) that estimates relative level of inequalities of service utilization among higher and lower educational groups, and (c) slope index of inequality (SII) that estimates absolute level of inequalities of preventive services utilization among higher and lower educational groups.

Prevalence rates were calculated for each type of preventive service by education group and participating country. The prevalence rates were standardized by 5-year age-group and gender to the total SHARE population as representative sample for the standard European population aged 50+.

The RII and the SII are regression-based indices that are used to measure socioeconomic inequalities in health in a comparable way in different countries[17]. RII quantifies the relative position of each educational group within the hierarchy of all educational groups before it is related to health indicators by means of log-binomial regression. RII results in ratio that can be described as the prevalence ratio of preventive services utilization in the very bottom of the educational hierarchy compared to the very top of the hierarchy. SII is the absolute value of RII and represents the difference in utilization level of preventive services between the end points (highest and lowest level) of educational hierarchy. These indices have the advantage that they can be applied in comparable way to all countries provided that the educational classifications are strictly hierarchical. All calculations were done using log-binomial regression analysis in SAS statistical package (version 8.02). We included categorical variables in the regression models, representing 5-year age-group, sex, and country (in case of analysis of pooled data) to control for demographic and geographic confounders.

Some preventive services can be provided not only for preventive, but also for therapeutic purposes (for example, flu vaccination, colon and breast cancer screening). In order to exclude therapeutic consults we excluded people who reported having breast or colon cancer from analysis of respective preventive services. In analysis of flu vaccination, we adjusted our results for presence of chronic diseases for which flu vaccination is recommended according to the CDC guidelines[18] and which were present in the dataset (asthma, chronic lung and cardiovascular diseases, and diabetes).

To account for variations in sampling design in different countries, we corrected our results by applying calibrated weights to all regression models[19].

Results

Number of people who participated in the study varied between 709 in Switzerland and 2564 in Belgium (Table 9.1). Participants in all countries were similar by their age (mean around 64.4 years old) and gender (about 46% men) structure. Distribution by education, however, varied significantly between countries with the lowest numbers of people with lower education being in Germany (16%) and Denmark (23%) and the highest numbers of people with lower education being in southern parts of Europe (Spain, 85% and Italy, 75%).

Vast majority of interviewed people reported having a general practitioner (about 82%), although this percentage was smaller for Greece and Sweden, where only about 55% of people reported having a general practitioner (GP).

Table 9.1 Background information of the study population by country

Country	Number of people	Mean age (SD [a])	Gender (% of men)	Education level		% reporting having a GP
				% lowest education[b]	% highest education[b]	
Denmark	1196	64.2 (10.2)	46.4	23.4	32.4	96.9
Sweden	2122	64.9 (9.9)	47.3	51.3	30.5	58.9
Netherlands	2026	63.6 (9.6)	45.8	56.4	19.4	61.7
Belgium	2564	64.0 (9.9)	47.6	50.0	24.0	89.2
Austria	1661	65.2 (9.6)	42.0	30.9	23.5	94.4
Germany	1884	64.1 (9.3)	47.1	16.2	28.9	94.3
Switzerland	709	65.0 (10.4)	48.2	49.6	26.3	91.2
France	1182	63.8 (10.0)	45.7	50.7	18.4	93.3
Spain	1533	66.2 (10.5)	41.3	85.4	6.4	97.2
Italy	1531	64.3 (8.5)	44.9	75.5	8.4	97.7
Greece	1835	64.5 (10.4)	45.6	64.2	15.5	52.7
Total	18243	64.4 (9.8)	45.7	50.5	21.3	82.2

[a] SD = standard deviation

[b] Lowest education corresponds to levels 0-2 of ISCED classification while highest education corresponds to levels 4-6 of ISCED classification

For all countries of Europe combined there were no inequalities present for flu vaccination (RII=0.94 CI: 0.84-1.04, Table 9.2A), but there were large country variations in utilization of flu vaccination (interaction between education and populations was statistically significant). Significant inequalities favouring higher educated people were present in Denmark, Sweden, and Germany (RII between 0.60 and 0.71). In absolute terms the largest inequalities were present in Denmark and Germany (SII around -0.12). In contrast, in the Netherlands and Greece flu vaccination was reported significantly more often by people with lower education (RII=1.30 and higher). The overall prevalence rate (PR) in utilization of flu vaccination was low in all countries of Europe and in all educational groups (around 37% for all countries combined). Utilization prevalence rates were particularly low in Greece (between 13% and 21% for lower and higher educational groups respectively) and were somewhat higher in the Netherlands, Belgium, Italy, France, and Spain (around 42%).

Educational inequalities in utilization of eye examination were consistently present in all countries of Europe (RII for all countries combined=0.74, Table 9.2B). The largest inequalities favouring better educated were present in Greece (RII=0.49) and the smallest inequalities were in the Netherlands (RII=0.89). Unlike utilization of flu vaccination, prevalence rates of eye examination were higher (around 60% in all countries combined). PRs were the lowest in the Netherlands among all educational groups (around 41%) and the highest in France (between 69% in the lowest educational group and 81% in the highest educational group).

Table 9.2 Absolute and relative inequalities by education in utilization of preventive services in different European countries

A. Inequalities in utilization of flu vaccination

Country	PR lower education	PR middle education	PR higher education	RII	95% Confidence Interval	SII
Denmark	0.29	0.32	0.37	0.60	(0.40-0.90)	-0.13
Sweden	0.28	0.33	0.33	0.67	(0.49-0.90)	-0.08
Netherlands	0.49	0.44	0.36	1.30	(0.97-1.73)	0.08
Belgium	0.47	0.46	0.45	1.05	(0.84-1.31)	0.01
Austria	0.25	0.34	0.37	0.76	(0.55-1.06)	-0.08
Germany	0.27	0.37	0.42	0.71	(0.51-0.97)	-0.12
Switzerland	0.33	0.32	0.33	0.95	(0.55-1.63)	-0.05
France	0.41	0.40	0.39	0.98	(0.67-1.43)	0.00
Spain	0.44	0.37	0.48	1.08	(0.65-1.79)	0.04
Italy	0.42	0.39	0.42	1.00	(0.65-1.53)	0.00
Greece	0.13	0.16	0.21	1.47	(0.79-2.76)	0.04
Europe	0.36	0.37	0.38	*0.94*	*(0.84-1.04)*	*-0.02*
Interaction†				**		

B. Inequalities in utilization of eye examination

Country	PR lower education	PR middle education	PR higher education	RII	95% Confidence Interval	SII
Denmark	0.58	0.61	0.60	0.89	(0.66-1.19)	-0.07
Sweden	0.51	0.50	0.59	0.77	(0.61-0.96)	-0.15
Netherlands	0.41	0.41	0.41	0.89	(0.67-1.18)	-0.05
Belgium	0.56	0.68	0.67	0.76	(0.63-0.92)	-0.17
Austria	0.56	0.64	0.65	0.81	(0.64-1.03)	-0.14
Germany	0.69	0.76	0.79	0.87	(0.70-1.07)	-0.11
Switzerland	0.64	0.71	0.77	0.73	(0.51-1.04)	-0.25
France	0.69	0.80	0.81	0.83	(0.64-1.08)	-0.13
Spain	0.47	0.62	0.72	0.55	(0.37-0.80)	-0.33
Italy	0.55	0.69	0.77	0.61	(0.45-0.83)	-0.30
Greece	0.49	0.65	0.72	0.49	(0.37-0.65)	-0.41
Europe	0.54	0.63	0.65	*0.74*	*(0.68-0.80)*	*-0.18*
Interaction†				***		

PR = prevalence rates, age-sex standardized to the total SHARE population;
RII = Relative index of inequalities; adjustment for age, gender and country (Europe combined only)
SII = Slope index of inequalities; adjustment for age, gender, and country (Europe combined only)
†: p-value for interaction test between education and population, **: p<0.01; ***: p<0.005;
NS: non-significant

The pattern of educational inequalities in the utilization of mammography screening varied by country. There were no inequalities present in Sweden, the Netherlands, and Switzerland, while significant inequalities favouring better-educated women were present in Belgium, Austria, Germany, and Greece (RII between 0.42 and 0.74, Table 9.2C). Overall significant inequalities in utilization of mammography were present in all countries of Europe combined (RII=0.80 CI: 0.72-0.90). In line with relative inequalities were the absolute inequalities in mammography screening utilization with the largest inequalities present in Greece (SII=-0.32). The overall utilization prevalence of mammography screening constituted about 56%. It was exceptionally low in Denmark and Greece among people with lower education (around 26%) and high in the Netherlands and Sweden (around 73% among people with lower education).

People with lower education were consistently less likely to undergo colon cancer screening in most European countries (RII for all countries combined=0.71 CI: 0.63-0.80, Table 9.2D). Especially large were inequalities in Greece (RII=0.29), followed by France, Italy, Sweden, and Germany (RII between 0.60 and 0.75). In other countries inequalities were present but did not reach statistical significance. Utilization prevalence rates of colon cancer screening tests were low - around 30% in all countries combined. This rate was particularly low in Greece, Spain and the Netherlands (between 6 and 11% in lower educated groups).

We contrasted utilization of sigmoido- colonoscopy with the referral for this procedure (Table 9.3). We observed that countries that had large inequalities in utilization of sigmoido-colonoscopy had also large inequalities in the referral for sigmoido- colonoscopy. The level of inequalities in utilization of sigmoido- colonoscopy where decreasing proportionally to the inequalities in referral for this procedure. So in Switzerland and Austria inequalities in both the referral and in utilization of sigmoido- colonoscopy were small, while in Greece these inequalities were the largest.

The inequalities in utilization of eye examination, mammography, and colon cancer screening were consistently lower among lower educated people of all age groups and both genders (Table 9.4). Inequalities in mammography utilization tended to be larger among women in the oldest 75+ age group (RII=0.42) compared to their youngest counterparts (RII=0.86). According to guidelines some preventive services are recommended for a restricted age-group. We therefore, conducted additional analysis to estimate the level of inequalities in utilization of flu vaccination among people aged 65 and older and the level of inequalities in utilization of mammography among women aged 50-69. The pattern of inequalities across different countries of Europe in these restricted target groups did not change (results not shown).

Table 9.2 (Continued) Absolute and relative inequalities by education in utilization of preventive services in different European countries

C. Inequalities in utilization of mammography (women only)

Country	PR lower education	PR middle education	PR higher education	RII	95% Confidence Interval	SII
Denmark	0.24	0.20	0.16	0.64	(0.31-1.30)	-0.09
Sweden	0.70	0.74	0.70	1.08	(0.82-1.42)	0.05
Netherlands	0.75	0.76	0.72	0.97	(0.73-1.30)	-0.04
Belgium	0.56	0.64	0.70	0.74	(0.56-0.98)	-0.17
Austria	0.54	0.63	0.69	0.71	(0.51-0.97)	-0.20
Germany	0.34	0.45	0.43	0.67	(0.45-0.99)	-0.15
Switzerland	0.49	0.33	0.42	1.32	(0.67-2.61)	0.10
France	0.68	0.76	0.76	0.86	(0.59-1.24)	-0.10
Spain	0.54	0.64	0.60	0.85	(0.49-1.47)	-0.08
Italy	0.52	0.62	0.71	0.71	(0.47-1.07)	-0.21
Greece	0.28	0.43	0.54	0.42	(0.26-0.67)	-0.32
Europe	0.52	0.59	0.59	*0.80*	*(0.72-0.90)*	*-0.10*
Interaction†				*****		

D. Inequalities in utilization of colon cancer screening‡

Country	PR lower education	PR middle education	PR higher education	RII	95% Confidence Interval	SII
Denmark	0.15	0.16	0.19	0.77	(0.44-1.33)	-0.03
Sweden	0.18	0.23	0.23	0.66	(0.46-0.96)	-0.10
Netherlands	0.11	0.10	0.13	0.72	(0.42-1.23)	-0.04
Belgium	0.18	0.20	0.24	0.73	(0.52-1.02)	-0.06
Austria	0.60	0.66	0.64	0.91	(0.72-1.15)	-0.06
Germany	0.56	0.63	0.69	0.75	(0.59-0.95)	-0.17
Switzerland	0.35	0.33	0.42	0.85	(0.52-1.39)	-0.06
France	0.34	0.48	0.45	0.62	(0.43-0.89)	-0.19
Spain	0.11	0.15	0.14	0.75	(0.30-1.85)	-0.03
Italy	0.24	0.30	0.33	0.60	(0.37-0.98)	-0.12
Greece	0.06	0.11	0.14	0.29	(0.15-0.58)	-0.12
Europe	0.25	0.30	0.32	0.71	*(0.63-0.80)*	*-0.09*
Interaction†				*NS*		

PR = prevalence rates, age-sex standardized to the total SHARE population;
RII = Relative index of inequalities; adjustment for age, gender and country (Europe combined only)
SII = Slope index of inequalities; adjustment for age, gender, and country (Europe combined only)
†: p-value for interaction test between education and population, **: p<0.01; ***: p<0.005;
NS: non-significant
‡ Occult faecal blood test and/or sigmoido-/ colono-scopy

Table 9.3 Relative index of inequality (RII) of referral to and utilization of sigmoido- colonoscopy by education among men and women combined

Country	Referral for Sigmoido- colonoscopy		Use of Sigmoido-colonoscopy	
	RII	95% Confidence Interval	RII	95% Confidence Interval
Denmark	0.59	(0.31-1.10)	0.74	(0.39-1.37)
Sweden	0.76	(0.47-1.22)	0.66	(0.40-1.09)
Netherlands	0.82	(0.43-1.55)	0.89	(0.48-1.64)
Belgium	0.89	(0.61-1.29)	0.72	(0.48-1.07)
Austria	0.90	(0.64-1.28)	0.71	(0.49-1.04)
Germany	0.71	(0.51-0.98)	0.68	(0.46-0.98)
Switzerland	0.95	(0.49-1.87)	0.86	(0.44-1.67)
France	0.62	(0.41-0.94)	0.52	(0.32-0.82)
Spain	0.50	(0.20-1.22)	0.69	(0.25-1.94)
Italy	0.58	(0.33-1.01)	0.64	(0.34-1.23)
Greece	0.38	(0.19-0.76)	0.20	(0.09-0.48)
Europe	*0.72*	*(0.62-0.83)*	*0.64*	*(0.55-0.76)*

