Advances in cause-specific mortality of highly educated married people in Finland, Norway, and Sweden

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Introduction

Research devoted to mortality differentials focus primarily on the magnitude of differences or on the unfavorable health situation of the disadvantaged groups. At the same time mortality of the population with the lowest mortality receive much less attention. At the country level, it has been argued that vanguard populations displaying record longevity levels may predict future life expectancy trends for other countries lagging behind (Oeppen & Vaupel, 2002, Vaupel, 2003). Such vanguard groups within national populations can also be considered as predicting the future of mortality of other population groups and entire populations.

In this study, the vanguard as a two-dimensional group of highly educated married people since education and marital status are the two principal health dimensions determining availability of human and social capital (Ross & Mirowsky, 1999; Anson, 1989; Goldman, 2001). The main aim is to determine to what extent the non-vanguard populations follow mortality trajectories of the vanguard group in respect to causes of death. Therefore, we systematically analyze trends in cause-specific mortality in the vanguard groups and remaining populations in Finland, Norway, and Sweden from the early 1970s to the late 1990s.

Data and methods

For our analyses we use high quality census-linked mortality data for Finland, Norway, and Sweden covering the period 1971-2000. The data have been provided by the Statistics Finland, Statistics Norway, and Statistics Sweden. For Finland, census-based information about education and marital status was linked with the register information about deaths during the following five calendar years after the 1970, 1975, 1980, 1985, 1990, and 1995 censuses. For Norway, the information on education and marital status of the deceased and survivors was obtained using the 1970, 1980, and 1990 census data. Therefore, the data were available for the three five-year periods (1971-1975, 1981-1985, and 1991-1995). Finally, only the censuses of 1970 and 1990 were available for Sweden. Thus, the data series for this country cover only two periods (1971-75 and 1991-95).

We consider two population groups: vanguard group (married people with high education) and non-vanguard group (non-married people with lower than high education). In order to avoid potential discrepancies due to the changes in education and marital status, we restrict our analyses to the ages above 40.

Cause-specific mortality trends are analyzed by means of standardized death rates, age-specific probabilities of dying, and age- and cause- decomposition of life expectancy.

Results

Divergent trends in life expectancy at age 40

Figure 3 suggest that there are any signs of convergence of life expectancy at age 40 between vanguard and non-vanguard populations in Finland, Norway, and Sweden. This is despite the common trend, across countries and both population groups, showing important health improvements over 25 years of observation.

There were important country-specific differences in terms of the magnitude of life expectancy improvements over the period 1971-1995. For both sexes, overall life expectancy increases were the most significant in Finland, and the slowest in Norway (Fig. 1). With exception of the Norwegian females, the health gains were more significant in the vanguard group than in the non-vanguard group. The most significant improvements were observed among the Finnish vanguard population (5.0 and 5.5 years for males and females, respectively), whereas the smallest gains were observed in Norway (only 1.5 years for non-vanguard males). Norwegian vanguard females, showing the highest life expectancy at the beginning, experienced almost no improvement between 1971-75 and 1981-85. Similar stagnation in health trends of the vanguard females can be also observed in Finland. It can be seen that only Finnish non-vanguard males and females managed to catch up with the initial life expectancy levels of the vanguard group in 1971-75 (Fig. 1). For females it happened in 1991-95, whereas males achieved this level in 1996-2000.

Differences in the speed of health improvements in the vanguard and non-vanguard groups predetermined the corresponding changes in the life expectancy gap. Among males, the life expectancy gap between the two groups increased significantly in all three countries. The biggest difference was observed in Finland for the both 1971-75 and 1991-95 (4.5 and 5.6 years), whereas the smallest gap was in Sweden (3.0 and 4.4 years, respectively). Norway having a slightly worse situation at the beginning, showed the exactly same magnitude of the difference as in Sweden in 1991-95. Among females, the initial health gap was the biggest in Norway (5.0 years) and the smallest in Finland (3.0 years). However, over twenty five years of observation, the differences grew notably in Sweden and Finland, whereas the gap remained at the same level in Norway (Fig. 1). As result, the differentials in the two countries became the same (Finland) or even higher (Sweden).

