

# Changes in socioeconomic inequalities in mortality during an economic boom and recession among middle-aged men and women in Finland

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**Background:** Socioeconomic inequalities in mortality increased in several countries in the 1980s, but little is known about more recent trends. This study looks at how social class differences in mortality changed in Finland during 1981–1995, a period which saw drastic economic fluctuations. **Methods:** The study is based on the person records of the Finnish censuses of 1980, 1985 and 1990, to which the death records for 1981–1985, 1986–1990 and 1991–1995 respectively were linked. Men and women aged 35–64 years were classified into manual and non-manual classes on the basis of current or former occupation or the occupation of head of household. **Results:** Class differences in mortality increased during the 1980s among both men and women due to a more rapid decrease in cardiovascular mortality in the non-manual class and to a more rapid increase in mortality from alcohol-related causes of death, accidents and suicide in the manual class. In the 1990s, a period of severe economic recession, the increase in the relative mortality gap was clearly smaller than in the 1980s. This was due to the convergence between classes of trends for cardiovascular mortality and for mortality from alcohol-related causes, accidents and suicide. **Conclusion:** In Finland, economic recession slowed down rather than sped up the growth of relative inequalities among middle-aged men and women. Changes in mortality and socioeconomic inequalities in mortality result from a complex combination of different and even opposite trends in mortality from various causes of death. In the light of this complexity it seems unlikely that there exists any major single explanation for changes in inequalities in mortality.

**Keywords:** inequality, mortality, social class, unemployment

In all countries for which data are available, mortality among manual workers is higher than among non-manual workers. There are also inequalities according to other indicators of socioeconomic position, such as level of education, income and rank in civil service.<sup>1–5</sup> A central goal for the European Office of the WHO and for many national health policies has been to reduce inequalities in mortality.<sup>6,7</sup> However, the data on trends for evaluating the success or failure of these policies are scarce and they only cover the 1980s or periods ending in the early 1990s.<sup>8–15</sup> Although the quality and coverage of the available data vary, the general conclusion is that the socioeconomic mortality gap has increased, at least among working-age men. A major reason for this increase has been the more rapid decline in mortality from ischaemic heart disease in the non-manual class.

Together with other Nordic countries Finland has a system of personal identification numbers which allows for computerised linking of census records and death records. We are thus exceptionally well-placed to study trends in socioeconomic inequalities in mortality. The aim of the paper was to study how socioeconomic inequalities in mortality changed from 1981 to 1995 in Finland. Our data cover all persons aged 35–64 years and over 120,000 deaths and allow for an analysis of the contribution of major causes of death to changes in inequalities. Some researchers maintain that economic factors such as unemployment, poverty and income inequality are major determinants of levels of mortality and magnitudes of socioeconomic inequalities in mortality,<sup>16–19</sup> while others take a more critical position on these arguments.<sup>2,20–22</sup> Recent, exceptionally drastic economic fluctuations in Finland offer a good opportunity for shedding light on this issue.

In the second half of the 1980s economic growth was exceptionally rapid, but in 1991–1995 Finland suffered a very severe economic recession. Economic output declined for 3 years, reaching its low point in early 1993 at less than 90% of the 1990 level. The recession was partly caused by the collapse of the trade with the disintegrating Soviet Union. Another cause was an international recession which decreased export demand. In addition, following

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the liberalisation of financial markets in the 1980s, the real estate and stock markets had overheated and prices came tumbling down. The bankruptcy rate doubled in 3 years.<sup>23</sup> Due to recession the national unemployment rate increased from 3.4% in 1990 to 18.4% in 1994.<sup>24</sup> Manual workers were more exposed to unemployment than non-manual workers: in 1993–1994 the unemployment rate was 24% among manual workers and 11% among non-manual workers (Statistics Finland, unpublished data). If unemployment has a marked negative effect on mortality, an increase in class differences in mortality could be expected to have taken place during the recession.

