Why does Spain have smaller inequalities in mortality? An exploration of potential explanations

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ABSTRACT

Background

While educational inequalities in mortality are substantial in most European countries, they are relatively small in Spain. A better understanding of the causes of these smaller inequalities in Spain may help to develop policies to reduce inequalities in mortality elsewhere. The aim of the present study was therefore to identify the specific causes of death and determinants contributing to these smaller inequalities.

Methods

Data on mortality by education were obtained from longitudinal mortality studies in three Spanish populations (Barcelona, Madrid, the Basque Country), and six other Western European populations. Data on determinants by education were obtained from health interview surveys.

Results

The Spanish populations have considerably smaller absolute inequalities in mortality than other Western European populations. This is due mainly to smaller inequalities in mortality from cardiovascular disease (men) and cancer (women). Inequalities in mortality from most other causes are not smaller in Spain than elsewhere. Spain also has smaller inequalities in smoking and sedentary lifestyle and this is due to more smoking and physical inactivity in higher educated groups.

Conclusion

Overall, the situation with regard to health inequalities does not appear to be more favourable in Spain than in other Western European populations. Smaller inequalities in mortality from cardiovascular disease and cancer in Spain are likely to be related to its later socio-economic modernization. Although these smaller inequalities in mortality seem to be a historical coincidence rather than the outcome of deliberate policies, the Spanish example does suggest that large inequalities in total mortality are not inevitable.

Keywords: education, mortality, social inequalities, health behaviour

INTRODUCTION

Mortality differentials among different socio-economic groups belong to the most consistent findings in public health, but the magnitude of these inequalities differs substantially between countries. A recent study of inequalities in health in 22 European countries in the 1990s showed that some southern European populations have relatively small educational inequalities in mortality (1). Smaller inequalities in mortality in Spain and Italy were also found in a previous study (2), but have never been satisfactorily explained. We therefore conducted an in-depth study of potential explanations for smaller inequalities in mortality in Spain.

Spain is a young democracy, with an underdeveloped welfare state, important income inequalities, and a universal national health service (3). Evidence on socio-economic differentials in mortality based on individual data is relatively scarce, due to the poor quality of socio-economic information included in death certificates, and to restrictive legislation with regard to linkage of the death register with census information (4, 5). International literature focused mainly on the city of Barcelona or the region of Madrid (5-9). One factor standing out from the more detailed analyses that have been performed is smoking: inequalities in smoking are smaller in Spain and Italy than in other Western European countries, particularly among women, and this is likely to contribute to smaller inequalities in ischemic heart disease (10, 11) and lung cancer (12). Studies which tried to explain the comparatively small inequalities in mortality in Spain are non-existent, and a comprehensive explanation is lacking so far.

The present study was based on evidence from three Spanish populations (the city of Barcelona, the region of Madrid, and the Basque Country), which were compared with six other Western European populations [Finland, Sweden, Norway, Denmark, Belgium, and Turin (Italy)]. Our analysis aimed at identifying the specific causes of death and some of the specific determinants which contributed to smaller inequalities in total mortality in the three Spanish populations.

METHODS

Study population

Mortality data were obtained from longitudinal mortality studies based on linkage of death registries to population censuses and consisted of deaths and exposure counts by sex, 5-year age groups, cause of death and level of education (table 1). The data covered national (Finland, Sweden, Norway, Denmark, Belgium), regional (Madrid, the Basque Country) and urban (Barcelona and Turin) populations. The linkage between census data and death registries was achieved for almost 100% in all populations except Barcelona, Madrid and the Basque Country where the linkage was obtained for only 94.5%, 70% and 94.1% of the population, respectively. To correct for the underestimation of deaths we weighted the number of deaths in the three Spanish populations with a correction factor. The correction factors were 1/0.945 for Barcelona, 1/0.7 for Madrid and 1/0.941 for the Basque Country. Data on determinants of mortality by socio-economic position came from nationally representative health or multipurpose surveys with a cross-sectional design (table 1).

(Table 1 here)

Measures

The causes of death were classified according to the 9th and 10th revision of the International Classification of Diseases (ICD). We analysed a few large groups of causes [cardiovascular diseases (CVD), cancer, infectious diseases, respiratory diseases, alcohol-related causes, external causes and all other causes], as well as a few specific causes of death [ischemic heart disease (IHD), cerebrovascular disease, stomach cancer, lung cancer, breast cancer and pneumonia] (see supplementary table 1 for ICD-codes).

Data on determinants included smoking, obesity, sedentary lifestyle and health services utilization. Smoking status was measured as self-reported current tobacco smoking. Obesity was measured on the basis of self-reported height and weight, and defined as a body mass index >29 and <70. Sedentary lifestyle was measured either by asking the best described respondents' leisure time activities or the frequency of respondents' physical exercises or activities. The measurement of health services utilization was based on visits to a general practitioner, to specialists, and to any physician. All analyses of health services utilization were adjusted for self-assessed health.

Educational level declared at the census and during the interview surveys was used as a measure of socio-economic status and classified according to the International Standard Classification of Education (ISCED) using three categories: low (primary and lower secondary education), middle (upper secondary education) and high (post-secondary or tertiary education). Persons with missing information on educational level (generally <5%) were excluded from the analysis.

Statistical analysis

Analyses were conducted separately for men and women aged 30–74 years at baseline (i.e. at the time of census). The follow-up time was 10 years for most countries except Belgium, Denmark, Basque Country (5 years) and Madrid (1.5 years). To obtain comparable ages at death, analyses were conducted on slightly older age groups at baseline for countries with shorter follow-up period (35–79 years for Madrid, and 30–79 years for Belgium and the Basque Country). In Denmark, no information on socio-economic status was available for subject aged >75 years. Further information on this adjustment procedure can be found elsewhere (13).

Mortality rates by educational attainment were age-standardized with the direct method using the European Standard Population. The contribution of a specific cause of death to inequalities in all-cause mortality between low- and high-educated people was determined as the share of the rate difference for each cause of death out of the rate difference for total mortality. The magnitude of mortality inequalities according to educational level was summarized by relative (relative index of inequality, RII) (14) as well as absolute (slope index of inequality, SII) measures of inequality (1) using Poisson regression due to count data.

Prevalence rates of determinants by educational level were also age-standardized, and inequalities in determinant prevalence were summarized by RIIs. As the prevalence of the determinants was relatively high (>10%), we used log-binomial regression.

RESULTS

Mortality analyses

All populations included in the analysis show a graded relationship between education and mortality, but the absolute gap in mortality between the lowest and highest educated is smaller in the three Spanish populations (supplementary figure 1). Average mortality rates are also lower in Spain than in other Western European populations, both among men (with the exception of Barcelona) and particularly among women, where mortality in the lowest educated group is lower compared with the highest educated group in all other Western European populations.

Table 2 shows relative inequalities in total and cause-specific mortality. Among men, relative inequalities in total mortality in all Spanish regions tend to be smaller than those in most other populations, although the differences are neither entirely consistent nor substantial. Among women, relative inequalities in total mortality in the three Spanish regions are substantially smaller than those in all other populations, with the exception of Turin, which has similarly small RIIs.

Among men, relative inequalities in CVD mortality in the three Spanish regions are smaller than those in all other populations, but inequalities in mortality from other causes of death are similar in magnitude, or even larger than those elsewhere. Among women, relative inequalities in mortality from cancer are smaller in the three Spanish regions, but inequalities in mortality from other causes are not consistently smaller than those in other populations.

Moreover, reverse pattern was observed for lung cancer among women in the three Spanish populations and Turin, and for breast cancer among women in all populations except Turin and the Basque Country. The large inequalities in mortality from infectious diseases in Spain are predominantly due to AIDS mortality. More detailed data on cause-specific mortality by educational level can be found in supplementary tables 2-4.

(Table 2 here)

Figure 1 quantifies the contribution of specific causes of death to the difference in age-standardized mortality rates between low and high educated men and women. It shows that the smaller absolute inequalities in mortality in the three Spanish populations are partly due to smaller absolute inequalities in CVD mortality. These are negligible in Spain, but substantial in most other populations. Among men, these smaller contributions of CVD are due to both lower average rates of mortality, and smaller relative inequalities in mortality (table 2). Among women, these smaller contributions of CVD are mainly due to lower average rates of mortality, and not to smaller relative inequalities in mortality. Among women, smaller or negative absolute inequalities in cancer mortality also contribute importantly to smaller absolute inequalities in mortality in Spain (see supplementary table 5).