No signs of convergence within different age ranges

Figure 2 summarizes the trends in probabilities of dying within different age ranges (40-64 years, 65-74 years, and 75-84 years). Despite some important cross-country variations, there are any signs of the convergence in mortality between vanguard and non-vanguard groups within any of the three age ranges. Among males in all three countries, the most significant widening of mortality inequalities concerned the youngest age group 40-64 years (Fig. 2). Among females, it is possible to observe some important country-specific peculiarities. In Finland, the most important widening of the difference occurred in the age range 65-74, whereas in Sweden the most significant divergence can be observed for the ages 40-64. Finally, the most striking widening of the gap is attributable to Norwegian females at the ages 75-84 (Fig. 2).

Differences in the contributions of causes of death to the trends

Figure 3 provides data on contributions of different causes of death to the overall changes in life expectancy at age 40 in vanguard and non-vanguard groups in the three countries. It can be seen that life expectancy gains in the both groups were mainly achieved thanks to the success in reduction of cardiovascular mortality. This cause of death alone accounts for at least 60% of the net growth in male and female life expectancy in all three countries. With exception of the Norwegian females, the vanguard group showed significantly higher contributions of cardiovascular system diseases than non-vanguard group (Fig. 3). Among males, the biggest share of the contributions of cardiovascular system diseases came from reductions in mortality due to heart diseases. As for females, the contributions of cerebrovascular and other cardiovascular diseases were almost equally (for Finland and Sweden) or even more important (for non-vanguard group in Norway).

With an exception of Swedish non-vanguard males, the second most important role was played by neoplasms. The positive impact of this cause of death was almost equally important for both vanguard and non-vanguard males in Finland (about 0.6 years), whereas in Sweden the gains were more significant only for the vanguard males (0.7 years vs. 0.2 years, respectively). By contrast, in Norway, the contributions of neoplasms were negative for both groups (Fig. 3). Such opposite effect is mainly due to worsening in mortality due to prostate cancer (for the vanguard group) and mortality due to lung cancer (for the vanguard group). For the changes in female life expectancy, cancer mortality was less important (Fig. 3). It can be seen that the life expectancy gains due to this cause were greater for the vanguard groups. The only negative contribution can be observed for non-vanguard group in Norway. It is also important to note similar negative contributions of smoking-related lung cancer for both the vanguard and non-vanguard females in Norway and Sweden (Fig. 3).

The importance of other causes varies from country to country. External causes of death played a more important role for the changes in life expectancy for males in Sweden and for females in Finland and Sweden. In particular, the bigger contributions of this cause explain greater life expectancy gains among the vanguard females in Finland and Sweden. The respiratory system diseases made important contributions only in Finland and Norway. Among females in these two countries, the impact of improvements in respiratory diseases mortality was much more notable for the vanguard group. Similar disadvantage of the non-vanguard group can also be observed for the contributions of digestive system diseases among the Swedish females. Negative contributions of digestive system diseases and other causes of death counterbalanced a large part of the life expectancy gains in the female vanguard group in Norway. Similar albeit smaller scale negative effect of other causes of death can also be observed for the vanguard females in Sweden (Fig. 3).

Divergences in time trends in cause-specific mortality: the case of Finland

To look at more details of cause-specific changes, we depict time trends in mortality due to other heart diseases (excluding rheumatic dis.), cerebrovascular diseases, all other cardiovascular system diseases, cancers of larynx, trachea, bronchus, and lung, cancer of stomach, prostate cancer, other neoplasms, alcohol-related causes of death, and external causes of death for the vanguard and non-vanguard groups in Finland. Figures 4-7 suggest that for the most of the causes of death, the mortality gap increased or at least remained at the same initial level. The first exception concerns the convergence in female mortality due to cancer of stomach, whereas the second exception is attributable to the narrowing gap in male mortality due to other heart diseases.

Figures 4-5 point to the differences in the speed of progress in reducing mortality due to ischaemic heart diseases, other heart diseases (excluding rheumatic dis.), cerebrovascular diseases, and all other cardiovascular system diseases. With the exception of other heart diseases, the improvements were faster in the vanguard group. Male and female mortality due to ischaemic heart diseases decreased by 2.1-2.3 times for the vanguard group, whereas the corresponding reduction in the non-vanguard group was 1.5-1.7 times. As a consequence, non-vanguard males surpassed the initial mortality level of the vanguard males only in 1991-1995, whereas non-vanguard females did not manage to reach such level even by the end of the period covered. Significant differences in the speed of mortality decline between the vanguard and non-vanguard groups can also be observed for cerebrovascular diseases (females) and other cardiovascular system diseases (males).