RII = Relative index of inequalities; adjustment for age, gender and country (Europe combined only)

Table 9.4 Relative index of inequality (RII) for different preventive services by age group and gender for all countries combined

	Flu vaccination		Eye examination		Mammography		Colon Cancer Screening test$^{\alpha}$	
	RII	95% Confidence interval	RII	95% Confidence interval	RII	95% Confidence interval	RII	95% Confidence interval
Persons aged								
50-64	1.12	(0.93-1.34)	0.71	(0.64-0.80)	0.86	(0.75-0.98)	0.73	(0.62-0.87)
65-74	0.83	(0.71-0.99)	0.78	(0.67-0.91)	0.76	(0.61-0.98)	0.68	(0.55-0.85)
75+	0.82	(0.67-1.00)	0.75	(0.62-0.91)	0.42	(0.27-0.66)	0.69	(0.52-0.92)
Gender								
Men	1.01	(0.87-1.18)	0.67	(0.60-0.76)	-	-	0.65	(0.54-0.79)
Women	0.87	(0.75-1.01)	0.79	(0.71-0.88)	0.80	(0.72-0.90)	0.75	(0.64-0.89)

$^{\alpha}$Occult faecal blood test or sigmoido-/ colonoscopy

[a] RII = Relative index of inequalities; adjustment for age, gender and country (Europe combined only)

Discussion

We observed a diverse pattern of inequalities by education in utilization of preventive services, which differed by type of services and country. For all countries of Europe combined there were no inequalities present for flu vaccination, but large inequalities were observed for colon cancer screening, eye examination, and mammography. There were large country variations in the magnitude of socioeconomic inequalities in different types of services. Among all preventive services the largest relative and absolute inequalities were observed in Germany, Greece and Italy, while the smallest inequalities were present in the

Netherlands. Significant inequalities in utilization of all preventive services, except flu vaccination, were present in all age groups and both genders.

We used education as an indicator of socioeconomic position. Education allows classification of individuals who do not work, which our study population largely consists of, prevents reverse causation, and facilitates international comparisons due to its individual nature. In addition, recent studies suggest that education has an independent effect and is more strongly related to the likelihood of health services utilization, than income and employment status[20, 21]. On the other hand, educational level might not accurately indicate older person's current socioeconomic position since it is acquired early in life. We also observed large differences between countries in the educational distribution. Partly these differences reflect the real situation of educational attainment in different countries of Europe. However, there is a possibility that ISCED classification is not flexible enough to accommodate different national schemes. To cope with the differences in educational classification we used RII and SII, measures that take educational distribution into account. In addition, we conducted a sensitivity analysis using income as a measure of socioeconomic status and observed similar pattern of inequalities (data not shown). Therefore, we believe that any changes to the choice for the measure of socioeconomic status would probably have a weak influence on the results found here.

SHARE data excludes the institutionalized elderly, which leaves out a group of people with a high burden of morbidity. Our results, therefore, are less generalisable to the entire elderly population. This problem, however, most likely is limited only to those aged 80 and above.

Because the outcomes of our analysis relied on a person's self-report, recall bias is possible. Research generally suggests that the accuracy of self-report is not associated with education or income[22], therefore differential misclassification is unlikely to influence our estimates of relative inequalities by education. Another survey characteristic that might bias the results is the non-response bias. To the extent that non-response is associated with lower socioeconomic and poorer health status[23], this would result in overestimation of utilization rates and underestimation of inequalities in utilization of preventive services.

Despite these limitations, our study provides useful insights into the magnitude of inequalities in utilization of preventive services among elderly in different countries of Europe. Large diversity in the magnitude of inequalities among different countries suggests that in addition to patient-related factors, organization, finance and delivery of preventive health services might also contribute to the explanation of inequalities. Below, we will explore the role of some of these factors.

Flu vaccination

Our results show that inequalities favouring people with higher levels of educational attainment in the uptake of flu vaccination were present in Denmark, Sweden, Austria, and Germany, but the opposite trend was observed in the Netherlands and Spain. Similar pattern of inequalities remained in the vaccination target group of people aged 65 and older. Patient related factors such as lack of knowledge, low perception of need, or fear of side effects [24-26] were suggested to explain variations in uptake of vaccination by different socioeconomic groups. These patient-related factors might be unequally distributed among different socioeconomic strata leading to differential uptake of flu vaccination. Yet, differences observed between countries indicate that structural factors related to the organization and delivery of flu vaccination are also important in causing socioeconomic inequalities.

Vaccination policies and their implementation differ considerably across Europe. National flu vaccination studies indicate that countries with proactive invitation systems have higher vaccination rates[27-29]. Financial incentives for both physician (extra income) and patient (vaccination free of charge) seem to increase vaccination rates[27] while cost sharing negatively impacts utilization of health services[30, 31]. Potentially, similar financial incentives influence differential uptake of flu vaccination between people of different socioeconomic level. For example, in Denmark, Austria, and Sweden, the patient is requested to pay for his/her vaccination; this may have contributed to the inequalities observed for these countries.

Eye examination

Adults above 50 years of age are advised to receive a routine eye examination about once every 2 years[12]. Several studies showed that the burden of visual impairment affects disproportionately people with lower socioeconomic status[32, 33]. Differences in the use of eye care services may exacerbate the socioeconomic gap in the burden of visual impairment.

In the present study, people with higher education were significantly more likely to have had an eye examination almost in all countries. Our results are similar to those found in other countries[34-36]. This suggests a crucial role of patient related factors, rather than the organization of health care services. People in the higher education groups may find it easier to direct themselves toward a long-term goal, such as prevention of illness, compared with those in lower socioeconomic strata, who may be more oriented towards more immediate needs[35]. Yet, accessibility, affordability and continuity of care, as well as physician’s recommendations, possibly contribute to inequalities in receiving vision care[37].

Breast cancer screening

Our results show that in several countries women with lower education are less likely to undergo mammography compared to their more educated counterparts. This also applies to women in target age 50-69. Our results are in line with several national reports on socioeconomic inequalities in mammography screening[2, 3, 38, 39]. Differences in need perception and propensity to seek information or help were suggested to explain inequitable use of mammography[2]. At the same time, diversity in the size of inequalities between countries indicates that the organization of the health care services might play an additional role.

The coverage and the implementation of national policies related to breast cancer screening vary significantly between countries: from long-sustained countrywide programs (as in the Netherlands, Sweden, and Switzerland), through recent and/or regional programs (as in France, Italy, Denmark, and Spain) to opportunistic screening (as in Austria, Germany and Greece). Studies that compared mammography utilization in regions with and without organized screening programs indicate higher utilization rates in regions with organized screening programs[3]. Our results also point out that countries with organized countrywide breast cancer screening program do not present socioeconomic inequalities in breast cancer screening. It is plausible that organized screening programs have direct impact on inequalities in utilization. Considerably larger inequalities in utilization of mammography in the oldest age group (Table 9.4) for whom organized screening program is not available, supports this suggestion.

Physicians play a key role in motivating women to undergo mammography screening in many European countries. Yet, some researchers report lower rates of referral for mammography by health professionals for lower educated and lower income women[40]. Thus, countries that base their program solely (or mostly) on referral by physicians (as in case of opportunistic screening) are more likely to encounter socioeconomic differences in mammography utilization.

Colorectal cancer screening (CCS)

Despite a wealth of evidence on the effectiveness and feasibility of CCS [41, 42], only a few European countries have adopted CCS as public health policy, while no country has yet organized a national comprehensive CCS program. Therefore, most CCS still takes place opportunistically.

In line with our study, participation in CCS was found to be consistently lower for lower socioeconomic groups in several countries[43, 44]. Low public awareness about the risks and advantages of CCS found in several European countries[45, 46] create strong barriers for its uptake. In addition, fear and embarrassment associated with the procedure, low self-efficacy, low social encouragement, and high perceived threats of the diagnosis were shown as strong psychological barriers for CCS characteristic for lower socioeconomic groups[46, 47].

Costs associated with screening were also shown to greatly affect the prevalence of CCS, especially among people with lower income level. In the USA, Medicare or HMO covered patients have higher rates of screening compared to those who are privately insured or have fee-for-service scheme[43, 48]. Adams and colleagues also showed that expansion of coverage for CCS and reduction of out-of-pocket costs significantly increased the odds of screening among low-income Medicare beneficiaries[48] thus reducing socioeconomic gap.

Similar financial barriers potentially confront patients in European countries as not every basic health insurance covers costs associated with CCS.

In the absence of organized screening programs, medical providers play a crucial role in uptake of CCS. A strong positive association between physician recommendations and uptake of CCS was earlier reported in other countries[49, 50]. We also found that inequalities in referral are almost as large as inequalities in use of CRC screening (Table 9.3), suggesting a strong role of providers. Also notable is a close correlation between the country differences in inequalities in referral, and country differences in inequalities in use. Qualitative data suggest that providers are reluctant to refer for CCS patients if follow-up of abnormal results is not expected due to financial or other reasons or if they anticipate lack of patient cooperation[47], but the literature that would elucidate factors of differential referral is still incomplete.

In conclusion, our study shows a diverse pattern of inequalities by educational level in the utilization of preventive services. These inequalities are related to patient factors: preventive services mostly rely on a hardly understandable concept of risk, require a proactive approach to information and service seeking, and do not provide immediate benefits. However, large differences in the level of inequalities in utilization of preventive services between countries indicate that these inequalities might be also related to national differences in the organization of preventive health services. It appears that more centralized preventive programs leave fewer chances for socioeconomic inequalities in utilization of preventive services to persist. In addition, health care providers may be the core and most effective mechanism to reduce socioeconomic inequalities in utilization of preventive services. Lastly, it is likely that cost sharing can negatively impact the overall utilization of preventive services and widen the socioeconomic gap in their utilization.

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Chapter 10

Inequalities in quality: Does the quality of outpatient diabetes care differ between migrants and native Dutch?

Based on: Stirbu I, Lanting L, Joung I, et al. Differences in the management and outcomes of diabetes between migrant and the native Dutch patients in the Netherlands. Submitted

Abstract

Objectives

To investigate the differences in the process and outcomes of outpatient diabetes care for Turkish and Moroccan patients compared to the native Dutch patients, and to explore the role of acculturation in diabetes outcomes.

Methods

An interview and a medical record review were conducted for 204 migrant and native Dutch patients of a university hospital's outpatient department. We compared the processes and outcomes of outpatient diabetes care of migrant with the native Dutch patients. We also examined whether migrant's acculturation could explain diabetes outcomes.

Results

We observed no consistent differences regarding the process of outpatient care for diabetes delivered by the medical providers for migrant patients relative to Dutch patients. Diabetes outcomes, however, differed significantly; migrant patients had higher levels of HbA1c (difference in mean HbA1c=0.95% CI: 0.48; 1.42) and cholesterol (difference in mean TC:HDL=0.80 CI: 0.40; 1.21). Migrants experienced more than two times higher risk of having HbA1c above 8.5% and increased cholesterol compared to the Dutch patients. These results were not explained by the quality of care provided to migrant patients. Adjustment for educational status reduced the mean difference of HbA1c and TC:HDL by about 30% among migrant patients. Better integrated into the Dutch society migrants had similar diabetes outcomes compared to their less integrated counterparts.

Conclusion

Compared to the Dutch, migrant patients had sub-optimal glucose and fat spectrum levels more frequently, placing them at a higher risk of diabetic complications. These differences could not be explained by the quality of care provided to these patients. Partial integration of first generation migrants into the Dutch society does not systematically lead to better diabetes outcomes.

Introduction

Diabetes outcomes, including diabetes-related complications and mortality, disproportionately affect ethnic minorities compared to the native population in many countries[1-3]. Patients of foreign descent suffer more severe morbidity and higher mortality from diabetes[3-5]. Although some evidence suggest that genetic differences among people from different cultural backgrounds may influence illness[6], ethnic group health disparities are more likely to be caused by environmental and socio-political factors[7-9].

The Dutch society encompasses a diverse ethnic minority community with migrants of Turkish and Moroccan origin representing approximately 8% of the population. The prevalence of diabetes among Turkish and Moroccan population living in the Netherlands was found to be between 11-12%, almost 4 times higher compared to the native Dutch population[3, 10, 11]. A wealth of epidemiological data shows that a progressive increase in the prevalence of diabetes is associated with the process of urbanization and westernization that migrants to The Netherlands often experience with migration[12].

The challenge of diabetes care lies in its complexity: it requires adequate access to health care, implementation of an appropriate process of care (correct diagnostic scheme and treatment prescription outlined in clinical guidelines) by the provider, and rigorous self-management by the patient. Access to care, previously reported as powerful barrier to the proper management of diabetes[13], is overcome in the Netherlands by a health insurance safety net of public health insurance that is designed to capture the poor, disadvantaged and migrants, therefore, is believed not to have a major influence over the outcomes. However, less is known about the quality services provided to the migrant patients. Some studies suggest that poorer outcomes of diabetes among the migrant population are caused by inferior service quality provided to them compared to the native population[14] [15]. While other studies find no significant differences between the care provided to migrant and native patients, and argue that the poor adherence to guidelines (best evidence) is not a valid explanation to observed differences in outcomes of diabetes among migrant patients[16].

Self-management behaviour of patients is based on their cultural norms, trust, beliefs, and knowledge about the disease. Language barriers and an inability to comprehend the provider’s instructions, that migrants are often confronted with, may lead to poorer compliance with recommended treatment and under-use of health care services[17-19], which are crucial for secondary and tertiary prevention of diabetes. Migrants that are better acculturated into the new environment may have health outcome indices more similar to the local population. However, in many studies the concept of acculturation has been limited to patient’s language knowledge, thus not acknowledging other aspects of acculturation on diabetes outcomes.

