Increasing Excess Mortality Among Non-married Elderly People in Developed Countries

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A huge number of studies have shown that single, divorced and widowed persons have higher mortality than married persons. This excess mortality is usually considered to be partly due to the selection of higher-risk persons to the non-married states and partly to the protective effects of marriage (Hu and Goldman 1990, Joung 1996). The relative contributions of selection and causation are likely to vary according to time and place.

Although there is no shortage of studies on marital status mortality differences, few studies have dealt with trends in these differences. One exception is the study by Hu and Goldman (1990), which deals with marital status differences among men and women aged 25-64 in 16 developed countries. The years covered by the data vary from country to country starting from the 1950s or 1960s and ending in the 1970s or early 1980s. According to the results the relative excess mortality of single, divorced and widowed persons had increased in most countries, because of a more rapid decline among married than non-married persons. The authors suggested that the observed increase in the excess mortality of non-married groups from the 1950s to the early 1980s could be due to increasing protective effects of marriage during a time of rapid technological development, an increasing degree of selection in terms of type of person who remains unmarried or whose marriage is terminated, or the inappropriateness of relative mortality ratio as measure of excess mortality (Hu and Goldman 1990, 243).

Hajdu et al. (1995) studied changes in premature (under 65) mortality by marital status in Hungary and in England & Wales, and Watson (1995) in Poland and in East-Germany in the 1980s. National studies on trends in mortality by marital status have been published for the Netherlands (Joung 1996) and for Finland (Martelin 1996 and Koskinen et al. 1999). All these studies suggest that the development of mortality has been more
favourable in the married group than in the non-married groups.

Valkonen (2001) studied trends in mortality by marital status in the age groups 45 to 54 and 65 to 74 in 13 European countries from 1970 to the latest year for which data were available. According to the results there was a substantial increase in the excess mortality of non-married compared to married women aged 65 to 74 in all western and northern European countries. A similar increase was observed among men aged 65-74 in four Nordic countries and the Netherlands. In age group 45 to 54 the general tendency was also towards increasing differences in mortality but there was more variation between countries than in age group 65 to 74 years.

This paper is an extension of the study by Valkonen (2001). It concentrates on the trends in mortality in age group 65 to 74, in which an unexpected increase in the excess mortality of the non-married groups was found. A more thorough analysis of this trend and its causes is needed in order to develop policies to counter this unfavourable development. Persons without the support of a partner seem to be an increasingly vulnerable sub-population, the size of which is increasing along the aging of population. The paper analyses trends in mortality by marital status among persons aged 65 to 74 years in ten developed countries, for which data were available, from 1970 to mid-1990s.

There is a well known methodological problem in studies on trends in mortality differences: there are several ways of measuring the size of differences (inequality), and the conclusions about changes often depend on the measure chosen (see e.g. Mackenbach and Kunst 1997; Valkonen 1999) For example, when death rates decrease, the relative differences may increase, whereas the absolute differences may decrease. Relative differences of mortality (mortality ratios) are used more commonly in demographic and epidemiological studies than absolute differences. Absolute differences and changes in them
are, however, equally or even more important because they reflect more directly the public health significance of excess mortality of high-risk groups (Rothman 1986). When the absolute excess is small, the elimination of a large relative excess mortality saves less lives than the elimination of a smaller relative excess, when the absolute excess is high. In this paper we will study trends in both absolute and relative mortality differences.

Data

The study covers eight western European countries and Canada and Japan. For these countries comparable data were available at least until 1994. The main source of data for populations, deaths and death rates by sex and marital status in age group 65 to 74 were United Nations Demographic Yearbooks for the years 1974-1996. In addition, published and unpublished data from national statistical offices were used (see the list of sources in Appendix). The UN Demographic Yearbook uses 10-year age groups. Therefore, we were not able to use a more detailed age-classification within the age band 65-74. If data were available only for the number of deaths and death rates, the distribution of population by marital status was estimated on the basis of this information.