(Figure 1 here)

Analyses of survey data

Among men, inequalities in smoking are smaller in Spain than in most other populations (figure 2) because of comparatively prevalent smoking among higher educated Spanish men (P-value < 0.0001 for the comparison between Spanish men and the rest of the countries), while among women, they are small or absent in Spain because higher educated Spanish women smoke more than the lower educated.

Similarly, the smaller inequalities in sedentary lifestyle in the Basque Country are due to the fact that the higher educated are less physically active (P-value < 0.0001). With regard to obesity, the inequalities are substantial in all countries (figure 2).

After adjustment for self-assessed health, inequalities in health services utilization tended to favour the lower educated regarding visits to GP in most populations, including Spain. The opposite was observed for the use of specialized services, with the exception of the Basque Country.

(Figure 2 here)

DISCUSSION

Summary of findings

The Spanish populations have considerably smaller absolute inequalities in total mortality than other Western European populations. This is the result of both lower average levels of mortality and smaller relative inequalities in mortality. However, the analysis by cause of death reveals an important heterogeneity: smaller relative inequalities in total mortality in Spain are due mainly to comparatively small inequalities in mortality from CVD (men) and cancer (women). Inequalities in mortality from most other causes are not smaller in Spain than elsewhere, and inequalities in infectious disease mortality are even substantially larger.

Spain also has smaller inequalities in smoking and sedentary lifestyle, but not in health services utilization and its inequalities in obesity among women are larger than in the other populations. On the basis of these four determinants, one cannot therefore conclude that the exposure of lower socio-economic groups to health risks is generally more favourable in Spain than elsewhere.

Limitations

Although education as a measure of socio-economic position remains constant during adult life and old age (15, 16), reverse causation is less likely (17) and educational level is comparable across European countries when broader categories classified according to the ISCED are used (18), the impact of education on individual overall socio-economic position may differ between countries.

The comparability of the mortality rates may be compromised by differences between countries in calendar year at start and duration of follow-up. While we adjusted our results for different follow-up periods, we could not correct them for different starting years. Since there were mostly earlier for Northern Europe, and since inequalities in mortality have been widening in these European countries (19), any bias due to differences in starting year would tend to lead any differences in the magnitude of mortality inequalities in Spain to be underestimated. Regarding the differences in length of follow-up, 'sensitivity analysis' (comparison of countries with similar length of follow-up) gives the same results. The data available on the prevalence of determinants and the mortality follow-up applied to the same period. Data that would allow proper time-lag to be incorporated between exposure and outcome in our analysis were not available. However, it is unlikely that the social patterning of these risk factors changes substantially within a 5- or 10-year period.

We cannot exclude that some of our cause-specific results are affected by inaccuracies such as differences in certification or coding of causes of death between countries and socio-economic groups (20). However, we believe that those results using broad cause-of-death categories are likely to be robust.

Differences in the magnitude of inequalities in mortality between Northern and Southern European populations may be biased by the fact that we compared national mortality data for Northern European countries with urban or regional mortality data in Southern European countries. Although Turin,

Barcelona, Madrid and the Basque Country are relatively more prosperous than other regions in Italy and Spain, results show that inequalities in mortality in Turin, Barcelona and Madrid (where the share of the urban population is very large) are not greater than in the Basque Country (which contains only three medium-sized cities). In addition, on the basis of national mortality data during the 1980s, Kunst et al. (21) have shown smaller inequalities in mortality in Italy and Spain as a whole. Recently, Regidor et al. (22) reported small inequalities in mortality among older people in Spain. We therefore think that the comparatively small inequalities in mortality observed in Barcelona, Madrid and the Basque Country can be generalized to Spain as a whole.

Interpretation

The smaller educational inequalities in mortality observed in Spain are likely to be an effect of a later socio-economic modernization of Spain than that of Northern Europe. The socio-economic modernization refers to the historical process of large-scale socio-economic changes in society, such as rising prosperity, industrialization, urbanization and expansion of mass education. This may have led to smaller educational inequalities in mortality in two ways.

The first is that, due to later socio-economic modernization, educational attainment still may be less important as a social stratifier in Spain than in Northern Europe. During the 1990s, the proportion of low educated people was still about 70% in Spain, against only 30–50% in Northern Europe (supplementary table 6). Spain's very rapid economic development after the Franco dictatorship (23) may have created a mismatch between education and other status-attainment variables such as income and occupational class. This is confirmed by a review of comparative studies which found weaker relationship between educational attainment and occupational class in Spain compared to Northern European countries (24, 25) and the Netherlands (26). The health survey data also suggested a weaker relationship between educational level and income in the Basque Country than in several Northern European countries, particularly among men (supplementary table 7).

The second possible pathway is that later socio-economic development has delayed the epidemiologic transition (27). The transition from a mortality regime dominated by infectious diseases to one dominated by CVD and cancer occurred several decades later in Spain than in Northern Europe (28). The small absolute inequalities in CVD mortality in Spain are partly because average rates of mortality from CVD, particularly IHD, have remained low, especially among men (supplementary tables 2-4). While the increase in IHD mortality started many years later than in Northern Europe, the decline started only a few years later (29). The decline in IHD mortality in Spain after 1975 has been ascribed to the decline in smoking (only among men) and to improvements in medical care (e.g. cardiovascular drugs and intensive care units) (29). In other words, Spain already started to benefit from advances in knowledge about risk factors for IHD and advances in medical care before the epidemic could reach a higher peak.

That IHD mortality has never reached great heights in Spain is probably also due to the role of the Mediterranean diet with comparatively high consumption of wine, fish, fruits, vegetables, and olive oil (30). In view of the fact that partial adherence to the Mediterranean diet seems to explain the low average rates of mortality from IHD in Spain, it seems likely that adherence to this diet by lower socio-economic groups also explains part of the smaller inequalities in IHD mortality and the low rates of IHD mortality among the highe educated despite their high prevalence of smoking and physical inactivity. This is confirmed by a review of inequalities in diet in different European countries, which shows that the association between education and fruit and vegetables consumption is inconsistent in Spain (and clearly positive in Northern Europe), while the higher educated in Spain consume more animal fat and fewer vegetable oils than the lower educated (31). Not all studies, however, reach the same conclusions (32, 33).

Another reason for the smaller relative inequalities in IHD mortality in Spain can probably also be found in the different timing of epidemiologic developments. Previous studies have concluded that Southern European countries tend to be at an earlier stage of the smoking epidemic, in which smoking is still more prevalent in upper socio-economic groups, especially among older people and women (19).

Regarding cancer mortality, smaller absolute inequalities among women in the three Spanish populations were due partly to the strong reverse gradients for breast and lung cancer. Breast cancer is related to reproductive behaviour (a particularly high age at first pregnancy), and reverse gradients of breast cancer arise because higher educated women are the first to delay pregnancy to higher ages (34). The stronger reverse gradient in Spain may be due to the fact that this aspect of modernization started later, too (34).

Spain had very large inequalities in mortality from infectious diseases, due mainly to AIDS. During the 1990s, large inequalities in AIDS mortality in Spain were driven by a combination of lower access and adherence to treatment and to unfavourable material conditions among vulnerable groups (35). The introduction of highly active antiretroviral therapy (HAART) has contributed importantly to narrowing absolute inequalities in AIDS mortality in Spain (36).

Conclusion

Educational inequalities in cause-specific mortality and its determinants are not consistently smaller in Spain than in other Western European populations. Smaller absolute inequalities in total mortality in Spain reflect smaller absolute inequalities in mortality from CVD and cancer. On the other hand, Spain does not have smaller inequalities in mortality from many other causes of death, and as many of these relate to living conditions, our findings suggest that smaller inequalities in total mortality in Spain do not reflect a generally more favourable situation with regard to social inequality.