The group-specific trends are contradictory for different cancers. First, there are any signs of convergence for smoking-related cancer (cancers of larynx, trachea, bronchus, and lung) (Fig. 6). For males, the non-vanguard group in 1996-2000 showed mortality higher than the initial level of the vanguard group in 1971-75. At the same time, the female gap widened only in the 1990s, following a short term improvement in the vanguard group. Second, stomach cancer mortality showed strong and almost parallel improvements for both groups among males. For females, the trend was less consistent for the vanguard group, whereas non-vanguard groups showed very strong and rapid mortality improvement throughout the whole period. There were any significant group-specific differences in male mortality due to prostate cancer. At the same time, the expected disadvantage of the vanguard females in breast cancer mortality disappeared by the beginning of the 1990s (Fig. 6). Finally, there was a small increase in mortality gap for other cancers. Both non-vanguard males and females did not manage to catch up with the initial levels of the vanguard groups.

Probably the most illustrative example of the diverging trends between the vanguard and non-vanguard groups concerns alcohol-related causes of death (Fig. 7). Although alcohol mortality increased in the both groups, the deterioration was much more (2.4 times vs. 1.3 times) pronounced in the non-vanguard group. Although there was no similar widening of the mortality gradient for external causes of death, notable mortality excess of the non-vanguard group (1.6-2.0 times) remained unchanged throughout the whole period.

Concluding remarks

This study examined time trends in trends in life expectancy at age 40 and cause-specific mortality in the vanguard groups and remaining populations in Finland, Norway, and Sweden from the 1970s to the 1990s. The strength of this study is that we used comparable across the countries high quality census-linked data, which allowed to perform uniform calculations of group-specific mortality estimates. The analyses also have some limitations. First, there were fewer time points for Sweden and Norway. Thus, we were not able to identify precisely all peculiarities of the time trends in these countries. Second, there were several changes in the classification systems of causes of death (and, possibly, also in coding practices) during the period covered. This may have affected the comparability of the data for different periods. However, since we used only broad groups of causes of death, the effect of changes in classification or coding practices is not likely to change our conclusions about the directions of the trends.

The study suggests that there are any signs of convergence in life expectancy at age 40 between vanguard and non-vanguard groups even in egalitarian Nordic countries. On the contrary, an increasing disadvantage of the non-vanguard population affects all age ranges. A worrying trend concerns the widening mortality gap among the oldest females in Norway. Life expectancy advantages of the vanguard group can be mainly explained by the greater progress in reducing mortality due cardiovascular system diseases. The role of cancer is important only for the smaller life expectance gains among non-vanguard males in Sweden. The bigger health progress of vanguard females in the three countries can also be explained by more significant declines in mortality due to respiratory system diseases.

The analyses of time trends in cause-specific mortality in Finland revealed that with exception of stomach cancer for females, there were any signs of convergence between the two groups. Moreover, mortality gaps increased for the most of causes of death. The most notable divergence occurred for alcohol-related causes of death. By the end of the 1990s, non-vanguard groups did not reached the initial mortality levels for ischaemic heart diseases, smoking-related cancers, alcohol-related and external causes of death.