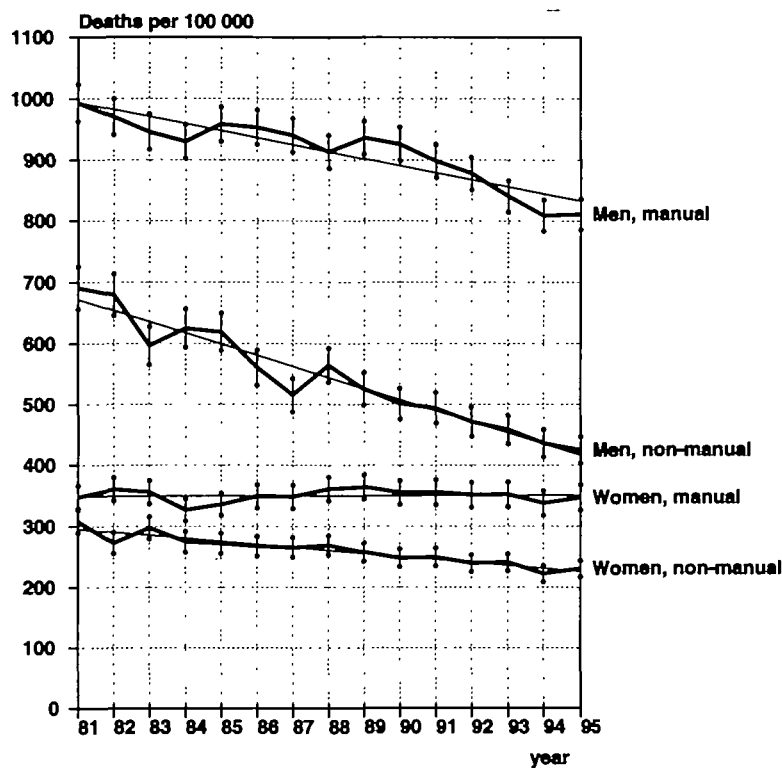


Figure 1 Annual age-standardised mortality (per 100,000) with 95% confidence limits and linear regression lines by social class among men and women aged 35–64 years during 1981–1995 in Finland

DATA AND METHODS

The data used in the study consist of three subsets, the first of which is based on the records of the 1980 census, which have been linked to the records on all deaths in 1981–1985 by Statistics Finland. The other data sets were constructed in the same way by linking the 1985 census records to the 1986–1990 death records and the 1990 census records to the 1991–1995 death records. More than 99.5% of all death records could be linked to the deceased persons' records in the previous census.<sup>15</sup> This study is restricted to men and women aged 35–64 years during the years 1981–1995. The data cover 23.3 million person-years and 122,250 deaths (table 1). Two occupation-based social classes are distinguished: non-manual workers and manual workers. Economically active persons were classified according to the occupation reported in the census on which the relevant subset of data was based. Housewives and other family members working at home were classified according to the head of household's occupation. Pensioners, unemployed persons and others for whom information on current occupation was not available were classified according to occupational information in earlier censuses. One percent of men and women could not be classified and were excluded from this analysis. We also excluded farmers, other self-employed persons and employers (18.3% of men and 14.2% of women). This group is socioeconomically heterogeneous and has a mortality level which falls in-between that of the manual and non-manual groups.<sup>15</sup> The analysis is based on ten groups of causes of death (see table 3). The 8th revision of the International Classification of Diseases (ICD) was used in 1981–1986 and the Cause of Death Classification 1987 of Statistics Finland

in 1987–1995.<sup>25</sup> The latter classification is based on the 9th revision of the ICD.

Person-years and number of deaths by cause were calculated by sex, age (5 year age groups) and social class for the population aged 35–64 years for each year from 1981 to 1995. Age-standardised death rates were calculated by the direct method using the sum of male and female person-years in 1981–1995 as the standard population. Confidence intervals were computed for death rates, differences in them and changes in differences.<sup>26</sup>

RESULTS

Trends in inequalities in all-cause mortality

Figure 1 shows the annual age-standardised death rates for the manual and non-manual classes by sex. The age-standardised mortality in the total male manual and non-

Table 1 Person-years (1,000s) and the number of deaths covered by the study by social class and period, men and women aged 35–64 years

	Period	Person-years (1,000s)		Number of all deaths
		All	Percentage manual	All
Men	1981–1985	3,406	62.1	28,802
	1986–1990	3,808	59.8	29,522
	1991–1995	4,022	57.8	27,879
Women	1981–1985	3,706	46.4	11,969
	1986–1990	4,088	40.0	12,294
	1991–1995	4,277	34.7	11,784

manual population aged 35–64 years diminished markedly (26%) from 1981 to 1995. Both the absolute and relative decline was greater in the non-manual than in the manual class. Between 1981 and 1995 the absolute difference between the classes increased from 303 deaths to 386 deaths per 100,000 and the relative difference from 44 to 91%.

The death rates of male manual workers fluctuated around the linear trend. Until 1984 the decline in mortality was relatively rapid, as it had been in the late 1970s,<sup>15</sup> but from 1984 to 1990 there was no improvement. In the 1990s the death rate diminished again. In the non-manual class there were no systematic fluctuations around the trend such as those observed in the manual class.

The overall relative decline in mortality from 1981 to 1995 was smaller among women (17%) than among men. Female manual workers did not experience any decrease in mortality from 1981 to 1995, but the fluctuations around the horizontal regression line resemble those observed among male manual workers: mortality rose in the late 1980s but fell slightly in the 1990s. Among non-manual women mortality diminished fairly steadily from 1981 to 1995. *Table 2* summarises the sizes of class inequalities for the three 5 year periods. The relative differences increased systematically from period to period among both men and women, but the increase slowed down in the 1990s compared to the 1980s. Among men the absolute difference increased from the first to second period, but not from the second to third period even though the relative difference increased. This apparent inconsistency is due to the overall decrease in mortality. Among women the absolute difference between the classes increased both from the first period to the second period and from the second period to the third period. However, the latter increase was smaller than the former.