Smaller inequalities in mortality from CVD and cancer are likely to be due to Spain's later socio-economic modernization. While the Spanish example shows that inequalities in total mortality are not

inevitable, the favourable situation in terms of inequalities in mortality from CVD and cancer in this country seems to be a historical coincidence rather than the outcome of deliberate policies. Unfortunately, in view of the on-going changes in social-protection policies in Spain and the changing socio-economic distribution of risk factors for mortality in the Spanish population (37), this favourable situation is also likely to be transitory.

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Key points:

- Although the social inequalities in mortality and health are relatively small in southern European countries compared to the rest of Europe, the smaller size of inequality in total mortality in Spain does not represent an unambiguously favourable situation.
- Smaller inequalities in mortality in Spain were only found for cardiovascular disease and cancer. Inequalities in mortality from most other causes were not smaller in Spain than elsewhere.
- The smaller inequalities for cardiovascular diseases and cancer did not resulted from lower risk factor prevalence in lower socio-economic groups but from relatively high risk factor prevalence in higher socio-economic groups.
- The on-going changes in social-protection policies in Spain and the changing socio-economic distribution of risk factors for mortality in the Spanish population need to be taken into account to tackle health inequalities.

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Table 1: Data sources of mortality and determininants, 30–74 years

Country	Mortality data				Morbidity data		
	Type of study	Follow-up period	Number of person years at risk	Number of deaths	Survey	Years	Number of respondents
Finland	National, longitudinal, census-linked mortality study	1990–2000	25874201	270130	Finbalt Health Monitor	1994, 1998, 2000, 2002, 2004	15207
Sweden	National, longitudinal, census-linked mortality study	1991–2000	43042216	393038	Swedish Survey of Living Conditions	2000–2001	7999
Norway	National, longitudinal, census-linked mortality study	1990–2000	19956768	213022	Norwegian Survey of Living Conditions	2002	4834
Denmark	National, longitudinal, census-linked mortality study	1996–2000	13926291	136065	Danish Health and Morbidity Survey	2000	11739
Belgium	National, longitudinal, census-linked mortality study	1991–1995	24861015	283349	Health Interview Survey	1997–2001	13114
Italy	Urban, longitudinal, census-linked mortality study for the city of Turin	1991–2001	4873109	50621	Health and Health Care Utilization, Multipurpose Family Survey, Aspects of Daily Living	1999–2000, 2000	116600
Spain	Urban, longitudinal, census-linked mortality study for the city of Barcelona	1992–2001	8151810	77101	National Health Survey	2001	13926
	Regional, longitudinal, census-linked mortality study for the region of Madrid	1996–1997	3663333	22585			
	Regional, longitudinal, census-linked mortality study for the Basque Country	1996–2001	6098485	41704	Health Survey of the Basque Country	2002	8920

Table 2: Relative index of inequality (RII) for selected causes of death by educational level, and corresponding 95% confidence intervals (CI), nine European populations, 30–74 years