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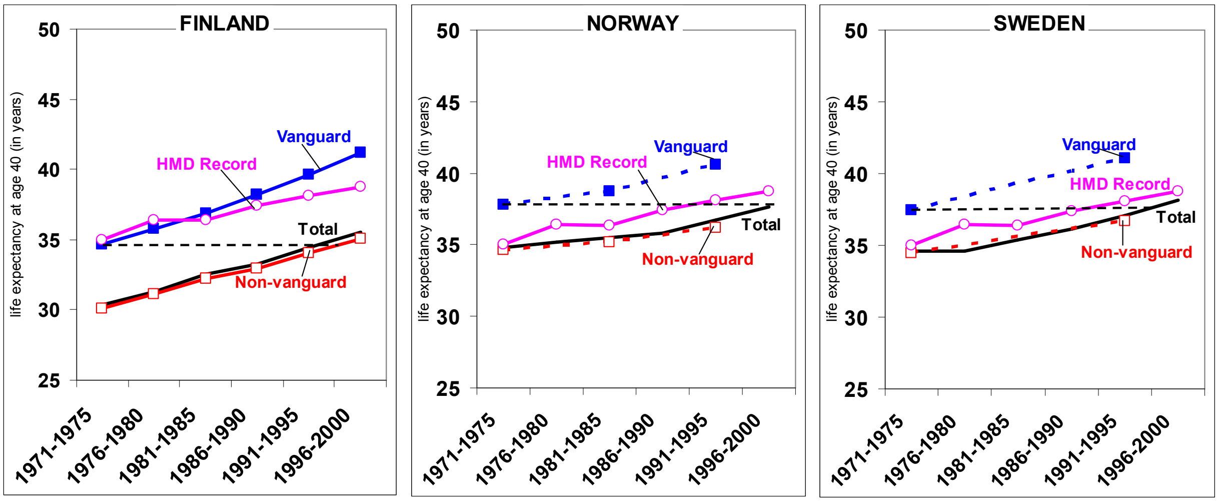
Fig. 1. *Trends in life expectancy at age 40 for vanguard, non-vanguard, and total populations of Finland, Norway, and Sweden and in the HMD record life expectancy at age 40, 1971-75 – 1996-2000.*

A) Males



B) Females

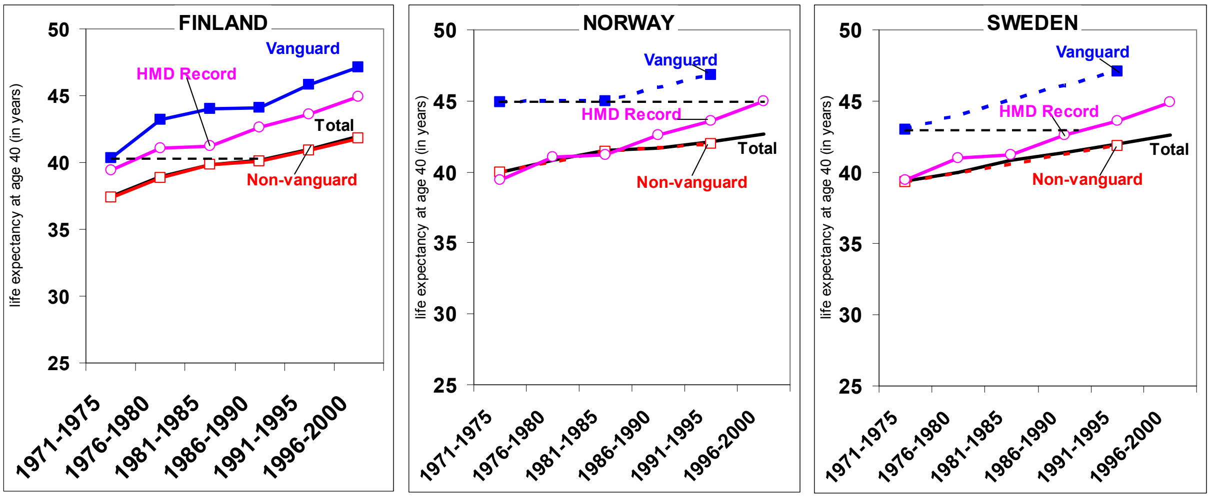
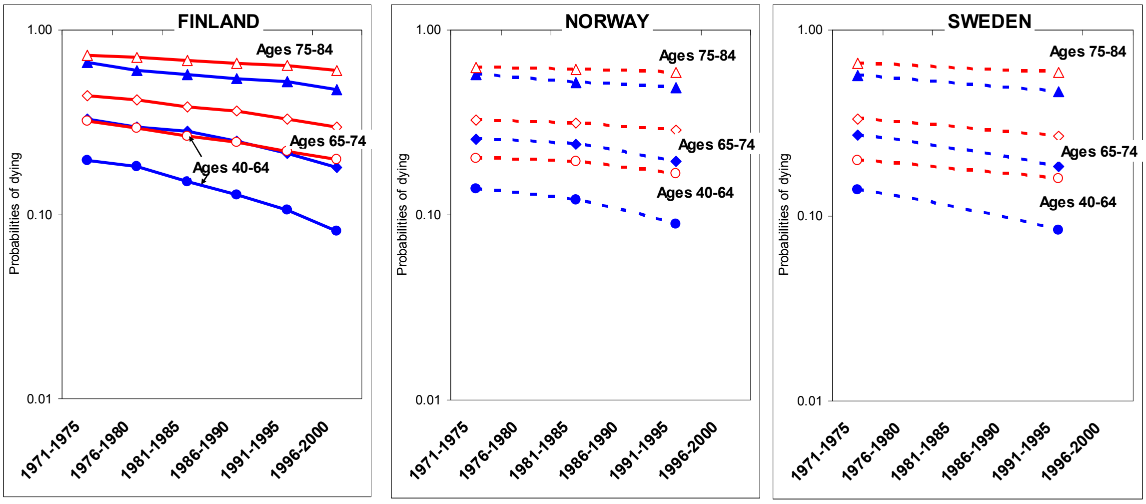