This study aims to investigate the differences in the process and outcomes of outpatient diabetes care for migrant patients compared to the native Dutch patients, and to explore the role of acculturation in diabetes outcomes. The results of this research may help health providers and managers take appropriate decisions in regard to the most suitable care for migrant patients with diabetes.

Methods

Selection of participants

In order to be included in the study, patients had to be of Dutch origin or born in Turkey or Morocco, be clinically diagnosed with Diabetes Mellitus (type I or II), and be treated for it at least for one year by a diabetes specialist at the outpatient department of a university hospital. There were 67 Turkish and 63 Moroccan patients who fulfilled these inclusion criteria. Their ethnic origin was identified initially on the basis of their last names. After a number of checks on country of origin, one person was identified as Dutch and excluded. In addition, we excluded 2 patients who underwent kidney transplantation. The remaining 129 migrant patients were approached for an interview. Of them 51 Turkish and 51 Moroccans agreed to participate (response rate 79%). For each migrant patient a Dutch patient with diabetes was selected from the hospital's outpatient database with the best matching demographic (sex, age) and socioeconomic characteristics (calculated based on the mean household income equivalent of the neighbourhood of residence). This resulted in a total sample of 204 patients included in our analyses, of which 102 were the native Dutch patients, 51 were patients of Turkish descent, and 51 were patients of Moroccan descent.

Data

Two types of data were collected: a face-to-face interview with the patient and a summary of records from the patient's medical chart. The interview was based on the questionnaire that was developed by the expert team consisting of researchers and diabetes specialists. The questionnaire, formulated in Dutch, included 95 questions and sub-questions focusing on language skills, ethnic self-identity, behaviour, education and religion. To ensure that migrant patients understood the questions, interviewers were selected from the same ethnic background and translated the questions, when necessary. Consensus on appropriate translations was agreed on beforehand. The questionnaire was pre-tested. During the period January-December 2003 trained interviewers conducted interviews. During the same period data on process and outcomes of care were extracted from the medical records of all studied patients. All participating patients provided their informed consent.

Processes and outcomes of care

Standards for process and outcomes of care were based on the 1998 diabetes management clinical guideline developed by Dutch Institute for Healthcare (CBO) in collaboration with Dutch Diabetes Federation. To assess the process of care we determined whether the physician performed the following diagnostic tests: blood pressure (BP), control of diabetes (measured by the level of HbA1c), control of cholesterol (measured as ratio of 'total cholesterol' over 'high-density lipoprotein' [TC:HDL]), smoking status, weight and height, level of albumin in urine, eye examination, and foot examination. All measurements had to be done within the time frame indicated by the guidelines. Based on all measurements we calculated the quality of care index, which represents the number of tests performed by the physician out of the total number of diagnostic tests indicated by the guideline. In addition to diagnostic tests, as part of process of care we also collected information on the presence of an action to control elevated cholesterol and HbA1c.

We used five outcomes of care: body-mass index (BMI, calculated as by body height divided by square weight), control of systolic and diastolic BP, control of diabetes, and control of cholesterol. Blood pressure was considered within normal range if systolic BP was < 140 mmHg and diastolic BP < 90 mmHg in patients under 60 years or systolic BP < 160 mmHg and diastolic BP < 90mmHg in patients above 60 years of age. Diabetes was considered under control if HbA1c was less than 7.0%, in borderline control if HbA1c values ranged between 7.0 and 8.5%, and uncontrolled if values exceeded 8.5%[20, 21]. Controlled cholesterol level (TC:HDL) was defined as =<5 among smokers above 50 years of age and <6 among smokers younger than 50 years old and among any age group for non-smoking patients[20, 21]

Acculturation

We classified all migrants into four distinct types of acculturation: assimilation (abandonment of native cultural identity and adoption of the values and norms of the larger society), integration (maintenance of ethnic cultural integrity at the same time as becoming an integral part of a larger society), separation (self-imposed withdrawal from the larger society, while preserving the native culture), and marginalization (out of cultural contact with both traditional culture and the larger society) [22] [23]. We used three main determinants to classify subjects in one of the above four categories of acculturation: self-identification, behaviour and language skills. To determine self-identification, migrant patients were asked to identify their sense of belonging to Dutch or their own ethnic society and feelings about being group member of that society on a 5 point scale. This scale was adapted from the International Comparative Studies of Ethnocultural Youth (ICSEY) questionnaire[24]. Migrants were also asked about their behaviour: amount of time spent outside of the house, number of Dutch and non-Dutch friends and the amount of time spent with them, celebrating Dutch and own ethnic holidays, etc. Competence in migrant's native and Dutch languages was measured by a self-report on a scale constructed by Kwak[25]. We inquired about a migrant's abilities to understand, speak, read, and write the migrant's native and Dutch languages. All answers were given on a five-point score system ranging from "not at all" (score 1) to "very well/much" (score 5). The sum of scores for each determinant was further calculated. Based on this score, migrant patients were assigned to one of the acculturation groups.

Analysis

We compared the process and outcomes of outpatient diabetes care of Turkish and Moroccan migrants to that of the native Dutch patients. The size of the difference was calculated using conditional logistic regression in Glim statistical software (version 4) accounting for matching. Odds ratios were adjusted for the duration of diabetes (when appropriate). Differences in means were estimated using univariate linear model in SPSS (version 11). Adjustment for age, sex and socioeconomic status was made in the design of the study (matched case control). Additional adjustment was performed separately to estimate the role of socio-demographic factors, education, quality of care and acculturation.

Results

The study population consisted of 204 participants, of whom 50% (102 persons) were of Dutch origin, 25% (51) were migrants from Turkey and 25% (51) where from Morocco (Table 10.1). Migrants from these two groups were similar in terms of their age and gender distributions. Patients from foreign descent were more likely to be married and have a lower education. From the medical perspective migrant patients on average had shorter duration of diabetes, were more likely to have type-2 diabetes, and missed the appointments with the specialist more frequently. All migrant patients belonged to either the integrated (38.5%) or separated (61.5%) acculturation groups. There were no patients who were classified in assimilated or marginalized groups by any of the acculturation determinants used.

Table 10.1 General information about the study population

	Dutch	Turkish	Moroccans
Number of people in the study	102	51	51
Mean age (Standard error)	54.8 (1.3)	54.2 (1.6)	52.3 (1.7)
Gender (% males)	39.2	35.3	43.1
Marital status (% married)	42.2	74.5	78.4
Education level (%)			
No or primary education	17.6	80.4	86.3
Lower secondary education	69.6	19.6	13.7
Higher secondary and tertiary education	12.7	0	0
Duration of diabetes, mean self reported years (Standard error)	16.4 (1.2)	13.8 (1.3)	12.6 (0.9)
Type of diabetes mellitus (% type II)	67.6	90.2	86.3
Regularity of visits (% patients with <2 missed visits)	86.3	64.7	45.1
Acculturation* (% integrated patients)	NA	34.7	42.6
Language acculturation (% integrated** patients)	NA	44.0	49.0

* Overall acculturation was calculated based on three dimension of acculturation: migrant's self-identity, behaviour, and language skills. Integrated type of acculturation means that migrants reported gaining Dutch self-identity, behaviour, and language knowledge while retaining ethnic self-identity, behaviour, and language knowledge.

** Migrants reporting having relatively good knowledge of both Dutch and their native languages

Results of the process of outpatient diabetes care are presented in Table 10.2. There were no significant differences between migrant and Dutch patients in the diabetes observation and treatment approach taken by medical staff. In some cases, migrant patients had more opportunity to receive care in accordance with the guidelines than Dutch patients. For example, they were somewhat more likely to be consistently tested for HbA1c (Odds ratio [OR]=1.19) and have urine or eyes examined in the past 12 months. Patients of non-Dutch origin had a slightly higher chance of having at least 4 out of the 8 examinations recommended by the guideline performed in the past year (OR=1.38), however they were less likely to have had all the measurements done (OR=0.72).

Table 10.2 Differences in the process of care between migrant and Dutch patients

Process of care indicators	Dutch patients (%) N=102	Migrant patients (%) N=102	Odds ratio [a] (95% Confidence interval)
Three measurements of blood pressure performed (% of all patients with indication)	67.6	70.8	1.08 (0.79-1.49)
HbA1c tested during last 2 visits (%)	68.6	80.4	1.19 (0.86-1.64)
No action to control high HbA1c (% out of all patients with high HbA1c)	6.9	6.3	0.99 (0.75-1.36)
Fat spectrum analysed in the past 12 months (%)	73.5	82.4	1.14 (0.83-1.55)
No action to normalize cholesterol level (% out of all patients with high cholesterol)	5.9	7.8	1.03 (0.70-1.35)
Smoking assessed (%)	93.1	89.2	0.96 (0.72-1.28)
Weight and height examined in the past 12 months (%)	68.6	68.6	1.01 (0.73-1.42)
Urine albumin checked in the last 12 months (%)	80.4	90.2	1.14 (0.84-1.53)
Eye examination done in the past 12 months (%)	63.7	76.5	1.20 (0.86-1.67)
Feet examined in the past 12 months (%)	63.7	68.6	1.08 (0.77-1.52)
Any 4 out of 8[b] examinations done	73.7	89.5	1.38 (0.97-1.94)
All [b] examinations done	27.3	20.0	0.72 (0.41-1.27)

[a] Turkish and Moroccan migrants compared to the native Dutch patients; adjusted for matching pairs
[b] Blood pressure, HbA1c, fat spectrum, smoking status, weight and height, urine albumin, eye and feet examinations

The mean BMI, systolic, and diastolic blood pressures were similar in both Dutch and migrant groups (Table 10.3). Compared to the native Dutch, the mean level of HbA1c for migrant patients was significantly elevated (difference in mean 0.95 CI:0.48; 1.42). Similarly, the TC:HDL scores were significantly higher among the migrant patients (difference in mean =0.80; CI:0.40; 1.21). Non-Dutch patients were more than 2 times more likely to have had HbA1c above 8.5% (OR=2.37; CI:1.39-4.05) and increased level of TC:HDL (OR=2.00; CI:1.03-3.89).

Adjustment for disease-related factors such as diabetes type and duration did not change the mean difference of any of the outcome variables (Table 10.4). Neither quality of care, nor diabetes regime or treatment for hyperlipidemia contributed to explaining the differences in outcomes between migrant patients and Dutch patients. The level of education of patients and their knowledge of diabetes, on the other hand, reduced the mean difference of HbA1c between migrant and Dutch groups by about 25% (difference in means with adjustment for education decreased from 0.95 to 0.61). Education also contributed to the reduction of mean TC:HDL values (difference in means from 0.80 to 0.56). Other outcome measures (BMI, systolic and diastolic BP) did not change significantly from their baseline values.

Table 10.3 Differences in the outcomes of care between migrant and Dutch patients

Outcome indicators	Mean scores[a], Dutch patients	Mean scores[a], Migrant patients	Difference in means [b] (95% CI)
Body mass index, mean (SD)	31.06 (8.75)	30.05 (5.44)	0.34 (-2.48; 3.16)
Systolic BP, mm Hg, mean (SD)	135.00 (19.24)	135.95 (22.08)	1.31 (-4.22; 6.83)
Diastolic BP, mm Hg, mean (SD)	77.06 (10.73)	77.46 (10.12)	0.34 (-2.58; 3.25)
HbA1c mean score (SD)	7.62 (1.21)	8.60 (1.80)	0.95 (0.48; 1.42)
TC:HDL mean score (SD)	3.80 (1.56)	4.60 (1.53)	0.80 (0.40; 1.21)
Patients with adverse outcomes	**%**	**%**	**OR [b] (95% CI)**
BMI ≥ 30	32.4	36.3	1.30 (0.73-2.33)
Increased BP for age	27.5	30.4	1.11 (0.66-1.85)
HbA1c above 7%	61.8	81.4	1.31 (0.94-1.83)
HbA1c above 8.5%	18.6	46.1	2.37 (1.39-4.05)
Increased TC:HDL	12.7	25.5	2.00 (1.03-3.89)

[a] Mean scores and % in each ethnic group are unaccounted for matching
[b] OR = Odds ratios,
CI = Confidence Interval. Migrants compared to the native Dutch patients, accounting for matched pairs

Overall, there was not a consistent pattern of change in the mean values of any of the diabetes outcomes associated with acculturation status (Table 10.5). BMI had a tendency to be higher and blood pressure to be lower among patients belonging to the separated group in relation to more integrated migrant patients. At the same time, HbA1c and TC:HDL had only marginal differences between integrated and separated groups.

Discussion

In our study, we observed no consistent differences regarding the process of outpatient care for diabetes delivered by the medical providers for Turkish and Moroccan patients compared to the native Dutch counterparts. However, diabetes outcomes differed significantly, with migrant patients having higher levels of HbA1c and cholesterol. Turkish and Moroccan patients experienced more than two times higher risk of having HbA1c above 8.5% and increased cholesterol compared to the native Dutch patients. These differences were not explained by the quality of care provided to patients. Adjustment for educational status significantly reduced the difference in mean of HbA1c and TC:HDL by about 30%.