	Finland		Sweden		Norway		Denmark		Belgium		Turin		Barcelona		Madrid		Basque country	
	RII	95%-CI	RII	95%-CI	RII	95%-CI	RII	95%-CI	RII	95%-CI	RII	95%-CI	RII	95%-CI	RII	95%-CI	RII	95%-CI
Men																		
Cardiovascular diseases	**2.17**	(2.10-2.25)	**1.99**	(1.94-2.04)	**2.12**	(2.05-2.19)	**1.81**	(1.72-1.90)	**1.77**	(1.70-1.85)	**1.51**	(1.37-1.67)	**1.29**	(1.19-1.39)	**1.20**	(1.03-1.39)	**1.25**	(1.11-1.41)
Ischemic heart disease	**2.26**	(2.17-2.36)	**2.16**	(2.09-2.23)	**2.26**	(2.17-2.36)	**2.01**	(1.88-2.16)	**1.75**	(1.64-1.86)	**1.54**	(1.31-1.80)	**1.21**	(1.08-1.36)	**1.03**	(0.83-1.28)	**1.19**	(1.00-1.43)
Cerebrovascular disease	**1.91**	(1.76-2.06)	**1.73**	(1.63-1.84)	**1.82**	(1.68-1.97)	**1.59**	(1.42-1.78)	**1.71**	(1.55-1.89)	**1.85**	(1.49-2.30)	**1.65**	(1.39-1.96)	**1.20**	(0.85-1.68)	**1.09**	(0.85-1.39)
Other circulatory diseases	**2.11**	(1.93-2.31)	**1.75**	(1.66-1.85)	**1.97**	(1.83-2.12)	**1.59**	(1.45-1.75)	**1.83**	(1.70-1.97)	**1.31**	(1.11-1.55)	**1.18**	(1.03-1.36)	**1.43**	(1.12-1.82)	**1.46**	(1.18-1.81)
Cancer	**1.68**	(1.61-1.75)	**1.32**	(1.28-1.36)	**1.46**	(1.40-1.52)	**1.32**	(1.26-1.39)	**1.81**	(1.74-1.88)	**1.86**	(1.70-2.05)	**1.55**	(1.45-1.65)	**1.52**	(1.35-1.72)	**1.57**	(1.42-1.73)
Stomach cancer	**2.25**	(1.89-2.69)	**1.83**	(1.61-2.09)	**1.90**	(1.62-2.22)	**2.06**	(1.56-2.72)	**3.20**	(2.57-3.97)	**4.47**	(2.80-7.16)	**4.07**	(2.91-5.69)	**2.35**	(1.44-3.85)	**3.98**	(2.58-6.14)
Lung cancer	**3.35**	(3.07-3.65)	**1.82**	(1.70-1.94)	**2.51**	(2.31-2.73)	**1.82**	(1.66-1.99)	**3.13**	(2.92-3.36)	**2.50**	(2.12-2.96)	**1.78**	(1.58-2.01)	**1.53**	(1.22-1.90)	**1.60**	(1.33-1.93)
Other cancer	**1.22**	(1.16-1.28)	**1.19**	(1.15-1.23)	**1.20**	(1.14-1.25)	**1.14**	(1.08-1.21)	**1.25**	(1.19-1.32)	**1.50**	(1.33-1.68)	**1.36**	(1.25-1.47)	**1.45**	(1.25-1.69)	**1.43**	(1.27-1.61)
Infectious diseases	**1.81**	(1.41-2.32)	**1.74**	(1.45-2.10)	**1.57**	(1.22-2.01)	**3.44**	(2.54-4.66)	**1.29**	(1.05-1.58)	**3.15**	(1.30-7.59)	**3.87**	(3.09-4.85)	**5.65**	(3.64-8.77)	**8.94**	(6.24-12.80)
Respiratory diseases	**4.12**	(3.72-4.57)	**2.48**	(2.29-2.68)	**2.99**	(2.73-3.27)	**3.40**	(3.02-3.81)	**4.41**	(3.97-4.89)	**2.85**	(2.07-3.91)	**3.59**	(2.93-4.39)	**3.81**	(2.63-5.53)	**2.57**	(1.87-3.53)
Pneumonia	**3.73**	(3.24-4.30)	**2.42**	(2.12-2.75)	**2.33**	(2.00-2.71)	**2.54**	(1.90-3.37)	**3.04**	(2.48-3.74)	**1.66**	(0.93-2.97)	**1.76**	(1.18-2.62)	**2.98**	(1.54-5.79)	**1.46**	(0.72-2.99)
Other respiratory diseases	**4.57**	(3.94-5.31)	**2.51**	(2.27-2.78)	**3.41**	(3.05-3.82)	**3.59**	(3.16-4.08)	**4.94**	(4.38-5.57)	**3.49**	(2.39-5.10)	**4.45**	(3.52-5.64)	**4.24**	(2.70-6.65)	**2.90**	(2.04-4.13)
Alcohol-related causes	**3.10**	(2.85-3.38)	**3.90**	(3.51-4.33)	**3.89**	(3.37-4.48)	**2.37**	(2.10-2.68)	**2.39**	(1.98-2.87)	**6.03**	(2.71-13.40)	**4.25**	(2.36-7.68)	**3.47**	(1.27-9.45)	**5.82**	(2.90-11.67)
External causes	**2.69**	(2.53-2.86)	**2.01**	(1.89-2.14)	**2.54**	(2.32-2.79)	**3.25**	(2.92-3.63)	**2.15**	(1.98-2.34)	**1.60**	(1.23-2.09)	**2.28**	(1.82-2.86)	**1.88**	(1.27-2.78)	**3.60**	(2.87-4.52)
Other causes	**1.94**	(1.80-2.09)	**1.85**	(1.76-1.94)	**2.06**	(1.93-2.19)	**2.34**	(2.18-2.50)	**2.06**	(1.93-2.19)	**1.94**	(1.72-2.18)	**2.00**	(1.80-2.24)	**1.87**	(1.53-2.29)	**1.73**	(1.46-2.05)
Total mortality	**2.20**	(2.15-2.25)	**1.79**	(1.76-1.81)	**1.96**	(1.92-2.00)	**1.87**	(1.82-1.93)	**1.97**	(1.92-2.02)	**1.80**	(1.70-1.90)	**1.70**	(1.62-1.77)	**1.65**	(1.52-1.79)	**1.77**	(1.66-1.89)
Women																		
Cardiovascular diseases	**2.41**	(2.29-2.54)	**2.47**	(2.38-2.57)	**2.56**	(2.44-2.69)	**2.71**	(2.50-2.95)	**2.56**	(2.39-2.74)	**1.81**	(1.52-2.14)	**2.02**	(1.73-2.35)	**2.42**	(1.77-3.30)	**2.14**	(1.61-2.84)
Ischemic heart disease	**2.75**	(2.56-2.96)	**2.79**	(2.64-2.96)	**3.04**	(2.82-3.27)	**3.50**	(3.07-3.99)	**3.11**	(2.75-3.51)	**1.99**	(1.43-2.78)	**2.31**	(1.73-3.09)	**2.13**	(1.19-3.83)	**2.35**	(1.35-4.11)
Cerebrovascular disease	**2.08**	(1.89-2.28)	**2.06**	(1.91-2.22)	**2.02**	(1.84-2.22)	**2.11**	(1.81-2.46)	**2.05**	(1.82-2.32)	**1.42**	(1.06-1.90)	**1.67**	(1.28-2.18)	**2.36**	(1.33-4.19)	**2.20**	(1.35-3.59)
Other circulatory diseases	**2.08**	(1.84-2.35)	**2.36**	(2.18-2.56)	**2.42**	(2.19-2.68)	**2.43**	(2.09-2.83)	**2.56**	(2.31-2.85)	**2.08**	(1.57-2.74)	**2.13**	(1.67-2.73)	**2.66**	(1.65-4.29)	**1.95**	(1.24-3.07)
Cancer	**1.21**	(1.15-1.27)	**1.33**	(1.28-1.37)	**1.40**	(1.34-1.47)	**1.35**	(1.28-1.42)	**1.17**	(1.10-1.23)	**1.12**	(0.99-1.27)	**1.03**	(0.93-1.15)	**0.90**	(0.74-1.09)	**0.90**	(0.76-1.06)
Stomach cancer	**1.42**	(1.14-1.77)	**1.88**	(1.56-2.26)	**1.77**	(1.41-2.23)	**1.53**	(1.01-2.32)	**2.41**	(1.72-3.39)	**3.17**	(1.49-6.77)	**1.95**	(1.12-3.38)	**2.27**	(0.92-5.59)	**1.79**	(0.78-4.07)
Lung cancer	**1.87**	(1.57-2.23)	**1.86**	(1.70-2.04)	**2.93**	(2.58-3.33)	**2.42**	(2.13-2.73)	**1.63**	(1.36-1.96)	**0.74**	(0.52-1.06)	**0.48**	(0.34-0.68)	**0.34**	(0.18-0.67)	**0.33**	(0.20-0.56)
Breast cancer	**0.84**	(0.75-0.93)	**0.87**	(0.81-0.94)	**0.77**	(0.69-0.86)	**0.83**	(0.74-0.94)	**0.82**	(0.74-0.91)	**0.94**	(0.73-1.21)	**0.78**	(0.63-0.96)	**0.51**	(0.35-0.74)	**0.91**	(0.64-1.29)
Other cancer	**1.27**	(1.19-1.35)	**1.36**	(1.31-1.42)	**1.39**	(1.31-1.47)	**1.30**	(1.20-1.39)	**1.25**	(1.17-1.34)	**1.23**	(1.04-1.45)	**1.22**	(1.07-1.40)	**1.16**	(0.90-1.49)	**0.99**	(0.80-1.22)
Infectious diseases	**1.93**	(1.41-2.66)	**2.16**	(1.70-2.74)	**2.04**	(1.52-2.72)	**3.10**	(1.91-5.04)	**2.12**	(1.54-2.92)	**2.40**	(0.69-8.37)	**5.31**	(3.18-8.86)	**2.90**	(1.27-6.65)	**4.63**	(2.42-8.87)
Respiratory diseases	**3.06**	(2.62-3.56)	**2.61**	(2.36-2.89)	**3.00**	(2.68-3.37)	**3.51**	(3.07-4.01)	**3.05**	(2.53-3.68)	**1.95**	(1.17-3.25)	**1.40**	(0.92-2.13)	**2.85**	(1.16-6.99)	**1.59**	(0.75-3.37)
Pneumonia	**3.17**	(2.60-3.85)	**2.95**	(2.44-3.56)	**2.14**	(1.78-2.57)	**2.88**	(1.96-4.23)	**2.87**	(2.07-3.98)	**1.15**	(0.50-2.65)	**1.21**	(0.57-2.55)	**2.81**	(0.64-12.39)	**2.42**	(0.58-10.11)
Other respiratory diseases	**2.89**	(2.26-3.69)	**2.48**	(2.20-2.80)	**3.69**	(3.19-4.28)	**3.61**	(3.13-4.16)	**3.14**	(2.50-3.94)	**2.58**	(1.34-4.96)	**1.49**	(0.90-2.48)	**2.87**	(0.93-8.87)	**1.33**	(0.56-3.20)
Alcohol-related causes	**3.82**	(3.18-4.60)	**3.79**	(3.08-4.67)	**3.39**	(2.56-4.49)	**2.20**	(1.78-2.72)	**1.66**	(1.26-2.19)	**6.34**	(1.40-28.76)	**3.36**	(0.98-11.56)	**1.49**	(0.28-8.00)	**4.39**	(1.02-18.96)
External causes	**1.65**	(1.48-1.84)	**1.34**	(1.22-1.47)	**1.18**	(1.02-1.37)	**1.86**	(1.58-2.18)	**1.33**	(1.18-1.52)	**0.93**	(0.63-1.38)	**1.27**	(0.88-1.83)	**1.16**	(0.58-2.34)	**1.93**	(1.19-3.13)
Other causes	**2.08**	(1.91-2.26)	**2.45**	(2.30-2.62)	**2.05**	(1.89-2.21)	**2.27**	(2.06-2.49)	**2.13**	(1.96-2.32)	**1.57**	(1.32-1.85)	**2.23**	(1.87-2.65)	**1.95**	(1.37-2.76)	**2.34**	(1.70-3.20)

Total mortality	**1.84**	(1.78-1.89)	**1.84**	(1.80-1.88)	**1.92**	(1.87-1.98)	**1.91**	(1.84-1.99)	**1.73**	(1.67-1.79)	**1.40**	(1.29-1.52)	**1.51**	(1.40-1.62)	**1.40**	(1.22-1.61)	**1.44**	(1.28-1.63)