An attempt was made to obtain data for the latest year for which data were available and for the years 1970, 1980 and 1990. When data for the last mentioned years were not available in our sources, data for the nearest available year was used. Linear interpolation or extrapolation was used to adjust the data to make the death rates and population distributions by marital status cover the years 1970, 1980, 1990 and 1996 (Belgium, Denmark, France, Japan, the Netherlands) or the years 1971, 1981, 1991 and 1997 (Canada, England and Wales, Finland, Norway, Sweden). In the analysis adjacent years (for example 1970 and
1971) are treated as belonging to the same time period (presented as 1970/71).

Results

Average trends in marital status differences in mortality in ten countries

Table 1 shows the (unweighted) average shares of the four marital status groups in the countries studied from 1970/71 to 1996/97. Thanks to the decline of mortality the share of both widowers and widows diminished markedly during the whole period covered. On the other hand, the proportion of divorced men tripled and that of divorced women almost tripled. There was a slight decrease in the percentage of single men, but a much clearer decrease in the percentage of single women. As the net result of these trends the percentage of married men remained almost constant during the period covered (77% to 79%), but the percentage of married women increased from 46% to 55%.

The changes in the marital status distribution in the individual countries usually followed the average pattern described above: the share of widowed persons diminished and that of divorced persons increased in all countries. The percentage of single persons diminished in almost all countries and periods. The main exception is Japan, where being single was very exceptional in 1980 (0,9% among men and 1,2% among women) but has become more common by 1996 (1,7% among men and 3,9% among women).

Figure 1 shows the average death rates by marital status for the countries covered by the study from 1970/71 to 1996/97. Logarithmic scale is used and the figure thus shows changes in relative mortality differences between groups. In 1970/71 the death rates for single, divorced and widowed men were very close to each other. The excess mortality of these groups compared to married men varied from 38 % (single and divorced) to 41 %
The death rates decreased in all marital status groups from 1970/71 to 1996/97, but relatively more rapidly in the married than non-married groups. The mortality of widowed men diminished more rapidly than that of single and divorced men.

The relative excess mortality of single, divorced and widowed men compared to married men increased systematically from period to period (Figure 2). In 1970/71 the excess mortality of all non-married men compared to married men was 40 %, but by 1996/97 the excess had increased to 65 %.

Among women the overall picture is the same as among men, although the relative excess mortality of the non-married groups was somewhat smaller than among men (Figures 1 and 2). Like among men the mortality of non-married women decreased relatively less rapidly than that of married women. Among widows mortality decreased more rapidly than among single and divorced women. The average relative excess mortality of all non-married women was 26 % in 1970/71, and it increased to 48 % in 1996/97.

A linear scale is used in Figure 3 to present the same data that was presented in Figure 1 using a logarithmic scale. Figure 4 shows the trends in the absolute differences in death rates between the non-married groups and the married group. The figures show that the increase in the absolute excess mortality of the non-married group is not as clear as the increase in the relative excess mortality shown above. Because the overall level of mortality has decreased, the absolute excess mortality of the non-married category has increased only slightly despite the large increase in the relative excess mortality. In total the absolute excess mortality of all non-married men compared to married men increased from 17.0 to 18.2 deaths/1000 (by 7%). The absolute increase in the non-married excess mortality among women increased from 5.8 to 6.3 deaths/1000 (9%). As Figure 4 shows, there was no increase in the 1970s. All of the increase of the excess mortality occurred from 1980/81 to
1996/97 both among men and women. We will, therefore, concentrate mainly on this period in the rest of the paper.

Country-specific changes in mortality and excess mortality

Figures 5 and 6 show the trends in mortality by marital status for each of the ten countries. Table 2 gives changes in the absolute excess mortality of each of the three non-married marital states compared to the married state. Among men the absolute excess mortality of single men increased in all countries except Japan and Belgium from 1980/81 to 1996/97. As Figure 5 shows the mortality of single men even increased in Norway, Canada, Denmark and the Netherlands. In Japan the mortality of single men decreased rapidly, but Japan is exceptional because of the extremely low percentage of single men.

The mortality of divorced men decreased in all countries except Japan. The trends in the absolute excess mortality of divorced men are not as uniform as those among single men. The excess increased in four but decreased in six countries.