Table 10.4 Differences in the outcomes of diabetes care between migrant and Dutch patients adjusted for various factors

	Difference in means [a] (95% Confidence interval)				
	BMI	Systolic BP	Diastolic BP	HbA1c	TC:HDL
Unadjusted	0.34 (-2.48; 3.16)	1.31 (-4.22; 6.83)	0.34 (-2.58; 3.25)	**0.95 (0.48; 1.42)**	**0.80 (0.40; 1.21)**
Adjusted for diabetes type	0.17 (-2.69; 3.02)	1.30 (-4.26; 6.85)	0.31 (-2.60; 3.22)	**0.95 (0.48; 1.42)**	**0.80 (0.40; 1.20)**
Adjusted for duration of diabetes	-0.52 (-3.39; 2.34)	2.32 (-3.27; 7.90)	0.55 (-2.41; 3.50)	**0.93 (0.43; 1.44)**	**0.74 (0.32; 1.16)**
Adjusted for marital status	0.37 (-2.47; 3.22)	1.25 (-4.30; 6.80)	0.28 (-2.64; 3.20)	**0.95 (0.48; 1.42)**	**0.81 (0.40; 1.21)**
Adjusted for education	-0.59 (-4.88; 3.71)	2.40 (-6.17; 10.98)	0.39 (-4.13; 4.92)	0.61 (-0.13; 1.35)	0.56 (-0.07; 1.18)
Adjusted for diabetes knowledge	-0.32 (-3.70; 3.07)	0.87 (-5.73; 7.47)	-0.44 (-3.92; 3.05)	**0.68 (0.12; 1.24)**	**0.80 (0.32; 1.29)**
Adjusted for quality of care*	0.07 (-2.75; 2.89)	1.53 (-4.02; 7.07)	0.30 (-2.64; 3.24)	**0.95 (0.48; 1.43)**	**0.82 (0.42; 1.22)**

[a] Migrants compared to the native Dutch patients
* Quality of care index represents the total number of tests that the physician performed out of all required for diabetes patients diagnostic tests.

Table 10.5 Difference in means in the outcomes of diabetes for each acculturation determinant. Separated migrant group compared to integrated migrant group (95% confidence interval)

	Language	**Self identity**	**Behaviour**	**Overall acculturation**
Body mass index	0.20 (-2.48; 2.88)	0.58 (-2.31; 3.47)	0.98 (-1.77; 3.73)	0.84 (-1.98; 3.67)
Systolic BP	-3.24 (-13.18; 6.70)	-3.94 (-14.33; 6.45)	-0.43 (-10.41; 9.54)	0.25 (-10.12; 10.62)
Diastolic BP	-1.92 (-5.98; 2.13)	-3.88 (-8.13; 0.36)	-1.87 (-6.02; 2.28)	-1.57 (-5.79; 2.65)
Increased HbA1c (8.5%)	0.09 (-0.66; 0.84)	-0.14 (-0.93; 0.66)	0.04 (-0.72; 0.80)	0.02 (-0.75; 0.80)
Increased TC:HDL	-0.04 (-0.82; 0.74)	0.08 (-0.74; 0.90)	0.53 (-0.23; 1.30)	0.18 (-0.64; 1.00)

Turkish and Moroccan patients who were better integrated into the Dutch society had similar outcomes as those that were less well integrated.

Some limitations of the data deserve consideration. First, due to the small numbers of our study population we had limited power to demonstrate statistically significant differences in the outcomes of diabetes when sub-groups of migrants were examined separately. Second, among the diabetes patients only the first generation migrants were available for the study. Larger differences between the separated and integrated group may have been observed in a setting where second generation migrants could have been included. Third, several data collection processes might have affected our results, such as interviewer bias, translation bias, and inter-rater bias. To minimize these effects, we conducted thorough training of the interviewers, discussing in detail possible translations and medical record review mechanisms. Finally, the information may not always have been recorded in the medical charts, thus underestimating the process of care results. However, we have no reason to suspect systematic differences in recording between migrant and the native Dutch patients.

In our study the process of care was similar for the native Dutch and migrant patients. Our results are consistent with other findings from Europe[26] and the Netherlands[16] that report no differences in the process of care among ethnic minorities/migrants and the native population in inpatient and primary health care settings. The fact that we observed large differences in diabetes outcomes suggests that these are caused by characteristics of the patients, and not the providers.

Although the process of care was similar for both Dutch and migrant patients, the overall level of adherence to guidelines was variable, ranging from about 90% for smoking status assessment to about 25% for performing all necessary measurements. We did not collect information on appropriateness of indicated treatment. This information would have provided more details on variations in practice. Less adequate adherence to guidelines has been reported in other studies in the Netherlands and other countries[15, 27, 28]. It is also supported by the general sub-optimal control of diabetes found in our study for both native Dutch and migrant patients. Using more recent guidelines where BP and HbA1c targets are set at lower levels (130/80 mm Hg for BP and 6.9% for HbA1c)[29] would have increased the number of patients with poor main outcome indices. Results from clinical trials over the past decade indicate that aggressive management of hyperglycemia and hyperlipidemia among diabetes patients is imperative in order to decrease the risk of complications and improve quality of life. The main barriers to the implementation of diabetes guidelines that are frequently mentioned in the literature are a high staff workload, inadequate financial compensation, and a shortage of personnel[30]. It is possible that similar barriers prevent specialists in the studied outpatient department to comply with guidelines.

One of the potential causes of differences in the control of diabetes and control of cholesterol between migrant and the native Dutch patients could be related to variations in the physiologic response to diabetes control treatment among patients with different ethnicity. Several studies have reported ethnic differences in response to particular medications[31-33]. However, no known study has examined the physiological responses of Turkish and Moroccan ethnic groups to anti-diabetic agents. The understanding of the aetiology and mechanisms causing increased susceptibility to diabetes and resistance to anti-diabetic treatment in Turkish and Moroccan patients will provide clues to more effective prevention and treatment of diabetes among these groups. Despite this, our data suggest that more intensive treatment is required in these groups. Although patient education and lifestyle counselling are fundamental to effective diabetes management, medical therapy remains the major strategy by which levels of glucose and lipids are lowered. Our findings also raise the need to revise current guidelines that do not, at the moment, advocate the use of ethnic-specific targets of treatment[34, 35].

We hypothesized that migrant patients who are better integrated into the Dutch society would better understand and trust the Dutch (in most cases) health provider and, thus, would be more likely to comply with recommended treatment compared to the migrant patients that are not integrated into the Dutch society. Despite our expectations, we found that none of the acculturation determinants (self-identity, behaviour and language) played a sizable role in predicting any of the diabetes outcomes among migrants. This could be related to the fact that Turkish and Moroccan migrants in our study belonged to either the separated or integrated acculturation groups. There were no migrants who lost their ethnic self-identity completely, ethnic behaviour, and native language (marginalized or assimilated types of acculturation). Potentially, partial integration does not influence compliance to recommended treatment to the extent to be reflected in diabetes outcomes. This increases the importance of programs that employ strategies to improve compliance and self-management targeted to all patients of foreign descent[13, 36-38].

Our study demonstrated that the migrants' proficiency in the Dutch language did not predict the outcomes of diabetes. Similar results were found elsewhere[39] and could be attributed to two main factors. First, language proficiency is only one of many factors needed for an effective communication. Literature shows, that less information and less communication overall is provided to migrant and low income patients[40] and the quality of information is rated less favourably by patients of foreign descent[39]. A large discrepancy was found between patients' and professionals' perceptions and recollection of the content of the consultations[41]. These discrepancies may be even larger when migrants are involved. Secondly, patients that have little to no Dutch language skills might have often benefited from the translation provided by an accompanying bilingual person (usually a family member), while patients who have some knowledge of Dutch might rely more on their own (possibly limited) capacities, thus loosing, misunderstanding or misinterpreting given recommendations for self-management.

Several studies have suggested that differences in diabetes outcomes between migrant and Dutch patients might be related to the differences in self-management. We observed in our study that HbA1c and cholesterol level decreased by about 30% when education level of the patients and their knowledge about diabetes was taken into account. Patients with higher general education and better knowledge about diabetes are potentially more likely to understand and comply with recommended home treatments than patients with lower education. Contrary to our findings, previous studies reported that education was not predictive of poor glycemic control[42]. We attribute that to the unique distribution of educational level in migrants in our study, 80% of whom had no education or very basic education.

Missed appointments could be regarded as lost opportunities for diabetes specialist's control, adjustment of the previous treatment and an additional communication session that is, undoubtedly, a point of concern. Our study points out that migrant patients were more than two times as likely to miss their appointment. Several factors could play a role: (1) inability of an accompanying person (most often an immediate dependent) to join; (2) previous negative experience with the system; (3) long stays abroad; and (4) neglect or low assessment of the necessity to come for an appointment. More research is needed to identify and address these problems.

The findings of our study lead to some important conclusions. Compared to the native Dutch patients, Turkish and Moroccan patients had a sub-optimal glucose control and cholesterol levels more often, which places them at a higher risk for diabetic complications and should warrant greater attention. Both the native Dutch patients and migrants suffering from diabetes in the Netherlands would benefit from activities targeted to maintaining a long-term glycemic control and low cholesterol levels. Migrant patients would benefit from more aggressive treatment, from improved communication that would ascertain patient's self-management skills, and from strategies that would increase health literacy in the area of diabetes. Researchers are encouraged to study barriers and facilitating factors for an adequate compliance to recommended treatment among migrant patients.

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PART V

GENERAL DISCUSSION

Chapter 11

Discussion

In this chapter we discuss key findings of this thesis and draw main conclusions. We follow the process of health inequalities research that can be organized in three phases: description of inequalities, understanding the causes of inequalities, and the reduction of inequalities. Thus, first we will summarize our findings that describe the direction and magnitude of socioeconomic and ethnic inequalities in mortality (based on Part II). Then we will summarize the results of the studies that examine the role of the health care system in explaining inequalities in mortality among socioeconomic and ethnic groups (based on Parts III and IV). The summary of the core findings is followed by an analysis of methodological limitations and an interpretation of the study findings. Finally, we outline possible ways in which health care can contribute to the reduction of inequalities in health outcomes among people from different socioeconomic and ethnic backgrounds.

11.1 Overview of the direction and magnitude of socioeconomic and ethnic inequalities in mortality

Results of this thesis suggest that socioeconomic position is strongly associated with mortality in all European populations. The magnitude of these inequalities, however, varied substantially between countries. Southern European populations had smaller-than-average, and most countries in the East and Baltic regions had larger-than-average educational inequalities in mortality. Educational inequalities tended to be smaller among women than among men, but approximately the same international patterns were found for both genders.

Data on occupational inequalities in mortality among middle-aged men confirm the general international pattern of inequalities. For example, we observed smaller relative inequalities in mortality in Southern European populations than in most other Western European countries. These results are also in agreement with other international studies[1-3].

Our data also contribute to a better understanding of how smaller inequalities in total mortality among Southern European populations, and larger inequalities in the East and Baltic regions arise. Among men and women, smaller inequalities in total mortality in the South are largely due to smaller inequalities in cardiovascular disease mortality. For example, among men in the Basque region of Spain cardiovascular disease mortality accounts for 45% of the smaller-than-average inequalities in total mortality in this population. Larger inequalities in cardiovascular disease make an important contribution to larger inequalities in total mortality in the East and Baltic regions too, but so do cancer in the East region, and injuries in the Baltic region.

We also have found important ethnic differences in mortality. Specifically, all-cause mortality among all migrant groups combined was significantly higher compared to the native Dutch population. The pattern of inequalities, however, was not so uniform as with socioeconomic inequalities in mortality. Surinamese and Antillean/Aruban men and women and Turkish men had higher relative risks of mortality compared to the native Dutch population, while Moroccan men had lower mortality risk and Turkish and Moroccan women did not differ in their mortality risk from the Dutch population.

Important variations were found not only among various ethnic groups, but also among different causes of death. All migrant groups had substantially higher risk of death from infectious diseases, especially from hepatitis and tuberculosis. The risk of death from diabetes was also substantially elevated among all migrant groups, while higher risk of death from hypertension and cerebro-vascular accidents was more characteristic to Surinamese and Aruban/Antillean migrants. Additionally, the risk of death from most external causes such as pedestrian accidents, drowning, poisoning, fire and scalds, and homicides was elevated among migrants compared to the native Dutch population. Inequalities in injury mortality were the highest among children and young adults, but persisted in the age group above 50 years old.

At the same time, all migrants enjoyed important advantages in the risk of death from almost all types of cancers. For a large number of cancers, migrants had more than 50% lower risk of death, while elevated risks were found for stomach and liver cancers. Although all-cancer mortality among all migrant groups combined was significantly lower compared to the native Dutch population, our study identified important convergence patterns of migrant cancer mortality towards the rates of the native Dutch population. For example, we observed that within migrant groups, mortality risks for all cancers combined were the highest among 2nd generation migrants, those with younger age at migration, and those with longer duration of residence. This effect was particularly pronounced for lung and colorectal cancers. Although cancer mortality rates among 2nd generation migrants approached the levels of the native Dutch population, they still remained lower than the rates of the native Dutch population.

Thus, in answering the first research question evidence suggests that socioeconomic inequalities in mortality are omnipresent in all European countries, although the magnitude of inequalities varies according to country. Differences in mortality between migrants and native Dutch are not uniform and depend on cause of death and ethnic group.

11.2 Role of health care in explaining inequalities in mortality

Below we describe our findings that identify the potential role of health care services in inequalities in mortality. We assess the role of health care services from two perspectives: (a) inequalities in mortality related to the functioning of the health care system by looking at differences in avoidable mortality among people with different socioeconomic position and ethnic backgrounds; and (b) inequalities caused by differential access to health services by looking at inequalities in the utilization of GP, specialist and preventive services, and inequalities in the quality of care.

Inequalities in mortality related to the functioning of the health care system

In Part III we have investigated inequalities in avoidable mortality, i.e. mortality from causes amenable by appropriate and timely medical care, thus causes that are directly related to the functioning of the health services. Our results show that educational inequalities in avoidable mortality were present in all countries of Europe and in most types of avoidable causes of death (chapter 6). Inequalities in avoidable mortality were slightly larger than inequalities in all-cause mortality. Especially large relative inequalities for people with different educational attainment were found for infectious diseases and acute conditions. Risk of death from avoidable cardio-respiratory conditions was about 2,5 times higher for people with lower education compared to people with higher education in Northern and Western European countries and 4 times higher in CEE and Baltic countries. For almost all types of avoidable conditions inequalities were larger in CEE and Baltic countries, followed by Northern and Western European countries and smaller in the Southern European regions. Avoidable mortality inequalities contributed to between 11 and 24% of the difference in temporary life expectancy (TLE) between high- and low-educated groups. Infectious diseases and cardio-respiratory conditions were the main contributors to this difference in TLE.