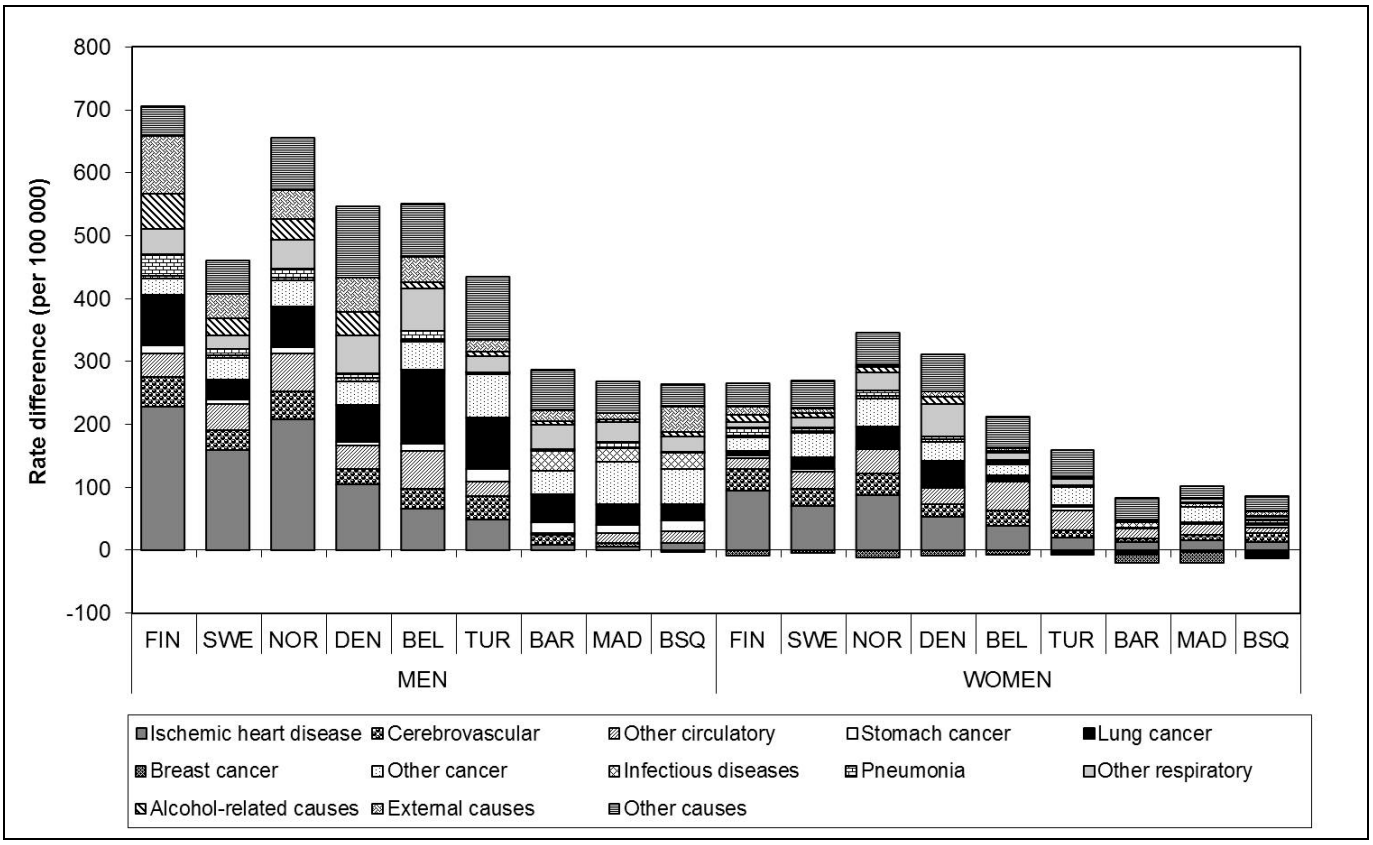
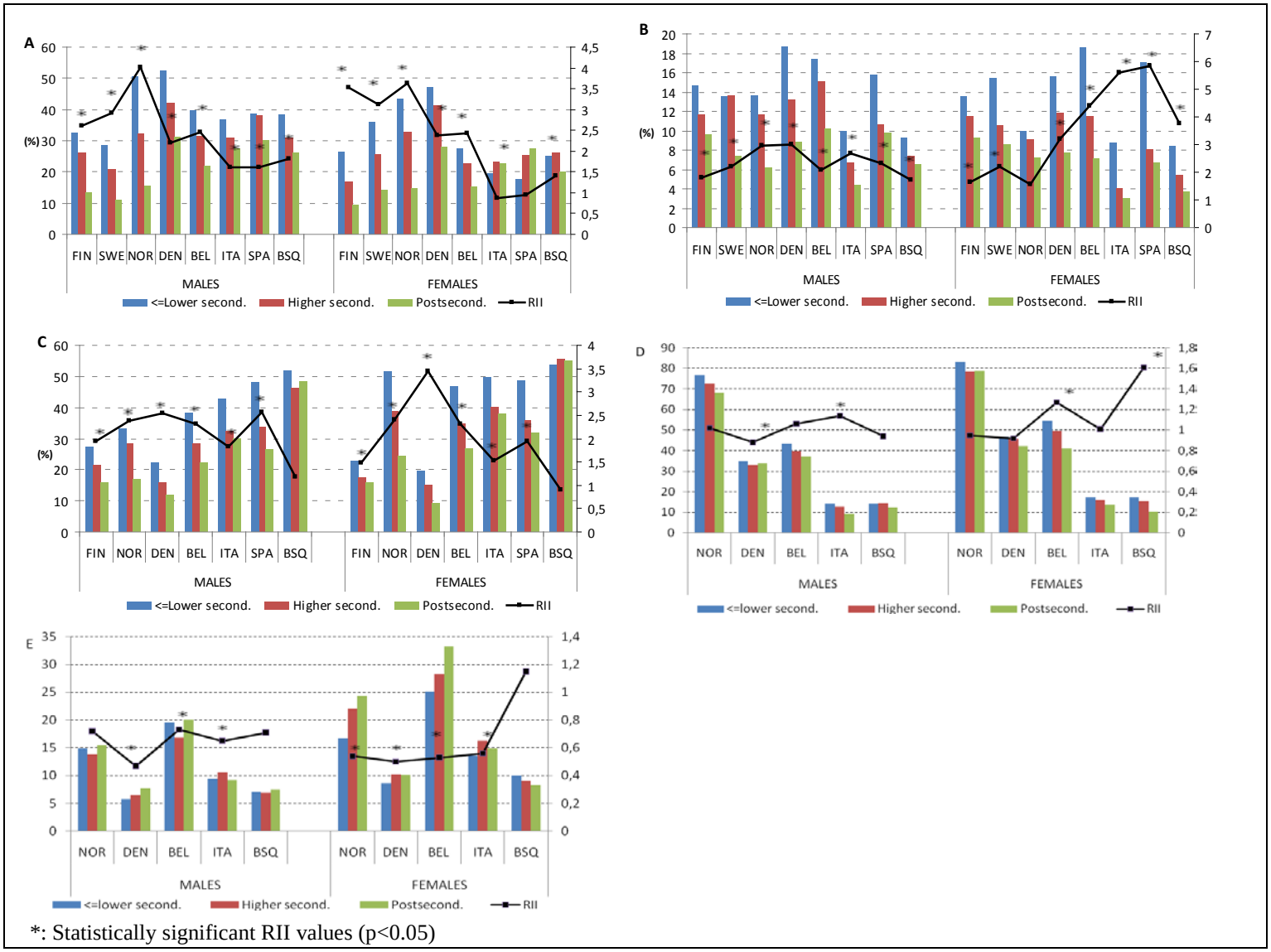


Figure 1: Contribution of causes of death to the difference in age-standardized mortality rates between low and high educated men and women, 30–74 years

Legend: FIN = Finland, SWE = Sweden, NOR = Norway, DEN = Denmark, BEL = Belgium, TUR = Turin, BAR = Barcelona, MAD = Madrid, BSQ = Basque Country