Fig. 2. *Trends in q(40-64), q(65-74), and q(75-84) for vanguard and non-vanguard populations of Finland, Norway, and Sweden, 1971-75 – 1991-95 (1996-2000 for Finland).*

Males



Females

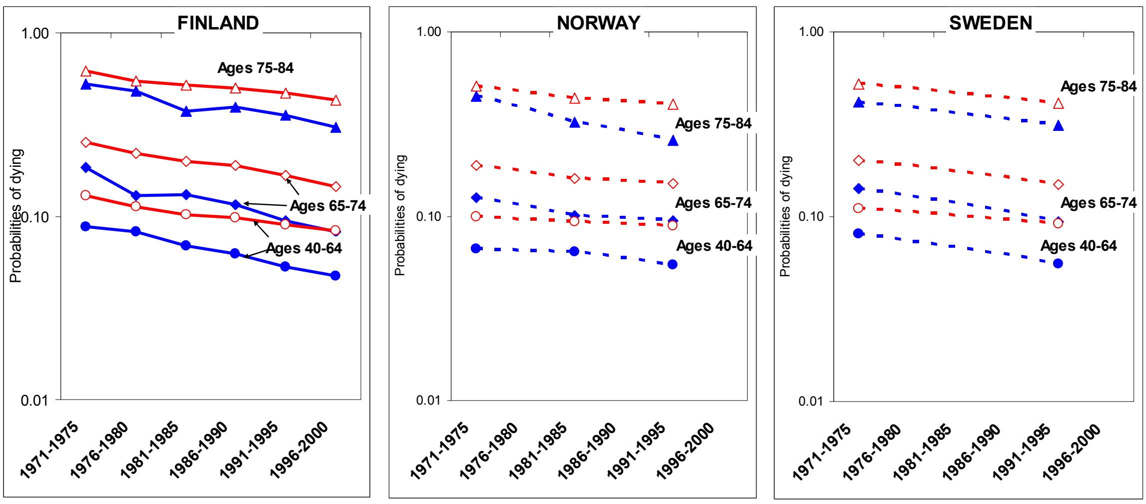


Fig. 3. *Cause components of the <u>total changes</u> in life expectancy at age 40 in vanguard and non-vanguard populations in Finland, Norway, and Sweden from 1971-1975 to 1991-1995.*