With the exception of Denmark, the changes in the mortality of widowers were relatively similar to those among married men, and the absolute excess mortality slightly diminished in most countries. Due to the large increase in the excess mortality of single men, the excess mortality of all non-married men taken as one group, however, increased in all countries except Belgium, Japan, and France.

As for men, the excess mortality of single and all non-married women increased in most countries. Japan and Norway were the only exceptions. The patterns of change among divorced and widowed women differed from those among men, as the excess mortality increased in almost all countries, whereas this was not the case among men.

On the basis of the analysis presented above the ten countries can be classified into
four groups:

1. Canada, Denmark and Netherlands. In these countries the absolute difference in mortality between non-married and married increased strongly both among men and women.

2. England and Wales, Finland and Sweden. In these countries the excess mortality of non-married compared to married men and women also increased but not as much as in group 1.

3. Belgium, France and Norway. In these countries the direction of changes in the excess mortality was different among men and women.


Table 3 shows changes in the relative excess mortality of the non-married groups. For example, the death rate for single men in France in 1980/81 was 41.3% higher than that of married men. In 1996/97 this relative excess was 58.9%. The change in the relative excess mortality in percentage points was 17.6=58.9-41.3.

The relative excess mortality of the group of all non-married persons increased in all countries among both men and women. When the non-married marital states are looked at separately, eight cases of decrease in the relative excess are observed (Table 3). Four of these cases are for Japan. At least some of the rest of the cases may be due to errors in data. It seems that an increase in the relative excess mortality of the non-married groups has been almost universal in the group of countries studied here and probably also in other countries in which death rates have decreased.

Discussion

Weaknesses in the data

Due to the limitations of the statistical sources we had to use death rates calculated for the
entire 10-year age band without more detailed age-classification. To estimate to what extent this may have caused bias, we calculated age-standardized death rates for 1980/81 and 1996/97 for three countries (Finland, France, and Sweden) for which data by 5-year age groups were available. Results for both years and all three countries showed that age-standardization had only a small effect on the differences in mortality between married, single and divorced persons, as the age-distribution of these groups in the age-band 65-74 is relatively similar. On the other hand, age-standardization had a relatively strong effect on the mortality of widowed persons, as the share of older persons (70-74 years) was larger among widowed people than other marital states. The unbiased (age-standardized) death rates for widowed persons are therefore smaller than those presented in Figures 5 and 6. The excess mortality of widowed compared to married persons varied by year and country. On average the excess was 22 per cent smaller when 5-year age-standardized death rates were used instead of the unstandardized 10-year death rates. This should be taken into account, for example, when looking at Figures 5 and 6, in which the death rates for widowed persons should be clearly lower.

Since this study is focused on changes in the differences rather than the differences in itself, the bias caused by the lack of age-standardization is relevant only to the extent it has an effect on the results concerning changes in excess mortality. Table 4 shows a comparison of the results on changes in the absolute excess mortality of the non-married marital states when measured without age-standardization (as in Table 2) and with age-standardization for the three countries. The comparison shows that the age-standardized figures are, in many cases, different from the unstandardized figures. However, with one small exception, the sings of the changes are the same. The use of age-standardized figures thus does not change the conclusions for this relatively homogenous group of three countries. Furthermore is
unlikely that the use of standardized death rates would change the main conclusions for the
more heterogeneous group of all ten countries or the countries most different from the
average (Japan, Canada, Denmark and the Netherlands). However, due to the possibility of
bias, detailed comparisons of countries are not advisable and future analyses of marital status
differences should use more detailed age-classifications and adjust for the differences in age-
structure within broad age groups.

In addition to the crude age-classification, there may be other weaknesses in the data.
There are some irregularities in the trends presented in Figures 5 and 6, which may be due
to errors in data, caused for example by typing-errors in publications or inconsistencies in
the information on marital status in the death and population records. The use of interpolated
and extrapolated death rates may also have some effects on the trends.