On the other hand, total mortality from avoidable causes of deaths was only slightly elevated for all migrant groups combined compared to the native Dutch population (chapter 7). Cause-specific examination showed a higher risk of death among migrants from infectious and several chronic conditions and a lower risk of death from malignant conditions. Ethnicity specific investigation showed that the Surinamese and Antillean groups had higher risks of death and Turkish and Moroccan groups had generally lower risks of death from avoidable conditions compared to the native Dutch population. Control for demographic and socioeconomic factors explained a substantial part of ethnic differences in avoidable mortality.

Thus, in answering the second research question evidence suggests that socioeconomic inequalities in mortality related to the functioning of the health care system are present in all European countries. On the other hand, inequalities in avoidable mortality were present only among some migrant groups residing in the Netherlands and only for some specific causes of death.

Inequalities in access to health care services and quality of care

In chapter 8 we have shown that people with lower education use GP services slightly less often in most countries compared to people with higher level of education. In addition, higher-educated people used specialist care services significantly more often in all countries, except the Netherlands. Large inequalities in utilization of specialist care were not compensated by utilization of GP services. We also observed that inequalities in utilization of specialist care were equally large in Eastern European and in Western European countries, except for Latvia, where the level of inequalities was larger. Similarly large was the level of inequalities in the utilization of specialist care among patients with chronic diseases, diabetes, and hypertension.

We have additionally investigated whether inequalities exist in the utilization of specific preventive services and, in a particular, the vulnerable group of people aged 50 and above (chapter 9). Our results show large variations between European countries in the magnitude of inequalities between higher- and lower-educated people in the uptake of flu vaccination, colorectal cancer screening and mammography. For example, there were large inequalities in the utilization of mammography screening between higher- and lower-educated women living in Belgium, Austria, Germany, and Denmark, while these inequalities were not present in the Netherlands, Sweden and Switzerland. Large variations in the level of inequalities in utilization of preventive services between countries indicate that these inequalities may be related to the type of organization and delivery of preventive health services. In chapter 9 we additionally explored the role of health care providers and concluded that they may be the core and most effective mechanism to reduce socioeconomic inequalities in the utilization of preventive services.

In chapter 10 we hypothesized that some of the inequalities in diabetes mortality between different ethnic groups and native Dutch population may be caused by differential quality of care (i.e. differences in diagnostic and treatment procedures) provided by health professionals. Thus, we investigated inequalities in the process of care between patients with Turkish or Moroccan descent and the native Dutch diabetes patients. Process of care was evaluated against recommended clinical guidelines for diabetes. We observed no consistent differences regarding the process of outpatient care for diabetes delivered by the medical providers for Turkish and Moroccan patients compared to the native Dutch counterparts. However, diabetes outcomes differed significantly, with migrant patients having higher levels of glucose (HbA1c) and cholesterol (TC:HDL). Turkish and Moroccan patients experienced more than two times higher risk of having HbA1c above 8.5% and increased cholesterol compared to the native Dutch patients. These differences were not explained by the quality of care provided to patients. Adjustment for educational status significantly reduced the difference in mean of HbA1c and TC:HDL by about 30%. Turkish and Moroccan patients who were better integrated into the Dutch society had similar outcomes as those that were less well integrated.

Thus, in answering the third research question, evidence suggests that there are important socioeconomic inequalities in the utilization of general and preventive health care services in Europe. However, we found no evidence for inequalities in quality of care provided to migrant groups and native Dutch patients.

11.3 Methodological considerations and validity

Some important factors influencing the validity of the results in this thesis should be carefully considered.

Education as an indicator of socioeconomic position

Throughout this thesis we used education as an indicator of socioeconomic position. Education facilitates international comparisons due to its individual nature, prevents reverse causation, and allows for the classification of individuals who do not work. On the other hand, educational level may not always accurately indicate a person's socioeconomic position: for example, among older people (chapter 9) who acquired their education early in life[4]. A more comprehensive measure of socioeconomic position may have provided a better picture of socioeconomic variations. In order to validate our results, in a number of studies we conducted a sensitivity analysis using income or occupational status as additional measures of socioeconomic position. Although the magnitude of income and occupational inequalities in health outcomes was somewhat smaller, the general pattern of inequalities remained. Therefore, we believe that any changes to the measure of socioeconomic status would probably have a weak influence on the results found here.

We also observed large differences between countries in the educational distribution. Partly these differences reflect the real situation of educational attainment in different countries of Europe[5]. However, there is a possibility that ISCED classification is not flexible enough to accommodate different national schemes. To cope with the differences in educational classification we combined several educational groups together, thus both low and high educational groups comprised a relatively large share of the population and did not represent the extreme ends of the educational distribution. An additional way to cope with the differences in educational distribution was by using measures that take educational distribution into account, such as Relative index of inequality (RII) and Slope index of inequality (SII)[6]. RII and SII estimates can be compared between countries, provided that a detailed and hierarchical classification of education is used in each country.

International comparability of mortality

In Parts II and III of this thesis we made a comparison of socioeconomic inequalities in a range of European countries using a large international database that comprised detailed information on the causes of death by socioeconomic position. Large international comparative studies allow for a comprehensive overview of the magnitude of inequalities in Europe, facilitate in identifying geographical patterns, and setting benchmarks for achievements. Most of the national datasets were of good quality, used longitudinal design with a follow up of 6-11 years, and included entire national populations or large regions.

International comparability of data on socioeconomic inequalities in mortality, however, is still imperfect. There were a number of between-country differences that remained despite efforts at standardization. Major differences are caused by variations in data collection, study design, exclusion of certain subpopulations from the studies, and different length of mortality follow-up and/or calendar years in which mortality was measured. The potential impact of these limitations is discussed in detail in chapters 3 and 6. Here we will highlight only limitations that might have had a greater impact on the results.

Data from Central and Eastern European countries (CEE, except Slovenia) and Baltic countries had cross-sectional unlinked design, while all other European countries and Slovenia were census-linked mortality follow-up studies. A direct comparison of two designs in Lithuania demonstrated that mortality inequalities based on unlinked mortality data were overestimated[7]. Although we have minimized the possible effect of this bias by restricting our analysis to younger age-groups and by combining the two lowest educational levels, we can not exclude the possibility that inequalities in mortality are overestimated in some countries in the Eastern and Baltic regions.

There are large variations across countries in cause-of-death registration practices. Therefore, bias due to misclassification of causes of death may have influenced our results. European Commission has put additional efforts into standardizing death certification in countries of European Union in the past 10 years[8]. However, numerous reports indicate still less than good quality of death registration in many countries[9-11]. Our results, however, would be biased only if misclassification would occur differentially across socioeconomic groups. There are no direct indications, that the accuracy of cause of death registration in European countries varies by socioeconomic position[12], however, possibilities of some misclassification can not be completely excluded.

Validity of studies on health care utilization

A number of factors might have had an impact on the results of the studies investigating differences in health care utilization patterns. These factors are related to the national survey designs, response rates, and the measurement of health and health care utilization that are discussed in detail in chapters 8 and 9. Here we will highlight only limitations that might have had a greater impact on the results.

The high non-response percentages in some countries could have biased our study results if both educational level and reported utilization of services would have been unequally distributed among respondents and non-respondents. Although, several studies observed that non-response is related to socioeconomic status[13-15], previous evaluations showed that the association between utilization of services and socioeconomic status would not greatly change if non-respondents were to be included with respondents[16, 17]. Nevertheless, we cannot exclude the possibility that an over-representation of sicker lower educated people in the non-response group may have led to some underestimation of the pro-rich inequalities in utilization prevalence rates in our study[15].

Because the outcomes of studies on health care utilization relied on a person's self-report, recall bias is possible. Research generally suggests that utilization of health services is underreported in health surveys[18], especially among older adults. The accuracy of self-report, however, is not associated with education or income[19, 20]. Therefore, we believe that differential misclassification is unlikely to influence our estimates of relative inequalities by education.

Strength and weakness of data on ethnicity

In Part II of the thesis we have measured cause-specific mortality differences among ethnic groups and Dutch population in the Netherlands. We made use of routinely collected data from Statistics Netherlands that includes cause of death registration and municipal population registration with information on the country of birth of the person and both parents, for all legal inhabitants of the Netherlands. The two registers could be linked by a personal identification number and provide a unique dataset free of numerator/denominator bias, a common problem in other countries. In addition, Dutch government through various mechanisms ensures that all deaths, including those that occurred abroad, are registered and that the municipal register adequately reflects the number of persons at risk.

We defined ethnicity based on available information on the country of birth of the person and both parents. Even though this definition is largely applied in the Netherlands, it does not take into account factors such as ethnic identity, culture, language or ancestry. It causes particular problems for Surinamese population that combines people of diverse ethnic origin (mainly India, West Africa, Java, and China) with different lifestyle behaviors, genetic background, and disease incidence. A more accurate measure of ethnicity would have better identified differences in mortality between ethnic groups and the native population.

In analysis of mortality among migrants, deaths that occurred abroad had cause of death unknown and, thus, for some causes of death mortality levels were underestimated. The causes of death that occurred abroad were studied in a separate analysis that showed that upon the redistribution of these deaths proportionally to the known causes of death mortality patterns remained largely the same[21].

In the study on ethnic inequalities in the management of diabetes (chapter 10) we have used a different source of data namely, medical chart reviews. In this study the number of immigrant patients was small and limited the statistical power to demonstrate statistically significant differences in the process of diabetes care. However, the size of our study population is comparable to that of other studies, in which ethnic differences in diabetes are investigated[22, 23]. Moreover, the high response rate (79%) in this study minimized the risk of selection bias. In addition to selection bias, the information may not always have been recorded in the medical charts, thus underestimating the process of care results. However, we have no reason to suspect systematic differences in recording between migrant and the native Dutch patients, thus, this information bias is unlikely to have influenced our results.

11.4 Avoidable mortality as an indicator of health care functioning

Throughout this thesis we used mortality as an indicator of the general health (Part II) and as an indicator of the quality of health care system (Part III). Mortality, however, is the final outcome that is strongly related to health care, but is also influenced by a number of additional factors. It is important to recognize these factors and take them into account when judging about the functioning of health care services. We will focus below on the most important factors that may influence such judgment.

Whilst many authors have highlighted the potential value of avoidable mortality as a measure to assess the quality or effectiveness of health care (Box 11.1), it has also faced considerable criticism. The first criticism stems out from a lack of association between avoidable mortality and medical supply reported by a number of researchers[24]. However, health outcomes depend not only on supplies, but also the quality of care. In addition, availability of supplies does not mean their equal utilization by different socioeconomic groups[25].

The second criticism is related to disagreement on selection of avoidable conditions and the attribution of health outcomes. This argument originates from the work of Walsworth-Bell[26] who analyzed eight of fourteen conditions considered amenable in a selected area in England and Wales in 1981-1983 that were originally identified as performing poorly in terms of avoidable mortality[27]. As a result of this inquiry the researchers found "convincing" cases for avoidability for hypertension and cancer of the cervix only, identifying health care related factors that may, in most cases, have altered the final outcome. For most other causes there was only little evidence of inappropriate care and, hence, scope for averting death. However the advocates of the original concept had accepted the limited usefulness of analysis of aggregate data as a mean of assessing quality of care, while emphasizing the need to supplement aggregate analyses with more detailed local enquiries[28, 29].

Thus, one should bear in mind that the indicator of avoidable mortality should not be interpreted as an absolute measure of outcome and it "does not provide definitive evidence that a particular service is wrong"[25, 30]. Rather it is recommended to use avoidable mortality as indicator for monitoring health service performance, however limiting the interpretation of it to an indicator of potential weaknesses or shortcomings in health care and a starting point for in-depth analysis[25, 31].

Box 11.1 Examples of successful application of avoidable mortality approach

Avoidable mortality allows drawing attention to problems that may otherwise have been missed as, for example, in studies on mortality gap between Eastern and Western European countries. It has been estimated that higher death rates from amenable causes accounted for 24% of the east-west gap in Europe of 4.2 years in male life expectancy between birth and age 75 in 1988[32]. These differences have been explained, in part, by the relative isolation of those countries from many modern health care developments, leading to lower quality of care provided to the population[33]. This is illustrated by the marked reduction in deaths from testicular cancer in the former German Democratic Republic (GDR) when modern chemotherapeutic agents became available after unification[34]. Other evidence suggests that shortages or inadequacies in health care may have led to less effective treatment of certain conditions, with management of hypertension and treatment of congenital heart anomalies in the GDR being cited specifically[34-36].

Another example is the observation of an eight-fold rise in deaths from diabetes among young people in the Ukraine since 1990, largely due to individuals experiencing a disruption in supplies of insulin and difficulties in obtaining specialized care when complications arose[37]. This example illustrates the usefulness of the concept of 'avoidable' mortality as an indicator of potential problems at the population level possibly related to health care that may then be investigated further by in depth studies.

An inherent problem with studying differences in mortality is that it takes no account of differences in the underlying incidence of diseases. Socioeconomic and, in particular, ethnic variations in incidence could largely contribute to the explanation of variations in mortality. Although taking disease incidence into account is highly desirable, this is often not possible due to lack of appropriate data. In our studies on avoidable mortality (chapters 6 and 7) we also could not account for differences in disease incidence between different socioeconomic and migrant groups. Studies that did take incidence into account concluded that it partly explained the observed variations in mortality, however, significant heterogeneity in avoidable mortality persisted, suggesting that variations in quality of medical care may have accounted for this result[38, 39]. In addition, we found that inequalities in avoidable mortality were generally larger than relative inequalities in all-cause mortality, suggesting a particular role of the health care system and not other causal factors. We also found that inequalities in mortality were present for a wide range of avoidable causes of death in all European countries. Such universal pattern points to health care system as a common underlying factor and challenges disease-specific factors as explanations of inequalities in avoidable mortality.