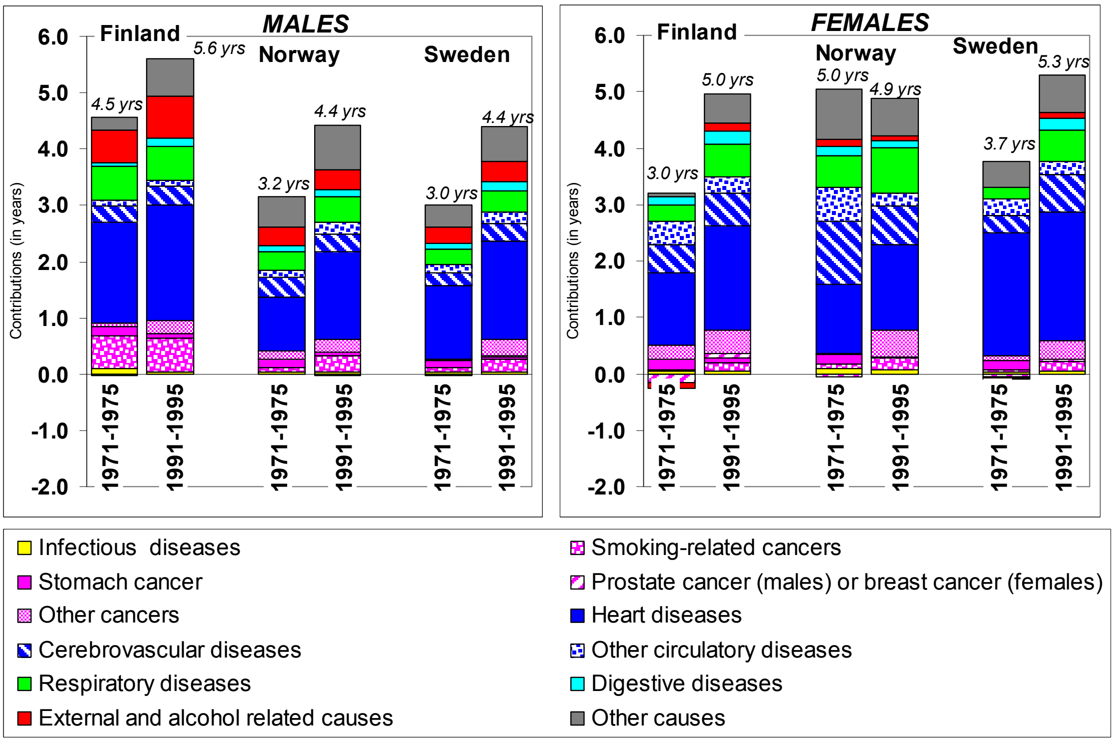


Fig. 4. *SDRs for ischaemic heart diseases for vanguard and non-vanguard groups in Finland, 1971-1975 - 1996-2000*