Changes in the relative and absolute excess mortality

According to the results, the relative excess mortality of single, divorced and
widowed persons increased from 1980/81 to 1996/97 with very few exceptions among men
and women aged 65-74 in all countries studied. A similar tendency towards increasing
relative excess mortality was observed by Hu and Goldman (1990) in their study on
mortality trends among 25-64 year olds from the 1950s to the early 1980s in 16 countries.

The increase in the relative excess mortality was connected with the overall decline
in mortality. Trends in other mortality differentials than marital status differences also show
a similar tendency towards increasing relative differences when mortality decreases
(Valkonen 1999). A related phenomenon is that relative mortality differences by sex,
socioeconomic status, and other variables tend to decrease by age, whereas absolute
differences increase. The increase in the relative excess mortality, which was found to have
occurred in all countries studied, may be considered at least partially a statistical artefact. The results on relative mortality differences do not necessarily imply that the mortality situation of non-married compared to married persons would have worsened.

Our results show, however, that even the absolute excess mortality of non-married persons increased in most countries from 1980/81 to 1996/97. This increase took place in all non-married groups among women and among single men. The absolute excess mortality of divorced and widowed men also increased in several countries. The most clear exception was Japan where the absolute excess mortality of the non-married group decreased both among men and women. The increase in the excess was mostly due to the less rapid absolute decrease in mortality in the non-married groups than in the married group, but among women in some countries (Denmark, the Netherlands and Canada), the increase was due to a halt of the decrease or even increase in mortality in some non-married states.

The results for individual countries may depend to some extent on the choice of the period covered. We can conclude, however, that there has been a trend towards increasing mortality disadvantage of single men and all non-married women in most western European countries and Canada. Our results do not apply to southern European countries and the former socialist countries, because we did not have data for any of them.

Attempts at explaining the increase in the excess mortality of non-married elderly people.

Part of the excess mortality in the non-married states is due to the selection of persons with higher than average risk to these states. As suggested by Hu and Goldman (1990) the increase in the excess mortality could, consequently, be due to a strengthening of this selection mechanism. This could take place, particularly, if the relative size of the less-privileged group decreases and the group becomes more deviant from the average
population. The share of single persons in age group 65-74 decreased in most countries. It is possible that the increase in the excess mortality of single persons was, at least to some extent, due to an increased selectivity. On the other hand, the rapid decline in the excess mortality of single persons in Japan is likely to be associated with the increased percentage of single persons.

The share of divorced persons has increased in all countries. Divorced persons should, therefore, be less negatively selected than before and their excess mortality should have diminished but in reality, it increased among women and remained relatively stable among men. Increased selection is therefore, unlikely to explain the increase in excess mortality among divorced persons.

The percentage of widows diminished in all countries. At the same time the excess mortality of widows increased in almost all countries. However, it is difficult to link this increase to an increased selectivity in becoming a widow, because the decrease in the share of widows was due to increasing life expectancy. Moreover, if increased selectivity would be relevant, we would expect an increase in excess mortality among widowers, too.

The increase in the excess mortality of non-married men was mainly due to the increase of the excess among single men only, and this may be explained, at least partly, by an increased selection. The increase in the excess mortality of non-married women cannot, however, be accounted for by selection. Therefore it seems, that there have been, at least among women, changes in the causal mechanisms affecting marital status differences in mortality: the protective effect of marriage and/or the adverse effects of the non-married states may have increased.

According to our results the mortality of married women has developed in a regular fashion since 1970 and usually declined continuously in the age group studied. No big
changes seem thus to have occurred in the protective effect of the married state. On the other hand, a slow-down in the decline in mortality and in some cases even an increase was observed in all non-married groups among women in most countries since 1980. This seems to imply that an increase in the vulnerability of women without a partner has been the most important mechanism underlying the results.

One hypothesis for the explanation of the (assumed) increased vulnerability of elderly non-married women is that urbanization, increased social and geographic mobility, the decrease in the number of children per women and other societal trends have reduced the possibilities (and willingness) of descendants, other relatives, and neighbours to help and care for elderly persons without a partner (Valkonen 2001). This hypothesis is in accordance with changes in the living arrangements of elderly people: the share of persons living alone among non-married elderly persons has increased since the 1970s in all European countries, for which data are available. (Pampel 1992, ref. Palloni 2001, 67). Another hypothesis is that the mortality of married people has declined more rapidly, because they have adopted healthy dietary habits and stopped smoking more commonly than non-married persons.