Inequalities in avoidable mortality among migrants in the Netherlands show a different pattern than that seen for socioeconomic inequalities in mortality: inequalities in avoidable mortality were generally small, smaller than those seen for total mortality, and were primarily present among Surinamese and Antillean ethnic groups. Additionally, inequalities were present only for some avoidable causes of death (for example, diabetes), but reversed for other causes of death (for example, neoplasms) compared to native Dutch. Such diseases-specific and ethnicity-specific patterns suggest that factors related to disease incidence and disease evolution are more likely to have played a role in causing inequalities in avoidable mortality than characteristics of the Dutch health care system. In addition, reduced mortality and increased life expectancy among migrant populations living in the Netherlands compared to people residing in the migrant's countries of origin points to a positive role of the health care system[40, 41].

Even though inequalities in incidence may be fundamental, this does not always justify the occurrence of inequalities in mortality. In case of avoidable mortality, death from many conditions could be prevented (e.g. infectious diseases) or considerably delayed until the age when it is not longer avoidable (65+) even after the condition has developed, provided that appropriate and timely treatment is applied. In addition, occurrence of some diseases can be prevented by medical intervention, e.g. cervical cancer, influenza and cerebro-vascular disease. In these cases, variations in incidence of some conditions may be considered as a possible indication of variations in the quality of preventive care.

In our examination of differences in mortality, we also did not account for disease severity. People with more severe and advanced disease are more likely to die, therefore adjustment for disease severity may have partly explained variations in mortality. Disease severity is a function of health-seeking behaviour and, thus, is partly outside the scope of health services. However, it may also reflect access to care and should therefore, at least in part, be related to health services.

Inequalities in avoidable mortality were present in all European countries; however, we observed important variations in the magnitude of these inequalities. Inequalities in avoidable mortality were generally larger in East European countries and smaller in South European countries compared to North and West European countries. These patterns would indicate that inequalities in access and quality of health care services are larger in Eastern European countries, while they are smaller in South European countries. Recent studies from Eastern European countries provide substantial evidence on large inequalities in access and quality of health care services in those countries[32, 42]. Comparative studies on inequalities in health between West and East European countries also suggest that inequalities in access and quality of health services are more pronounced in East European countries[32, 43], thus supporting our findings. On the other hand, evidence suggests that inequalities in access to health services in South and West European countries are comparably large[44]. Neither inequalities in quality of care were found to be particularly small in Southern countries[45, 46], although European comparative studies in this area were not performed. Potentially other factors such as lower and less socially patterned incidence may explain smaller inequalities in avoidable mortality in South European countries found in our study.

Based on the evaluation of results on avoidable mortality and their limitations we can conclude that health care does play a role in explaining socioeconomic inequalities in mortality in Europe. At the same time, we find no evidence that the Dutch health care system plays an important role in explaining differences in mortality among migrants.

Strong correlation with health status and health care provision, general ease of data collection, wide availability of good quality data, and the possibilities for international comparisons make mortality indispensable in health services research. However, mortality is only one of many possible ways to assess the performance of the health care system performance, and it is not able to provide the complete picture. Therefore, below we attempt to take a more holistic approach by complementing information on inequalities in mortality with information on inequalities in health care utilization and quality of care. Such a comprehensive view may better inform about the potential problems within the health care system that may lead to the exacerbation of inequalities in health outcomes.

11.5 Inequalities in health outcomes through the lens of the health care system

The conceptual framework (Figure 1.2) clearly depicts potential pathways between socioeconomic position and health outcomes. According to this framework inequalities within the health care may influence the size of inequalities in health outcomes through two potential mechanisms:

- Inequalities in access to care. People with lower socioeconomic position and migrants may reach health services at more advanced stage of disease or die before they reach health services;
- Inequalities in quality of care. Health services provided to people with lower socioeconomic status or different ethnic backgrounds are not adequate for their health status;

General organization of services is an overarching factor that may influence both access to health services and quality of care for people with different socioeconomic position and, therefore, deserves a special attention. Below we discuss these potential mechanisms and their roles in causing inequalities in mortality.

Access to care

European countries have very different health care systems: some countries operate with GP gate-keeping (UK, the Netherlands), others countries have more direct access to specialists and hospital care (France); some countries use only public insurance (Germany, the Netherlands), other only private or a combination of the two (Spain, Portugal); some countries use co-payments, others do not, etc. Regardless of the way the system is organized, we find a generalized pattern of differential access to primary and secondary care for people with different socioeconomic position. Such a universal pattern indicates that patients with lower socioeconomic position meet barriers that are common in all countries, and thus lie beyond the national structure and organization of the health care system.

Most European countries have achieved universal access to health care. Yet, the results of our study show that universal access does not mean equal use. One might argue that differences in utilization do not directly reflect inequalities in access to care. The decision to use health care services and the type of provider is, after all, a personal choice. Yet, this personal choice is forced to a large extent by enabling and predisposing factors (Figure 1.2). People from lower socioeconomic strata are likely to have fewer enabling factors and more barriers to use specialist care.

Proper communication between the patient and health provider where the patient not only receives information about his disease, diagnostic procedures, and treatment, but also feels understood and helped is essential. Studies show that successful communication contributes to both patient's outcomes[47, 48] and general satisfaction with services[49, 50]. People with lower socioeconomic position may better appreciate communication with the general practitioner than with a specialist, as the former may be clearer in discussing the disease, be better at understanding and addressing the needs of the patient, and, thus, be more trustworthy. Patients with the higher socioeconomic position, on the other hand, may trust a "better specialized" provider and thus request the contact with the specialist or seek this contact directly avoiding primary care provider. Literature suggests that patients with lower education, lower income and ethnic background express more preference to see a GP for their initial care than better educated, higher income white patients[51], although research in this area is very limited and sometimes contradicting[52]. Better educated patients that chose a GP for their initial contact (either as personal choice or due to organizational enforcement as in countries with gate-keeping system) are usually able to better articulate their needs for the specialist and have a higher assertiveness in being referred to one[53, 54], leading to a higher number of referrals.

Migrants experience additional communication problems due to their different cultural attitudes towards health and health care and lower language comprehension. Studies show that language barriers are associated with less health education, worse interpersonal care, and lower patient satisfaction[55]. Patients of ethnic background consistently rate less favourably their communication with health providers[56] [57] and the care received[58], which often results in inappropriate use of health services (particularly out-of-hours use), the risk of incorrect diagnoses, and non-compliance with the advised treatment[59].

One may suggest that a simple substitution of care occurs i.e. equal quality care for the same problem, which is performed by one type of provider instead of another without any consequences for the health outcomes of the patient. Our data, however, indicate that lower-educated people use GP services slightly less often compared to higher-educated people in most European countries, while inequalities in use of specialists are large. A better control for need of care may even reveal pro-rich inequalities in utilization of GP services (chapter 8). Thus, we do not find evidence for the substitution of care. Other researchers also showed that the likelihood to consult a specialist increases given a consultation of GP[60].

Another common feature of the health care system is its enormous complexity: whichever type of organization exists in the country, it is never easily understood, even more so by people with lower socioeconomic position. This complexity is often coupled with constant changes in the way the system operates that disorient even well-educated patients. While primary care (GP practices) is the easiest, most accessible, and least changeable type of care, people with lower socioeconomic position may not feel inclined to go further in the hierarchy of health care system organization to avoid this hardly understood complexity. This is also true for migrant patients, who are not only limited in their language abilities, but also limited in the general knowledge of the health system[61, 62]. Lack of knowledge of the system creates a false "happy migrant effect", an emergent concept, which reflects an acceptance of a negative event in health care delivery due to powerlessness, cultural norms that proscribe acceptance, politeness or social desirability, and sometimes fear of reprisals for speaking out[61].

Also some preventive services are consistently more often used by people with higher education compared to their lower-educated counterparts. In chapter 5 we showed that better educated people were significantly more likely to have had an eye examination almost in all European countries. Differences in the use of eye care services may exacerbate the socioeconomic gap in the burden of visual impairment that disproportionately affects people with lower socioeconomic status[63, 64]. Inequalities in the utilization of eye care services were also found in other countries[65-67]. People in the higher education groups may find it easier to direct themselves toward a long-term goal, such as prevention of illness, compared with those in lower socioeconomic strata, who may be more oriented towards more immediate needs[66]. Yet, accessibility, affordability and continuity of care, as well as physician's recommendations, possibly contribute to inequalities in receiving vision care[68].

Quality of care

The care that patients receive from health providers should be largely guided by evidence-based clinical guidelines. These guidelines, written for virtually all diseases, indicate most appropriate known to date diagnostic and management procedures that a patient should receive, as well as criteria for referral to upper-level services, and the type of advice that should be given to the patient. Health providers, in principle, are expected to follow these guidelines, however adaptations to the guidelines are requested to address the needs of a specific patient (for example, if the patient has co-morbidities or allergy to the first-line medication). Care standardized through clinical guidelines may not only contribute to improving the quality of care, but also to reducing inequalities in care since the process of care is more guided by evidence than by attitude. Emerging evidence suggests, however, that patients with similar conditions but different socioeconomic status still may get a different type of treatment. A number of studies on the quality of care for stroke, diabetes, and asthma reported fewer referrals to specialists, lower rates of referral to preventive services, and fewer diagnostic procedures done to patients with lower socioeconomic position and different ethnic backgrounds[69-73]. These findings suggest that the process of care should be regularly monitored and activities to improve the quality of care for vulnerable populations should be taken in order to reduce inequalities in care.

Our in-depth analysis of socioeconomic inequalities in utilization of preventive services showed that differential referral to the upper-level of services is a point of concern in most European countries. We found that elderly patients with lower education were significantly less often advised to undergo colorectal cancer screening (chapter 9). These inequalities in referral were almost as large as inequalities in the utilization of colorectal cancer screening, suggesting a strong effect of provider factors. We also noted a close correlation between the country differences in inequalities in referral, and country differences in inequalities in utilization. A strong positive association between physician recommendations and uptake of colorectal cancer screening was earlier reported in other countries[74] [75]. Qualitative data for colorectal cancer screening suggest that providers are reluctant to refer patients to screening if follow-up of abnormal results is not expected due to financial or other reasons or if they anticipate a lack of patient cooperation[76], but the literature that would elucidate factors of differential referral is still incomplete.

The findings of differential care provided to people with different socioeconomic and ethnic background are still not consistent[77]. We also found no differences in the process of care between migrant and Dutch patients with diabetes treated at the diabetes outpatient department in the Netherlands (chapter 10), while there were important differences in the outcomes of care. One of the reasons for the lack of evidence on inequalities in the process of care, while observing inequalities in outcomes, might be related to the incomplete measure of the process of care. In most of the cases quality of care is measured in terms of compliance to guidelines for diagnostic assessment and treatment indications. Rarely is the quality of communication between the patient and health provider measured.

On the other hand, findings of similar process of care, with persistent differences in outcomes may indicate differential physiological response of particular populations to treatment. For example, several studies have reported ethnic differences in response to particular medications[78-80]. The understanding of the aetiology and mechanisms causing increased susceptibility of particular groups to diseases and/or resistance to treatment will provide clues to more effective prevention and treatment of diseases. Our findings also raise the need to revise current guidelines that do not, at the moment, advocate the use of ethnic-specific targets of treatment[81, 82].

Organization of health services

Within the generalized pattern of differential utilization of different types of services, there are still quite large variations that indicate that national health care systems may play an additional role in (dis-)motivating patients to use particular types of care. For example, we have observed larger inequalities in the utilization of specialist care in Latvia and smaller inequalities in the Netherlands compared to other countries. Similar differences were also observed in studies on income inequalities in utilization of care[83]. It is plausible that these variations in the magnitude of inequalities are driven by differences in health system characteristics, such as sources of finance and service delivery practices. For example, in the Netherlands there is a stronger GP gate keeping system compared to other countries that may allow a better control of the patient flow to specialists that is in accordance with clinical guidelines (and needs of the patients). It is likely that a strong gate-keeping system leaves less room for inequalities in the utilization of specialist care to occur compared to a more free-way system[84].

Earlier, we discussed that referral from GP to the specialists is partly influenced by the assertiveness of the patient and his ability to articulate the need to see a more specialized professional. However, pressure from the patient for referral to a specialist is not the only non-clinical factor that influences a GP's referral practice. Also contextual barriers, such as time constraints and practice economics in the private practice setting, the need to maintain referral relationships and maldistribution of professionals in the practice community, and limited or absent insurance coverage negatively impacts on referral practices[85-87]. Additionally, provider's perceived restrictions for referral and pressure to maintain the costs were shown to reduce the number of referrals often at the cost of the more vulnerable population[84].

Another factor influencing the utilization of care is financial access. During the past 30 years cost sharing has been introduced on a large scale in many European countries as a cost containment measure and out-of-pocket payments have consistently increased across EU countries. This is due to the exclusion of certain types of care from the public benefits package, and to rises in co-payments[88]. Research shows that the use of medical care declines as patient cost sharing increases[89]. However, this decline occurs both in appropriate and in inappropriate services by the same proportion. In addition, lower income categories were more susceptible to cost sharing in outpatient care than higher income groups[89]. The effect of financial barriers on socioeconomic inequalities in health can be visible in Latvia where there are lowest utilization rates of GP and specialist services and largest inequalities in the utilization of specialist care compared, for example, to the neighbouring Estonia (chapter 8). Latvia (unlike other Baltic countries) recently implemented a system with larger co-payment mechanisms for public health services. It is plausible that in Latvia patient cost sharing decreased financial accessibility to care, especially for those sections of the population who are most in need for it, as a result of which socioeconomic inequalities in health may increase even further[90].