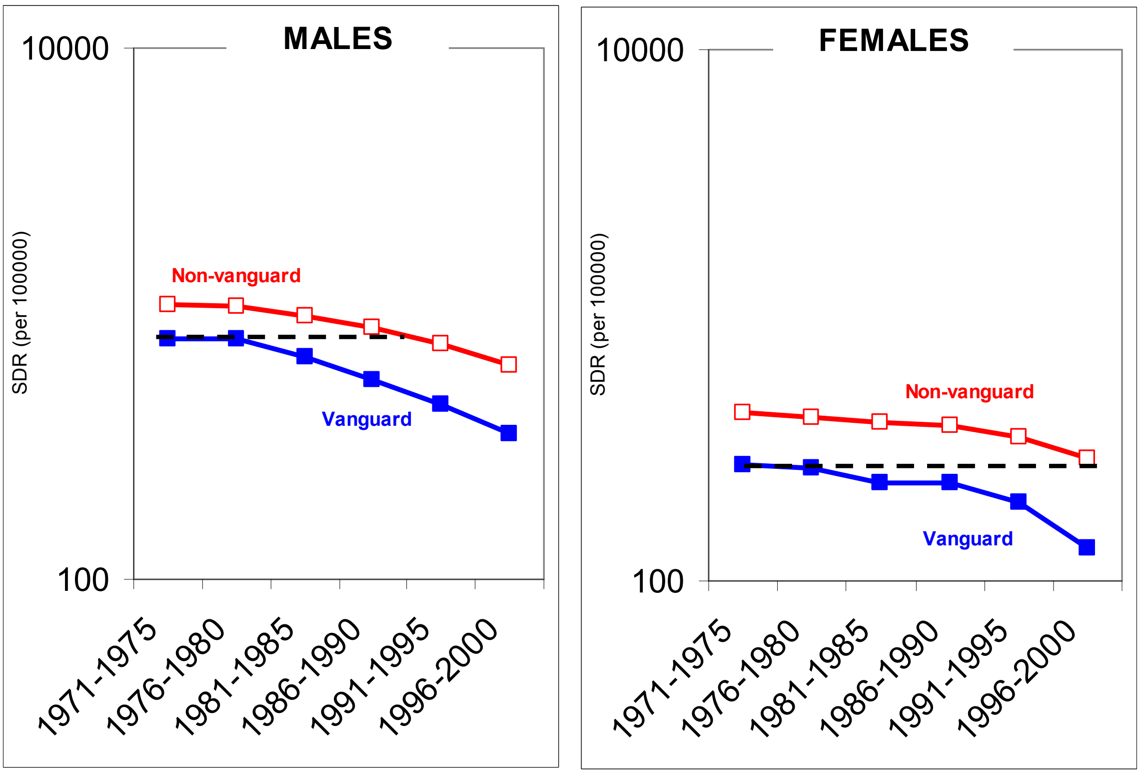
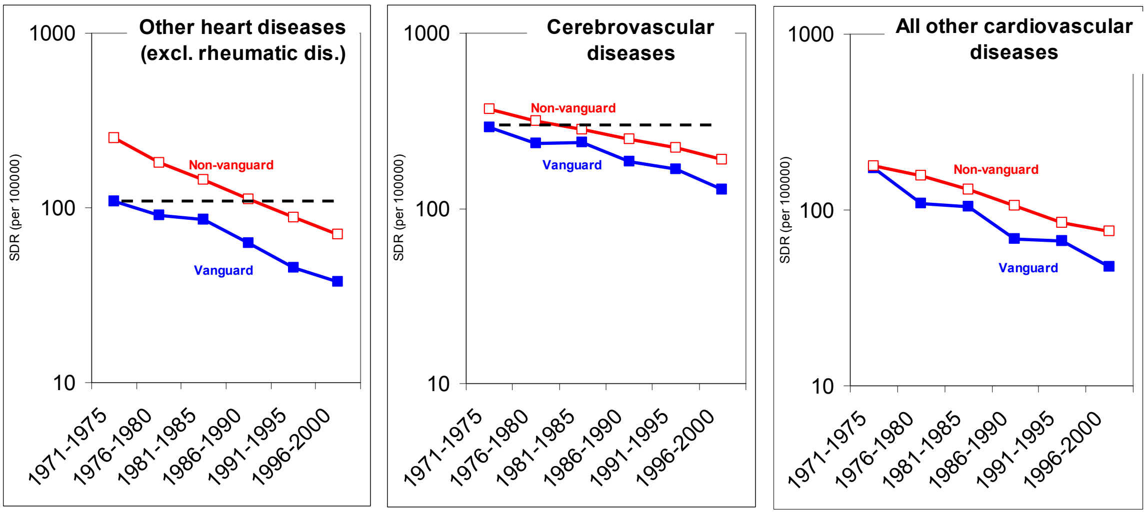


Fig. 5. *SDRs for other heart diseases (excl. rheumatic dis.), cerebrovascular diseases and all other cardiovascular system diseases for vanguard and non-vanguard groups in Finland, 1971-1975 - 1996-2000*