The problem with both of the hypotheses mentioned above is, however, that they should apply to both men and women, but the increase of the non-married excess mortality was clearly more systematic among women. Detailed cause- and country-specific studies are needed in order to improve our understanding of the trends described in this paper.
References


Appendix: Sources of data

Belgium
(Number of deaths and death rates, 1970 and 1981)
(Populations and numbers of deaths, 1990 and 1992)
(Populations and number of deaths 1999)

Canada
(Populations and death rates 1971, number of deaths and death rates 1983 and 1994)

Denmark
(Number of deaths and death rates, 1972 -1984)
Danmarks Statistik.  
(Number of deaths and populations, 1995)

England and Wales
(Population 1971)
(Number of deaths and death rates 1979)
Series DH1 no. 26 (Table 3).  
(Number of deaths 1991)
(Population 1991)
Series DH1 no. 31 (Tables 9 and 10). Age, sex and marital status.  
(Number of deaths and death rates 1998)

Finland
(Number of deaths and population 1971)
(Number of deaths and population 1981)
(Number of deaths and population 1991)
(Number of deaths and population 1997)

France
La situation demographique en 1970-1996. INSEE.  
(Populations and number of deaths)
Japan

(Population 1995)

Netherlands

(Number of deaths and death rates, 1979 and 1995)
(Populations, December 31\textsuperscript{st} 1973)

Norway

(Death rates 1970-1991; number of deaths 1979)
(Populations 1970)
(Populations 1991)
(Populations and number of deaths 1997)

Sweden

(Number of deaths and death rates 1973 and 1979)
(Populations and number of deaths, 1991 and 1997)
Figure 1. Average mortality (deaths /1000) by marital status in 1970/71-1996/97 for 10 countries, men and women aged 65-74 (logarithmic scale).
Figure 2. Average relative excess mortality (%) of the nonmarried groups compared to the married group in 1970/71-1996/97 in 10 countries, men and women aged 65-74.
Figure 3. Average mortality (deaths/1000) by marital status in 1970/71-1996/97 for 10 countries, men and women aged 65-74 (linear scale).
Figure 4. Average absolute excess mortality (deaths/1000) of the nonmarried groups compared to the married group in 1970/71-1996/97 in 10 countries, men and women aged 65-74.
Figure 5. Trends in death rates (per 1000) for marital status groups from 1970/71 to 1996/97 in 10 countries, men aged 65-74.

LEGEND:
N (red line) = Never married
M (brown line) = Married
D (green line) = Divorced
W (blue line) = Widowed
Figure 6. Trends in death rates (per 1000) for marital status groups from 1970/71 to 1996/97 in 10 countries, women aged 65-74.
Table 1. Unweighted average proportions (%) of population in marital status categories of all 65-74 year olds by sex in 1970/71, 1980/81, 1990/91 and 1996/97 in 10 countries.

<table>
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**Table 2.** Changes from 1980/81 to 1996/97 in the absolute excess mortality (deaths/1000) of nonmarried groups compared to the married, by sex and country.

### Men

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Table 3. Changes (percent points) from 1980/81 to 1996/97 in the relative excess mortality of non-married groups compared to the married group.¹

### Men

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### Women

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¹ The relative excess mortality (in percent) for each country, sex, period, and non-married state was calculated as $d_n * 100/d_m$ ($d_n$ and $d_m$ death rates for the non-married and married group, respectively). The change from 1980/81 to 1996/97 in the relative excess mortality was calculated as the difference between the relative excess mortality in 1996/97 and 1980/81.
### Table 4. Changes from 1980/81 to 1996/97 in the absolute excess mortality (deaths/1000) of nonmarried groups compared to the married. Non-standardized values compared to age-standardized.

<table>
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<tr>
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<td>-2.9</td>
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<tr>
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<td>-3.2</td>
<td>-0.9</td>
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<tr>
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<td>-0.3</td>
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### Women

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<th>All nonmarried</th>
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