In chapter 9 we discussed that the utilization of preventive services strongly depends on the way that the delivery of preventive services is organized. For example, in countries with well-organized and long-sustained countrywide mammography screening programs (as in the Netherlands, Sweden, and Switzerland) inequalities in utilization of mammography among women were smaller than in countries with opportunistic screening (Austria, Germany and Greece). Utilization of preventive services is based on hardly-understood concept of risk and requires a proactive approach. People with lower socioeconomic position often also have lower levels of health literacy and thus require extra motivation to undergo preventive health services (such as colorectal cancer screening, cervix cancer screening and mammography). In countries with national cancer screening programs this extra motivation is achieved by increased general awareness of the benefits of screening through mass-media and personalized information, active personal invitation for screening, and general social support[91]. Thus, national organized screening programs can serve as an example where the organization of the health services can effectively reduce inequalities in health.

11.6 General conclusions

In this thesis we have demonstrated that large socioeconomic inequalities in mortality exist in all European countries. We have provided evidence that some of the causes of these mortality inequalities should be sought within the health care system. In particular, we have demonstrated that socioeconomic inequalities in avoidable mortality are likely to be related to the functioning of the health care system and have discussed that both access to and quality of health services may be inadequate to address the needs of people from lower socioeconomic strata.

We have provided additional evidence that variations in mortality are also present among migrant groups residing in the Netherlands. Yet, further analysis of Dutch data suggested that the Dutch health care system is not likely to play an important role in explaining variations in mortality documented among migrants and the native Dutch population. In particular, inequalities in avoidable mortality were small and related to particular ethnic groups and specific diseases. We could also not find consistent evidence for the differences in the quality of care provided to migrant patients compared to native Dutch.

Direct measurement of the relative importance of health services in inequalities in mortality and health is very complex and, therefore, rarely done in health services research. In chapter 6 we estimated that socioeconomic inequalities in avoidable mortality accounted about 15% of the inequalities in total mortality in most European countries (with slightly higher figures in East European countries), indicating that a relatively small proportion of socioeconomic inequalities is attributed to health care. In addition, the proportion of ethnic inequalities in mortality attributed to health care is likely to be negligible. Other research studies also suggest that inequalities resulting from differences in health-related behaviours (for example, smoking and alcohol consumption), material factors, current and previous living and working conditions are relatively more important in explaining inequalities in mortality than the health care system[92].

Overall, the chain of events leading to socioeconomic and ethnic inequalities in mortality is very complex and health care system is likely not to be the main driving force. However, the health care sector has its own responsibilities in addressing these inequalities. This thesis shows that there are many unexploited windows of opportunity within the health care systems in terms of accessibility, quality, and general organization to address the health problems of lower socioeconomic groups and migrants. The health care system does have an important, even if relatively minor, role to play in promoting social justice and equity in health.

11.7 Research and policy implications

There is a general acceptance that actions should be taken to reduce inequalities in health, firstly, because these inequalities contradict values of fairness and justice (especially inequalities generated within the health care system) and, secondly, because reducing inequalities in health may lead to better average health in the population as a whole. This understanding of the need was translated by setting health equity targets initially by WHO followed by many European countries thus putting inequalities in health on the policy agenda of many governments[93, 94].

An agenda for further research

Many of the conclusions about inequalities in health in the literature and in this thesis are based on the analysis of outcomes, for example, on aggregated mortality data or self-assessed health. These outcome measurements have been largely favoured because of their objectivity and global perspective on health care. Nevertheless, the outcome measures alone provide us with "what" but not "why" and "where" and, even more important, they do not indicate what needs to be done when faced with the evidence of sub-optimal performance. To get the full picture, outcome measures must be closely linked to health care processes. For example, the results of our study on avoidable mortality (chapter 6) indicate particularly large inequalities in mortality from asthma among people with different levels of education. It is now important to study in more detail the process of asthma care (access, quality) for patients with lower education in order to determine aspects of the system through which existing inequalities in asthma mortality may be reduced. Thus, a more detailed analysis of the specific issues/shortcomings facing health systems are required in order to determine what needs to be done.

Most of the research to date focused on studying differential access to health care as a main cause for inequalities related to the functioning of the health care system. Yet, two additional aspects deserve as much attention: quality of health services and the organization of care. Although some aspects of inequalities in quality of care were studied (for example, inequalities in referral practices), information on many other aspects in quality of care remains very limited, e.g. inequalities in the quality of consultation. Assessment of compliance to guidelines, targeted studies evaluating providers' communication skills and cultural competence, and inquiries into satisfaction with care performed on regular or centennial basis may be some of the approaches to determine needs for services quality improvement.

In this thesis we have discussed that the organization of health care services may play an important role in fostering inequalities in health outcomes. The way to access a specialist or mammography services, the co-payment, and possibly other non-health related social regulations[95, 96] might influence the extent of inequalities in health. Efforts should be made to establish more exactly the mechanisms of this influence by investigating the pathways through which specific types of organizational policies affect the utilization and quality of care provided to people with different socioeconomic strata. Newly introduced policies should be evaluated on their effect on inequalities in health.

Although the scientific community is slowly turning towards the east, Eastern European countries remain an important gap in the knowledge on inequalities in health. The scientific investment in these countries, however, is more justifiable considering the changes that these countries underwent in the last 20 years. These changes can be viewed as natural experiments and scientists should be encouraged to take advantage of these experiments to study the effects of transformations on health care utilization, quality, and on overall population health. Conclusions based on this research may be very informative for policy makers in all European countries, but in particular in countries where health care reforms are high on the political agenda.

Finally, the scientific literature on inequalities in health is overflowed with descriptive evidences on the magnitude of inequalities in health in different populations. Although some gaps in this description remain (for instance in Eastern Europe), the focus of research should now turn on producing evidence of effective strategies to reduce inequalities in health care use and quality of care. Experimental research and studying the effects of new interventions made at local or national levels with the specific aim to reduce inequalities in health should become high on research agenda in many countries. Additional efforts should be put into studying opportunities to transfer knowledge from one setting/country to another.

An agenda for policy makers

If inequalities in health are mostly driven by factors that lie outside of the health care system (such as health-related behaviours or living and working conditions), one may suggest that strategies to reduce inequalities should target these specific areas, ignoring the focus on the health care system. While proper attention should be given to actions on living and working environment, unemployment, and personal life style factors, we argue that it is equally important to focus on the health care system. Making health care more equitable for all members of society regardless of their social status and ethnic background is, first of all, important from the perspectives of justice, but also because, regulatory actions taken within a system may deliver better results with fewer efforts in achieving equity than trying to change individual behaviour. Ideally, health care is not only equitable in its construction, but is also sensitive and capable to address the imperfections of other structures in the society, thus reducing the negative consequences. Therefore, efforts to monitor inequalities within the health care system and strategies to ensure appropriate response of the health care system to the health needs of different social and ethnic groups are fully justified.

The importance of monitoring the performance of the health care system is widely accepted in Europe. The struggle continues to create a set of monitoring indicators that would provide the most comprehensive information about the system performance. The results of this thesis suggest that indicators that measure health care system performance should, in addition to other qualities, reflect the diversity of the population (e.g. different socioeconomic strata and ethnic background) and include all aspects of health care (access, processes, outcomes).

The effective monitoring of health system performance calls for good quality of data. However, there are important gaps in data collection in Europe, which were drawn from the experience in collecting data for this thesis.

- Some countries lack even the most basic descriptive data on socioeconomic inequalities in self-assessed health and mortality. The availability of data is even scarcer when it comes to studying ethnic variations. Health authorities should assure availability of these data which are indispensable for effective monitoring of socioeconomic and ethnic inequalities in health.
- Many countries which do collect basic descriptive data should put additional efforts in order to overcome severe deficiencies in those data, e.g. small sample sizes of surveys, unlinked cross-sectional designs for mortality data, too low frequency of data collection, definition of ethnicity, etc.
- Data should be made available not only on main outcome indicators (such as self-assessed health and/or mortality) by socioeconomic and/or ethnic status, but also include information on inequalities in other health outcomes, such as disease incidence and survival, health care utilization, and quality of care.
- Efforts should be made at an international level to achieve a more optimal international comparability.

Improving data availability, quality of data and their international comparability is imperative for effective further monitoring of inequalities in health.

The literature on effective strategies to reduce inequalities in health through the health care system is far from being abundant and comprehensive. Nonetheless, several evidence-based strategies can be identified. They are described below.

Most European countries have adopted a universal non-targeted health care system. Although there are many arguments in favour to maintain such approach, evidence shows that paying special attention to vulnerable subgroups such as the chronically ill, older and children with lower socioeconomic position is beneficial[97]. Several countries have successfully used such selectivist measures to reduce inequalities in health. For example in UK, Health Actions Zones were created to specifically target people living in disadvantaged areas. Although the effectiveness of both selectivist and universalist approaches to reduce inequalities in health still needs to be evaluated, it is possible that a combination of the two approaches is necessary.

All European governments are aiming for a health system that is economically, geographically and culturally accessible. Several interventions were tested in different countries to improve the accessibility of health care, namely, hospital-based education programs, community outreach activities, personalized contacts with target groups, etc[98]. Some of these interventions were proven to be successful in increasing the uptake of different services (such as vaccination, screening or management of diseases) among people with lower socioeconomic position and thus warrant a larger-scale implementation. For example, studies show that both accessibility and satisfaction with health services may increase by introducing culturally sensitive health information in appropriate language in areas with high proportion of ethnic minorities[55, 57, 99].

More equitable access may also be achieved through the more equitable distribution of resources. Specifically, resources need to be distributed in proportion to the relative needs of local populations. In Sweden and England, for example, resources are allocated based on weighted capitation, which takes into account socioeconomic and demographic factors. Although these models require continual refining and further investigation of their impact on the utilization and quality of care, they do show that attempts at equitable resource allocation can be made.

A number of studies have identified that high patient co-sharing of health care costs introduced at large in almost all European countries creates extensive barriers in accessing health care services for people with lower socioeconomic position who are most in need. This has a negative impact on their health, thus increasing socioeconomic inequalities in health. In order to decrease socioeconomic inequalities in health care utilization, countries that practice extensive co-sharing schemes (Belgium, Austria, France) should consider mechanisms to offset the negative effects of cost-sharing, for example by post hoc corrective measures or income-dependent flexible cost-sharing.

As concluded in chapter 5, nationally organized preventive programs might have a positive impact on the uptake of preventive services among people with lower education. Combined with evidence of general effectiveness, such programs should be considered for a large-scale implementation in all European countries. This specifically may apply to breast and cervical cancer screening programs for women and colon cancer screening and vaccination programs for older adults. Hypertension and cholesterol screening serve as additional examples of programs that could be implemented at large. In the Netherlands, diabetes screening may be implemented in areas with a large ethnic minority population.

In chapter 4 we elaborated that countries with a stronger GP gate-keeping system have smaller inequalities in utilization of specialist services, therefore, countries with a more free-way system to access specialist care might need to take additional efforts to achieve more equitable use of care for people with lower socioeconomic position and various ethnic backgrounds.

Evidence based medicine (EBM) has provided a scientific basis for adequate diagnosis and treatment and was introduced into practice through clinical guidelines. Diagnosing and managing diseases and referral practices are now to a large extent guided by need. Although initial scope of standardization of care was to reduce variations in practice and improve quality and did not include reduction of inequalities per se, it is likely that larger variations in practice were among people with lower socioeconomic position and, thus, they might have benefited the most from this standardization. The fact that inequalities in quality of care are not consistently found[100-104] may be partly related to guidelines and therefore, the standardization of care may be considered as a successful intervention in reducing inequalities in health. Yet, in daily patient care, guidelines are still poorly implemented[105, 106]. In addition to continuing efforts to introduce EBM into practice, there is a further need to improve the quality and usability of guidelines[81, 107].

Equity audit might be another effective tool to reduce inequalities in health. Health equity audit is a process through which local partners systematically review inequities in the causes of ill health, and in access to effective services and their outcomes, for a defined population. Actions required to make services more equitable (thereby reducing inequalities) are agreed and incorporated into local plans, services and practice. A number of health institutions in the USA have already successfully incorporated equity audits as part of their activities.

Within this thesis we have focused primarily on the health care sector, yet it is important to remember that the health care system operates not in a vacuum. Taking into account the multifaceted nature and multiple causality of inequalities in health, inter-sectoral collaboration is particularly important. Wider involvement of the health care system in education sector (with health education programs), at the community level (empowerment efforts), hospitality (smoking reduction), and transportation (injury prevention) are some of the examples of collaboration with other sectors. In order to fully exploit its capacities and effectively reduce inequalities, the health care system should take more responsibility in providing leadership and professional guidance to the society. An equitable health care has more authority to take this leadership role compared to an inequitable one.

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S

Samenvatting

Introductie

Het internationale bewijs over sociaal-economische ongelijkheid is overtuigend: in alle Europese landen hebben mensen die in slechte omstandigheden leven een slechtere gezondheid, meer aandoeningen en een kortere levensduur dan zij die in meer welvaart leven. Ook de gezondheid van migranten is vaak slechter dan die van de autochtone bevolking, vooral onder specifieke etnische groepen en in het geval van specifieke aandoeningen. Slechtere toegang tot gezondheidszorg en een lagere kwaliteit van de zorg voor minder welvarende bevolkingsgroepen verklaren mogelijk een deel van de gezondheidsverschillen. Kennis over deze ongelijkheden in de gezondheidszorg kan door beleidsmakers worden gebruikt als mogelijke aanknopingspunt voor verbeteringen in de volksgezondheid, dat tegelijk kan bijdragen aan de verkleining van sociaal-economische en etnische verschillen in gezondheid.