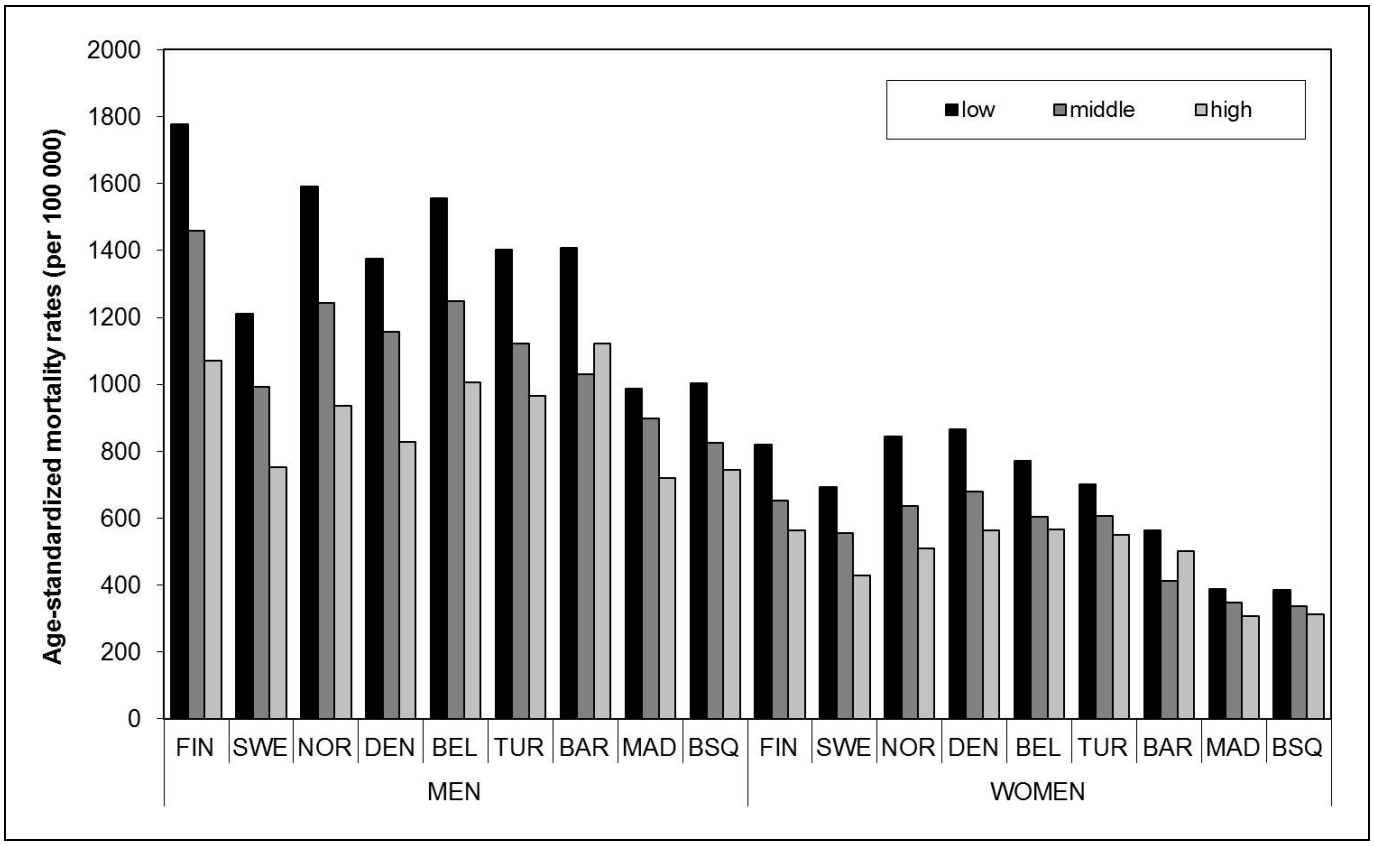


*: Statistically significant RII values ($p<0.05$)

Figure 2: Age-adjusted prevalence and relative index of inequality of (A) current smoking, (B) obesity, (C) sedentary lifestyle, (D) visit to GP and (E) visit to specialist

Legend: FIN =Finland, SWE = Sweden, NOR = Norway, DEN = Denmark, BEL = Belgium, ITA = Italy, SPA = Spain, BSQ = Basque Country

Supplementary material



Supplementary figure 1: Age-standardized mortality rates (per 100 000 person-years) according to the educational level, 30–74 years

Legend: FIN = Finland, SWE = Sweden, NOR = Norway, DEN = Denmark, BEL = Belgium, TUR = Turin, BAR = Barcelona, MAD = Madrid, BSQ = Basque Country

Supplementary table 1: ICD codes of causes of death selected for the analysis

Causes of death	ICD-9 codes	ICD-10 codes
Cardiovascular	390–459	I00–I99
IHD	410–414	I20–I25
Cerebrovascular	430–438	I60–I69
Other circulatory	Rest (390–459)	Rest (I00–I99)
Cancer	140–239	C00–D48
Stomach cancer	151	C16
Lung cancer	162–163, 165	C33–C34, C39
Breast cancer	174–175	C50
Other cancer	Rest (140–239)	Rest (C00–D48)
Infectious diseases	001–139	A00–B99
Respiratory diseases	480–487, 490–494, 496	J10–J18, J40–J47
Pneumonia	480–487	J10–J18
Other	490–494, 496	J40–J47
Alcohol-related causes	291,303,305.0,425.5, 571.0–571.3, 577.0–577.1, E860	F10, I42.6, K70, K85–K86.0, X45
External causes	E800–E999 (except E860)	V01–Y98 (except X45)
Other causes	Rest (001–E999)	Rest (A00–Y98)

Supplementary table 2: Age-standardized mortality rates (per 100 000), low education, 30–74 years

	Finland	Sweden	Norway	Denmark	Belgium	Turin	Barcelona	Madrid	Basque
Men									
Cardiovascular diseases	**784.8**	**544.8**	**680.3**	**419.7**	**497.2**	**418.0**	**373.3**	**254.4**	**254.5**
Ischemic heart disease	537.5	346.5	427.8	232.9	214.0	169.4	166.3	105.7	108.5
Cerebrovascular disease	139.5	88.1	114.2	76.2	98.2	100.1	89.3	48.7	58.7
Other circulatory diseases	107.9	110.2	138.3	110.6	185.0	148.5	117.8	100.0	87.4
Cancer	**425.5**	**341.9**	**456.4**	**420.7**	**537.7**	**520.0**	**579.8**	**411.5**	**418.5**
Stomach cancer	29.3	18.8	30.1	14.3	24.6	30.3	33.5	29.0	32.5
Lung cancer	144.0	72.5	126.6	129.4	221.1	182.3	181.4	121.8	111.0
Other cancer	252.2	250.5	299.7	276.9	292.0	307.4	364.9	260.7	274.9
Infectious diseases	**12.1**	**9.1**	**11.8**	**14.1**	**16.8**	**6.8**	**63.2**	**41.7**	**40.6**
Respiratory diseases	**123.5**	**56.1**	**104.5**	**101.6**	**132.6**	**58.5**	**91.7**	**70.8**	**55.8**
Pneumonia	59.8	20.9	33.4	15.2	29.1	13.7	17.5	19.1	8.1
Other respiratory diseases	63.7	35.2	71.2	86.5	103.5	44.9	74.2	51.7	47.8
Alcohol-related causes	**97.2**	**38.3**	**48.8**	**71.7**	**23.2**	**10.5**	**10.3**	**7.3**	**11.9**
External causes	**184.2**	**89.0**	**95.7**	**101.5**	**103.4**	**57.0**	**53.7**	**36.2**	**77.2**
Other causes	**148.9**	**132.9**	**195.1**	**245.7**	**244.9**	**330.6**	**235.7**	**166.2**	**145.8**
Total mortality	**1776.2**	**1212.3**	**1592.6**	**1374.9**	**1555.7**	**1401.5**	**1407.7**	**988.2**	**1004.3**
Women									
Cardiovascular diseases	**329.8**	**239.7**	**295.9**	**201.6**	**262.0**	**197.4**	**155.1**	**107.3**	**96.4**
Ischemic heart disease	183.9	120.2	149.4	89.9	86.6	55.3	46.0	29.5	27.0
Cerebrovascular disease	92.4	60.1	77.2	53.4	70.2	62.9	47.4	30.8	31.5
Other circulatory diseases	53.4	59.5	69.4	58.2	105.2	79.3	61.8	47.1	37.9
Cancer	**248.2**	**271.0**	**316.4**	**352.2**	**262.1**	**267.0**	**230.6**	**164.1**	**164.8**
Stomach cancer	13.2	9.9	13.3	6.4	9.5	12.3	11.3	11.6	9.5
Lung cancer	24.4	40.5	55.1	86.2	26.0	29.3	15.3	9.4	10.6
Breast cancer	44.6	43.0	47.0	63.1	63.0	59.6	51.4	32.1	34.5
Other cancer	165.9	177.6	201.1	196.5	163.5	165.8	152.6	110.8	110.2
Infectious diseases	**7.6**	**6.5**	**8.6**	**5.9**	**9.7**	**3.8**	**15.6**	**11.8**	**11.9**
Respiratory diseases	**41.7**	**38.3**	**63.0**	**89.4**	**35.7**	**22.5**	**17.6**	**13.9**	**12.1**
Pneumonia	26.3	11.6	20.1	9.7	11.8	6.6	5.2	5.1	3.6
Other respiratory diseases	15.5	26.7	43.0	79.8	23.9	15.9	12.5	8.8	8.5
Alcohol-related causes	**23.0**	**10.3**	**13.0**	**25.5**	**10.0**	**3.6**	**2.7**	**2.6**	**3.7**
External causes	**53.5**	**34.8**	**30.7**	**42.0**	**43.8**	**24.2**	**18.5**	**12.5**	**19.4**
Other causes	**117.6**	**92.2**	**116.0**	**150.0**	**148.2**	**182.3**	**123.2**	**76.7**	**78.0**
Total mortality	**821.3**	**692.9**	**843.6**	**866.6**	**771.5**	**701.0**	**563.3**	**389.0**	**386.3**