Males



Females

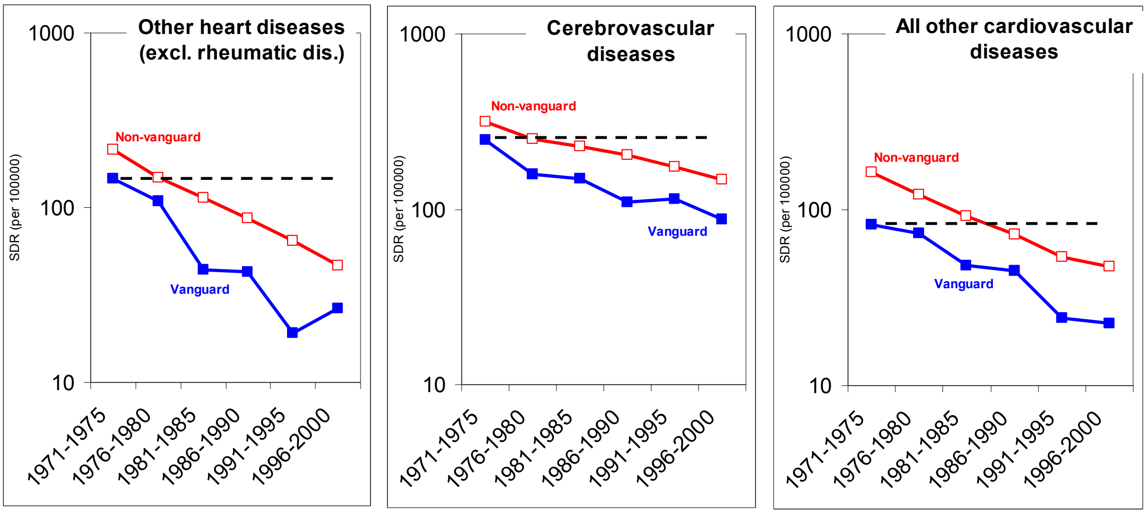


Fig. 6. *SDRs for cancers of larynx, trachea, bronchus, and lung, cancer of stomach, prostate cancer, and other neoplasms for vanguard and non-vanguard groups in Finland, 1971-1975 - 1996-2000*

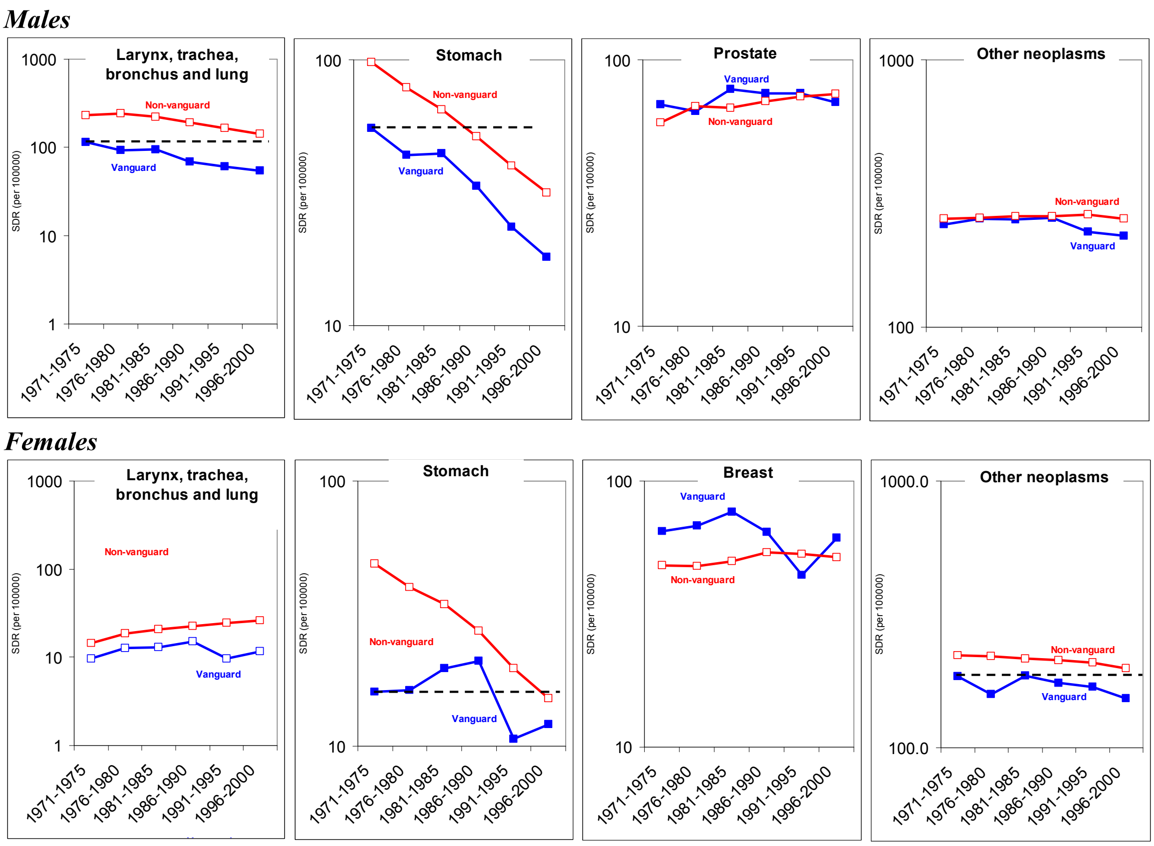


Fig. 7. *Male SDRs for alcohol-related and external causes of death for vanguard and non-vanguard groups in Finland, 1971-1975 - 1996-2000*