Het onderzoek dat ten grondslag ligt aan dit proefschrift beoogt bij te dragen aan de discussie over de rol die het gezondheidszorgsysteem speelt in sociaal-economische en etnische verschillen in gezondheid. We richten ons voornamelijk op het meten van de omvang van sociaal-economische en etnische verschillen in gezondheidsproblemen die gerelateerd zijn aan het functioneren van het gezondheidszorgsysteem. We doen dit door te schatten hoe groot de verschillen zijn in vermijdbare sterfte, en in het gebruik en de kwaliteit van de gezondheidszorg.

De volgende wetenschappelijke vragen zijn onderzocht:

1) Hoe groot zijn de sociaal-economische en etnische verschillen in sterfte in verschillende Europese landen?
2) Hoe groot zijn de sociaal-economische en etnische verschillen in specifieke doodsoorzaken die samenhangen met het functioneren van de gezondheidszorg in Europa?
3) Hoe groot zijn de sociaal-economische en etnische verschillen in het gebruik en de kwaliteit van specifieke onderdelen van de gezondheidszorg?

Gegevens en methoden

Dit proefschrift richt zich op 2 verschillende soorten populaties: de nationale bevolking van een groot aantal Europese landen en migranten groepen in Nederland.

Een sterke kant van dit proefschrift is het gebruik van verschillende databronnen uit een aantal Europese landen. Sterftegegevens van een aantal bevolkingsgroepen uit West, Centraal en Oost-Europese landen zijn gebruikt om de eerste en tweede onderzoeksvraag te beantwoorden. Deze sterftegegevens bevatten informatie over het aantal sterfgevallen naar land, leeftijd, geslacht, burgerlijke staat, sociaal-economische positie, etnische achtergrond (alleen voor Nederland), en een breed scala van doodsoorzaken. Door de doodsoorzaken te selecteren die gerelateerd zijn aan de kwaliteit van de gezondheidszorg konden we de rol van de gezondheidszorg in verschillen in sterfte tussen de verschillende groepen schatten. Door veel landen te includeren konden we inzicht krijgen in de mate waarin sociaal-economische verschillen in doodsoorzaken die gerelateerd zijn aan het functioneren van de gezondheidsdiensten een algemeen fenomeen vormen in Europa.

Om de derde onderzoeksvraag te beantwoorden bestudeerden we patronen in het gebruik en de kwaliteit van gezondheidszorg in verschillende bevolkingsgroepen: de algemene Europese populatie van 16 jaar en ouder, populaties van 50 jaar en ouder, en migrantengroepen. We bestudeerden het gebruik van de volgende onderdelen van de gezondheidszorg: huisarts, specialist, en preventieve diensten. Om verschillen in de kwaliteit van de zorg te evalueren, hebben we het proces van aangeboden zorg bij Nederlanders diabetes patiënten vergeleken met het proces bij migrantengroepen met diabetes. Door in andere analyses het niveau van sterfteverschillen in verschillende landen te vergelijken konden we conclusies trekken over de manier waarop nationaal sociaal en gezondheidsbeleid zowel de volksgezondheid kan beïnvloeden als het zorggebruik van mensen met uiteenlopende sociaal-economische status.

Samenvatting van de bevindingen

In deel II van dit proefschrift richtten we ons op het beschrijven van sociaal-economische en etnische verschillen in algemene gezondheid met speciale aandacht voor sterfte. In hoofdstuk 3 beschreven we in het bijzonder de grootte van opleidingsverschillen in sterfte en zelfgerapporteerde gezondheid in 22 Europese landen. Resultaten toonden dat sterfte cijfers en slechtere zelfgerapporteerde gezondheid vrijwel altijd substantieel hoger waren in lagere sociaal-economische groepen. We vonden ook een grote variatie in de omvang van gezondheidsverschillen tussen landen. Relatieve en absolute verschillen in sterfte varieerden tot twintigvoudig, waarbij in sommige Zuid-Europese populaties de verschillen kleiner waren, en in veel landen in Centraal- en Oost-Europese en Baltische regio's de verschillen juist groter waren dan in de rest van Europa. Een deel van de variatie bleek gerelateerd aan roken en excessief alcoholgebruik. Deze studie toonde aan dat er veel mogelijkheden zijn om gezondheidsverschillen te verkleinen.

In een studie met gegevens uit Nederland vonden we daarnaast belangrijke etnische verschillen in sterfte. Totale sterfte was significant hoger in alle migrantengroepen dan in de autochtone Nederlandse bevolking. Het patroon van ongelijkheid was echter niet zo uniform als dat van de sociaal-economische verschillen in sterfte. Onder Surinaamse en Antilliaanse/Arubaanse mannen en vrouwen en Turkse mannen was er een relatief hogere sterfte vergeleken met de autochtone bevolking, terwijl bij Marokkaanse mannen het sterfte risico juist lager lag. De sterfte onder Turkse en Marokkaanse vrouwen verschilde niet van die onder de autochtone bevolking. Ook vonden we belangrijke variatie in de verschillende doodsoorzaken.

In deel III onderzochten we sociaal-economische en etnische verschillen in vermijdbare sterfte: daarmee bedoelen we sterfte aan oorzaken die vermijdbaar zijn door geschikte en tijdige medische zorg. Deze doodsoorzaken kunnen worden beschouwd als direct gerelateerd aan het functioneren van de gezondheidszorg. Onze resultaten laten zien dat opleidingsverschillen in vermijdbare sterfte aanwezig waren in alle Europese landen en in het geval van de meeste types van vermijdbare doodsoorzaken (hoofdstuk 6). Verschillen in vermijdbare sterfte waren iets groter dan verschillen in totale sterfte. Verschillen in bijna alle verschillende soorten vermijdbare aandoeningen waren het grootst in Centraal- en Oost-Europese en Baltische staten, gevolgd door Noord- en West-Europese landen. Ze waren het kleinst in de Zuid-Europese regio's. Het verschil in vermijdbare sterfte droeg 11 tot 24% bij aan het verschil in tijdelijke levensverwachting tussen hoog en laag opgeleide groepen.

Aan de andere kant bleek bij analyse van etnische verschillen in Nederland dat sterfte aan vermijdbare doodsoorzaken slechts licht verhoogd was onder de migrantengroepen in vergelijking met de autochtone bevolking (hoofdstuk 7). Oorzaakspecifiek onderzoek liet onder migranten een hogere sterfte zien voor infectieziekten en verschillende chronische aandoeningen (zoals diabetes and astma) en een lager risico om te overlijden aan kwaadaardige nieuwvormingen. Surinaamse en Antilliaanse groepen hadden hogere sterfte risico's en Turkse en Marokkaanse groepen hadden over het algemeen een lager risico om te overlijden aan vermijdbare aandoeningen dan de autochtone bevolking. Demografische en sociaal-economische factoren verklaarden een substantieel deel van de etnische verschillen in vermijdbare sterfte.

In Deel IV richtten we ons op de mogelijke rol van het gezondheidszorgsysteem door verschillen in het gebruik en de kwaliteit van specifieke onderdelen van de gezondheidszorg te bepalen. In hoofdstuk 8 toonden we aan dat mensen met een hogere opleiding significant meer gebruik maakten van specialistische zorg in de meeste Europese landen. Deze verschillen in het gebruik van specialistische zorg werden niet gecompenseerd door omgekeerde verschillen in het gebruik van diensten van de huisarts en waren even groot onder patiënten met chronische aandoeningen, in het bijzonder diabetes en hypertensie. Verder vonden we een grote variatie tussen Europese landen in de omvang van opleidingsverschillen in het gebruik van preventieve diensten (hoofdstuk 9). Significante verschillen in bijvoorbeeld mammografie bevoordeelden hoger opgeleide vrouwen in België, Oostenrijk, Duitsland en Griekenland ten opzichte van lager opgeleide vrouwen, terwijl er geen verschillen waren in Zweden, Nederland en Zwitserland. Grote variatie tussen landen duidt op een mogelijke samenhang tussen deze verschillen en de organisatie en wijze van aanbod van preventieve zorg in de verschillende landen.

In hoofdstuk 10 veronderstelden we dat een deel van de verschillen in sterfte aan diabetes tussen migranten en de autochtone Nederlandse bevolking mogelijk veroorzaakt wordt door verschil in kwaliteit van zorg (te weten verschillen in diagnose en behandeling) zoals geleverd door gezondheidswerkers. Daarom onderzochten we verschillen in het zorgproces (geëvalueerd naar aanbevolen klinische richtlijnen) tussen diabetes patiënten van Turkse of

Marokkaanse afkomst en autochtone Nederlandse diabetes patiënten. We vonden geen consistente verschillen in poliklinische diabeteszorg zoals geleverd aan Turkse en Marokkaanse patiënten en de autochtone Nederlanders. Echter, ziekteuitkomsten verschilden significant; migranten patiënten hadden hogere glucose en cholesterol waarden. Deze verschillen werden echter niet verklaard door de kwaliteit van de zorg zoals geleverd aan de patiënten. Verschillen in opleidingsniveau verklaarden een klein deel van het verschil in gemiddelde glucose en cholesterol waarden. Turkse en Marokkaanse patiënten die beter geïntegreerd waren in de Nederlandse samenleving hadden vergelijkbare uitkomsten als degenen die minder goed waren geïntegreerd.

Conclusies

In dit proefschrift hebben we aangetoond dat er grote sociaal-economische verschillen in sterfte bestaan in alle Europese landen. We hebben aanwijzingen geleverd voor de veronderstelling dat de oorzaken van deze sterfteverschillen voor een deel gezocht moet worden in het gezondheidszorg systeem. Sociaal-economische verschillen in vermijdbare sterfte zijn waarschijnlijk gerelateerd aan het functioneren van de gezondheidszorg. Zowel toegang tot als kwaliteit van de gezondheidszorg zijn mogelijk niet adequaat om te voorzien in de behoeften van de lager sociaal-economische groepen. Daarnaast hebben we bewijs geleverd voor het bestaan van sterfte verschillen tussen verschillende groepen migranten in Nederland. Maar analyses van de Nederlandse sterftegegevens suggereerden dat het niet aannemelijk is dat het Nederlandse gezondheidszorgsysteem een belangrijke rol speelt in de verklaring van de sterfteverschillen tussen migranten en autochtone Nederlanders. Verschillen in vermijdbare sterfte waren juist klein en alleen gevonden voor specifieke etnische groepen specifieke ziekten. We vonden in een case-study ook geen eenduidig bewijs voor de verschillen in kwaliteit van de zorg aan migranten in vergelijking met de zorg aan autochtone Nederlanders.

Samenvattend kunnen we stellen dat de reeks van gebeurtenissen die leiden tot sociaal-economische en etnische ongelijkheden in sterfte erg complex is en dat het onwaarschijnlijk is dat de gezondheidszorg de grote drijfveer is achter die ongelijkheden. Desalniettemin heeft de gezondheidszorg zijn eigen verantwoordelijkheden om de ongelijkheid tegen te gaan. Er zijn veel ongebruikte mogelijkheden in het gezondheidszorgsysteem, in termen van bereikbaarheid, kwaliteit en algemene organisatie, om de gezondheidsproblemen van de lagere sociaal-economische groepen aan te pakken. De gezondheidszorg heeft een essentiële rol in het bevorderen van sociale gerechtigheid en gelijkheid in gezondheid, ook al is deze rol kwantitatief gezien relatief klein.

P

Personal

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Flatter me, and I may not believe you.
Criticize me, and I may not like you.
Ignore me, and I may not forgive you.
Encourage me, and I may not forget you.
William Arthur

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About the author

Irina Stirbu was born on December 1, 1973 in Chisinau, Moldova. She graduated from the high school N38 in 1990 and in the same year started her medical education at the State Medical University of Moldova "N. Testemitanu". In 1996 she has obtained her Doctor of Medicine diploma. From 1996 till 1998 Irina underwent medical specialisation in internal medicine at a number of major clinics in the country and in 1998, after successfully passing final medical residency examinations, she has obtained her medical practice license as a specialist in internal medicine. Irina's deep interest in public health issues has driven her to pursue further education in this area. In 1998 she was accepted as a Master student at Emory University in USA. Muskie Graduate Fellowship award that she won through a competition in the same year provided financial means for this education. During her studies at Emory she was particularly interested in the area of international public health and maternal and child health issues. Her master thesis was based on data obtained in Tajikistan where she was performing health facility needs assessment for basic maternal and child health services. In 2000 she graduated from Emory University with a Master of Public Health degree. During the following 4 years Irina worked with American non-governmental organizations in countries of Central Asia (mainly in Uzbekistan, Kyrgyzstan, and Kazakhstan) and Caucasus (Azerbaijan) on reforming the health care system and improving the health status of vulnerable populations. In 2004 Irina started NIHES program at Erasmus University, which she successfully completed in 2005 with Doctor of Science degree. As part of her studies at NIHES she began a close collaboration with the department of Public Health by working on a project investigating ethnic differences in mortality in the Netherlands. Until the end of 2008, she continued working at the department of Public Health as a researcher on a number of projects focusing on social and ethnic inequalities in health in Europe. This research work is presented in the current thesis. From 2009 Irina will continue her work at The Netherlands Health Care Inspectorate investigating social and ethnic inequalities in outcomes of care for patients with cardiovascular diseases in the Netherlands. Irina is married to Norman Wagner and is a mother of two children.

List of publications

that are not reprinted in this thesis

1 Menvielle G, Kunst AE, Stirbu I, Borrell C, Bopp M, Regidor E, Heine Strand B, Deboosere P, Lundberg O, Leclerc A, Costa G, Chastang JF, Esnaola S, Martikainen P, Mackenbach JP. Socioeconomic inequalities in alcohol related cancer mortality among men: to what extent do they differ between Western European populations? Int J Cancer. 2007 Aug 1;121(3):649-55.

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9 Spadea S, Bellini S, Kunst A, Stirbu I, Costa G. The impact on interventions to improve attendance in female cancer screening on social inequalities in attendance rates: a review. Submitted.

10 Mielck A, Kiess R, van der Knesebeck O, Stirbu I, Kunst A. Association between Foregone Care and Household Income among the Elderly in Five Western European Countries. Submitted.

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