Supplementary table 3: Age-standardized mortality rates (per 100 000), middle education, 30–74 years

	Finland	Sweden	Norway	Denmark	Belgium	Turin	Barcelona	Madrid	Basque
Men									
Cardiovascular diseases	**641.5**	**424.1**	**522.2**	**360.5**	**421.1**	**369.3**	**302.1**	**253.8**	**229.5**
Ischemic heart disease	437.8	259.8	321.0	193.3	183.8	152.8	139.9	111.7	102.9
Cerebrovascular disease	118.4	73.4	92.9	68.0	85.6	81.8	61.7	46.9	48.9
Other circulatory diseases	85.3	90.8	108.3	99.1	151.6	134.6	100.5	95.2	77.7
Cancer	**364.0**	**315.1**	**394.9**	**411.3**	**445.9**	**405.7**	**437.3**	**403.6**	**355.7**
Stomach cancer	22.1	15.8	22.4	11.1	15.1	17.4	14.7	23.5	15.7
Lung cancer	103.4	61.6	90.1	119.1	148.5	124.3	134.3	118.0	88.7
Other cancer	238.4	237.7	282.4	281.1	282.3	263.9	288.2	262.1	251.3
Infectious diseases	**11.9**	**7.3**	**9.3**	**7.5**	**15.1**	**4.0**	**37.5**	**19.5**	**19.9**
Respiratory diseases	**82.4**	**42.0**	**70.0**	**70.9**	**78.5**	**37.7**	**48.1**	**48.0**	**39.3**
Pneumonia	41.4	15.0	23.4	10.0	20.0	8.8	11.3	12.5	6.1
Other respiratory diseases	41.0	27.0	46.7	61.0	58.5	28.8	36.9	35.5	33.2
Alcohol-related causes	**78.1**	**26.0**	**31.7**	**59.7**	**18.7**	**5.1**	**4.3**	**6.8**	**6.1**
External causes	**148.9**	**71.8**	**66.9**	**65.0**	**80.0**	**49.1**	**37.3**	**25.7**	**50.5**
Other causes	**132.5**	**106.5**	**148.6**	**182.5**	**188.5**	**251.5**	**163.8**	**140.6**	**124.4**
Total mortality	**1459.3**	**992.7**	**1243.5**	**1157.4**	**1247.7**	**1122.3**	**1030.4**	**898.0**	**825.4**
Women									
Cardiovascular diseases	**242.2**	**174.5**	**201.4**	**139.1**	**175.1**	**154.7**	**98.3**	**71.9**	**68.7**
Ischemic heart disease	131.8	84.3	94.2	56.3	50.4	41.3	27.3	26.8	21.4
Cerebrovascular disease	70.3	47.2	58.2	41.0	52.9	54.2	30.1	17.7	25.5
Other circulatory diseases	40.1	42.9	48.9	41.8	71.8	59.1	40.9	27.4	21.9
Cancer	**229.2**	**246.9**	**268.7**	**317.4**	**246.3**	**257.4**	**193.7**	**186.5**	**178.6**
Stomach cancer	12.2	7.6	9.6	5.7	6.0	6.4	4.7	6.3	9.5
Lung cancer	18.6	35.1	35.1	65.5	22.6	33.4	22.8	18.8	16.2
Breast cancer	44.9	44.2	50.0	66.5	70.0	63.2	45.4	43.2	37.4
Other cancer	153.4	160.0	173.9	179.8	147.7	154.5	120.9	118.1	115.5
Infectious diseases	**6.5**	**4.6**	**6.4**	**4.1**	**6.3**	**3.2**	**9.7**	**9.3**	**6.6**
Respiratory diseases	**28.9**	**27.6**	**38.4**	**60.1**	**22.6**	**17.4**	**13.6**	**10.0**	**13.5**
Pneumonia	17.7	7.1	13.7	6.2	6.5	6.3	5.2	3.6	3.7
Other respiratory diseases	11.2	20.5	24.7	53.9	16.2	11.1	8.4	6.3	9.8
Alcohol-related causes	**14.0**	**7.0**	**8.4**	**21.8**	**9.1**	**1.9**	**0.8**	**3.1**	**3.1**
External causes	**45.7**	**31.0**	**26.7**	**29.2**	**36.4**	**22.7**	**17.7**	**9.9**	**14.3**
Other causes	**87.6**	**64.9**	**86.7**	**107.6**	**107.5**	**149.3**	**78.8**	**57.1**	**53.3**
Total mortality	**654.0**	**556.5**	**636.8**	**679.3**	**603.4**	**606.7**	**412.7**	**347.7**	**338.0**

Supplementary table 4: Age-standardized mortality rates (per 100 000), high education, 30–74 years

	Finland	Sweden	Norway	Denmark	Belgium	Turin	Barcelona	Madrid	Basque
Men									
Cardiovascular diseases	**472.0**	**313.2**	**368.8**	**253.9**	**340.6**	**310.0**	**346.0**	**227.4**	**228.7**
Ischemic heart disease	310.4	188.3	220.9	129.0	147.8	120.9	158.1	101.1	97.9
Cerebrovascular disease	92.1	55.5	68.8	51.1	67.1	63.4	73.6	43.0	61.7
Other circulatory diseases	69.5	69.4	79.2	73.8	125.7	125.6	114.3	83.3	69.1
Cancer	**306.9**	**267.8**	**338.9**	**319.2**	**363.4**	**349.3**	**481.0**	**298.5**	**319.4**
Stomach cancer	17.5	11.0	19.6	8.6	12.1	9.9	17.4	16.4	14.9
Lung cancer	63.2	41.4	61.3	70.6	104.2	101.1	137.1	89.4	84.3
Other cancer	226.2	215.5	258.0	240.0	247.1	238.3	326.5	192.8	220.2
Infectious diseases	**8.1**	**5.7**	**8.1**	**7.1**	**13.8**	**3.7**	**32.0**	**19.4**	**13.7**
Respiratory diseases	**48.3**	**24.9**	**44.1**	**34.7**	**51.5**	**32.1**	**49.7**	**29.7**	**31.1**
Pneumonia	25.8	10.4	18.4	8.6	14.3	13.4	15.1	10.2	7.2
Other respiratory diseases	22.4	14.5	25.7	26.1	37.2	18.7	34.6	19.5	23.9
Alcohol-related causes	**41.3**	**10.7**	**16.6**	**34.6**	**12.7**	**3.6**	**5.3**	**2.5**	**4.0**
External causes	**92.3**	**50.0**	**48.7**	**46.6**	**63.4**	**38.9**	**35.7**	**27.2**	**36.8**
Other causes	**102.2**	**80.3**	**111.8**	**132.3**	**159.6**	**229.2**	**171.8**	**115.9**	**109.8**
Total mortality	**1071.0**	**752.6**	**936.9**	**828.4**	**1005.0**	**966.8**	**1121.6**	**720.6**	**743.5**
Women									
Cardiovascular diseases	**183.5**	**114.8**	**135.9**	**102.7**	**153.7**	**134.4**	**121.6**	**65.9**	**61.4**
Ischemic heart disease	90.4	51.0	62.1	38.1	48.7	35.2	33.7	14.3	15.3
Cerebrovascular disease	57.9	32.6	43.1	32.1	45.5	52.2	42.2	22.7	15.8
Other circulatory diseases	35.2	31.2	30.6	32.5	59.5	47.0	45.7	28.9	30.4
Cancer	**224.1**	**214.9**	**247.0**	**287.3**	**242.6**	**236.5**	**250.3**	**157.1**	**170.7**
Stomach cancer	9.8	6.3	9.8	4.7	6.0	7.3	10.7	9.2	4.2
Lung cancer	17.3	21.9	23.1	45.4	19.0	35.2	23.0	13.1	21.6
Breast cancer	53.1	48.4	58.7	71.6	70.9	56.5	64.9	48.7	36.3
Other cancer	143.9	138.3	155.4	165.7	146.7	137.5	151.7	86.1	108.6
Infectious diseases	**4.3**	**3.8**	**4.3**	**2.6**	**7.2**	**0.4**	**7.2**	**6.4**	**6.9**
Respiratory diseases	**20.5**	**17.1**	**26.3**	**33.0**	**19.1**	**12.7**	**16.4**	**7.3**	**7.1**
Pneumonia	13.3	6.0	12.9	5.5	7.7	6.4	4.4	3.4	1.8
Other respiratory diseases	7.2	11.1	12.4	27.4	11.5	6.3	11.9	3.9	5.3
Alcohol-related causes	**11.3**	**3.6**	**4.6**	**14.4**	**7.2**	**1.2**	**2.6**	**0.6**	**1.7**
External causes	**41.2**	**26.9**	**27.2**	**32.6**	**40.2**	**25.3**	**15.7**	**11.9**	**11.4**
Other causes	**79.7**	**47.5**	**64.5**	**92.0**	**97.7**	**138.9**	**87.7**	**59.3**	**54.5**
Total mortality	**564.7**	**428.5**	**509.6**	**564.6**	**567.7**	**549.4**	**501.5**	**308.4**	**313.8**

Supplementary table 5: Slope index of inequality according to cause of death (per 100 000), nine European populations, average age at death 30–74 years

	Finland	Sweden	Norway	Denmark	Belgium	Turin	Barcelona	Madrid	Basque
Men									
Cardiovascular diseases	**525.5**	**313.5**	**402.3**	**213.2**	**260.2**	**162.6**	**89.5**	**44.7**	**54.5**
Ischemic heart disease	375.6	217.5	269.0	135.6	109.4	68.5	30.7	3.0	18.6
Cerebrovascular disease	80.1	42.5	57.1	31.5	48.9	56.1	40.8	8.5	4.9
Other circulatory diseases	69.7	53.5	76.1	45.8	102.0	38.7	18.7	33.5	31.5
Cancer	**201.1**	**88.2**	**152.8**	**111.1**	**289.9**	**293.5**	**234.4**	**162.7**	**177.3**
Stomach cancer	20.2	9.9	15.4	8.5	23.0	33.7	34.6	21.3	35.3
Lung cancer	135.4	37.3	85.3	66.8	203.4	142.6	94.3	48.6	49.2
Other cancer	48.2	41.3	50.8	35.9	64.3	116.7	105.1	92.6	93.6
Infectious diseases	**6.3**	**4.3**	**4.4**	**11.0**	**4.1**	**6.3**	**57.5**	**44.9**	**45.5**
Respiratory diseases	**129.2**	**40.2**	**81.2**	**87.6**	**147.7**	**50.8**	**90.7**	**73.9**	**46.1**
Pneumonia	59.1	14.5	21.7	10.5	26.6	6.3	8.8	17.1	2.9
Other respiratory diseases	70.3	25.8	59.2	77.1	120.5	44.6	81.7	57.0	43.5
Alcohol-related causes	**80.3**	**33.3**	**38.8**	**48.0**	**16.7**	**12.2**	**10.2**	**7.0**	**14.1**
External causes	**140.6**	**50.5**	**62.1**	**79.7**	**67.1**	**24.6**	**35.5**	**19.9**	**71.1**
Other causes	**86.0**	**68.2**	**109.4**	**161.0**	**156.2**	**194.7**	**143.4**	**94.0**	**73.4**
Total mortality	**1191.3**	**602.3**	**859.3**	**726.3**	**942.0**	**746.5**	**670.2**	**456.1**	**524.2**
Women									
Cardiovascular diseases	**248.5**	**174.8**	**214.9**	**161.1**	**215.7**	**109.2**	**100.1**	**85.3**	**67.9**
Ischemic heart disease	155.9	96.6	121.1	84.6	82.6	35.2	34.8	20.6	21.1
Cerebrovascular disease	59.5	36.6	45.0	34.0	46.0	21.3	23.0	23.8	22.9
Other circulatory diseases	34.0	41.4	48.3	42.4	87.0	52.9	42.5	40.8	23.9
Cancer	**45.2**	**71.4**	**95.4**	**98.4**	**39.4**	**29.9**	**7.2**	**-18.1**	**-17.4**
Stomach cancer	4.4	5.2	6.4	2.5	7.4	11.9	7.0	8.5	5.3
Lung cancer	13.5	21.2	41.1	61.8	11.8	-8.8	-11.6	-10.3	-11.7
Breast cancer	-7.9	-6.0	-13.0	-11.8	-12.4	-3.9	-12.9	-22.5	-3.2
Other cancer	37.6	51.1	60.0	48.1	35.8	33.4	30.0	16.1	-1.5
Infectious diseases	**4.4**	**4.0**	**4.9**	**4.9**	**6.5**	**3.0**	**17.5**	**10.5**	**12.5**
Respiratory diseases	**36.9**	**28.4**	**49.2**	**83.5**	**33.4**	**14.0**	**5.7**	**12.7**	**5.4**
Pneumonia	23.7	9.2	12.4	7.8	10.7	0.9	1.0	4.6	2.8
Other respiratory diseases	13.2	19.1	36.9	75.8	22.7	13.4	4.8	8.1	2.4
Alcohol-related causes	**19.7**	**8.5**	**9.5**	**16.2**	**4.7**	**4.6**	**2.5**	**1.1**	**4.2**
External causes	**22.9**	**8.9**	**4.7**	**21.3**	**12.0**	**-1.8**	**4.2**	**1.9**	**11.6**
Other causes	**73.7**	**64.1**	**67.1**	**99.8**	**100.8**	**77.4**	**89.2**	**47.3**	**59.6**
Total mortality	**443.7**	**362.5**	**456.0**	**484.4**	**394.9**	**228.0**	**221.1**	**127.1**	**137.2**

Supplementary table 6: Educational distribution (in %), mortality data, 30–74 years

Country	Educational level		
	Lower secondary and less	Upper secondary	Tertiary
Finland	50.1	29.3	20.6
Sweden	40.6	41.7	17.7
Norway	33.1	47.7	19.2
Denmark	45.1	34.9	20.0
Belgium	64.4	20.3	15.3
Italy (Turin)	71.5	19.8	8.6
Spain (Barcelona)	71.5	12.1	16.4
Spain (Madrid)	70.4	14.8	14.9
Spain (Basque)	70.9	16.2	12.9

Supplementary table 7: Prevalence ratios of being in the lowest income quintiles (4-5) by educational level in the population over 50 years

Country	Education	Men		Women	
		Prevalence ratio	95%-CI	Prevalence ratio	95%-CI
Norway	**low**	4.81	(3.57-6.47)	3.36	(2.65-4.25)
	middle	2.77	(2.05-3.75)	2.04	(1.60-2.61)
	high	1	-	1	-
Sweden	**low**	3.43	(2.74-4.29)	3.91	(3.19-4.79)
	middle	1.80	(1.42-2.29)	2.24	(1.81-2.78)
	high	1	-	1	-
Denmark	**low**	2.80	(2.50-3.14)	2.73	(2.47-3.02)
	middle	1.93	(1.71-2.18)	1.77	(1.57-2.00)
	high	1	-	1	-
Belgium	**low**	2.26	(1.98-2.58)	2.07	(1.80-2.38)
	middle	1.48	(1.26-1.73)	1.46	(1.24-1.71)
	high	1	-	1	-
Basque Country	**low**	2.06	(1.69-2.53)	2.34	(1.47-3.72)
	middle	1.18	(0.89-1.56)	0.90	(0.41-1.99)
	high	1	-	1	-