#### *Changes in mortality differences by cause of death in the 1980s*

The absolute difference between male manual and non-manual workers increased by 84 deaths per 100,000 from 1981–1985 to 1986–1990 (*table 3*). The increase in class difference was greatest in mortality from ischaemic heart disease. Mortality from this cause diminished rapidly in both classes, but more so in the non-manual class. Mortality from cerebrovascular diseases and other cardiovascular diseases also diminished clearly in the non-manual class but remained almost constant in the manual class. Altogether, the larger decrease in mortality from cardio-

vascular diseases in the non-manual class accounted for approximately 40% of the total increase in the male mortality gap from 1981–1985 to 1986–1990.

Nearly all the rest of the increase in the class difference in all-cause mortality among men was due to four groups of causes of death: alcohol-related causes (deaths for which the underlying cause is either a disease directly associated with alcohol use or accidental alcohol poisoning), 'other diseases' (diseases other than cancer, cardiovascular diseases or alcohol-related diseases), suicides and accidents and violence other than suicide and alcohol poisoning (called 'accidents etc.' below). Mortality from these causes increased in the manual class and, except for 'other diseases', also in the non-manual class, but the increase was larger in the manual class. The increase in alcohol-related mortality was particularly rapid: the increase was 44% in the manual class and 21% in the non-manual class. Lung cancer was the only cause of death distinguished here for which the class difference decreased.

Among women the absolute increase in the class mortality gap was 34 deaths per 100,000 from 1981–1985 to 1986–1990 (*table 3*). As in the case of men, total cardiovascular mortality diminished in both classes but more so in the non-manual class. However, since the proportion of cardiovascular deaths of all deaths is smaller among women than among men within the age bracket studied here, differences in trends in mortality from cardiovascular diseases made a relatively small contribution (approximately 20%) to the widening of the mortality gap.

As among men, mortality from alcohol-related causes, 'other diseases', suicide and accidents etc. increased among women in the manual class, but less or not at all in the non-manual class. Altogether these causes accounted for most of the increase in the difference in total mortality among women.

Mortality from breast cancer was somewhat higher in the non-manual than in the manual class in 1981–1985. It increased slightly in both classes from 1981–1985 to 1986–1990, whereas mortality from other cancers diminished. There was practically no class difference in total cancer mortality among women in either period.

#### *Changes in mortality differences by cause of death from 1986–1990 to 1991–1995*

The development of overall mortality was more favourable in the early 1990s than in the late 1980s: mortality

**Table 2** Relative (%) and absolute (per 100,000) differences in age-standardised mortality between manual and non-manual classes by period, men and women aged 35–64 years

	Men			Women		
	1981–1985	1986–1990	1991–1995	1981–1985	1986–1990	1991–1995
Relative manual/non-manual difference (%)	49.5	75.3	85.8	21.2	36.2	47.7
Index (1981–1985 = 1.00)	1.00	1.52	1.73	1.00	1.71	2.25
Absolute difference (per 100,000)	318	401	392	60	95	113
Index (1981–1985 = 1.00)	1.00	1.26	1.23	1.00	1.57	1.86

among the men studied here diminished by 9.1% from 1985 to 1990 but by 14.6% from 1990 to 1995 (figure 1). Among women these figures were 3.6 and 6.6% respectively.

The absolute class difference in male mortality in 1991–1995 was slightly smaller than in 1986–1990 (table 3). However, this change is not statistically significant. The main factor responsible for ending the increase in the

absolute mortality gap and also for the slowing down of the increase in the relative mortality gap was the development of mortality from ischaemic heart disease and other cardiovascular diseases: in contrast to the 1980s, cardiovascular mortality diminished more in the manual than in the non-manual class. Another important factor was the development of mortality from alcohol-associated causes, 'other diseases', suicide and accidents etc.

Table 3 Age-standardised death rates (per 100,000) by social class, difference in death rates between manual and non-manual workers in 1981–1985 (1), 1986–1990 (2) and 1991–1995 (3), and change in the difference in death rates from period 1 to 2 and from period 2 to 3 for selected causes of death, men and women aged 35–64 years<sup>a</sup>

	Manual			Non-manual			Difference manual – non-manual			Change in the difference	
	1	2	3	1	2	3	1	2	3	1-2	2-3
<b>Men</b>											
All causes	959 946–971	934 922–946	848 836–860	641 627–656	533 521–545	456 446–467	318 298–337	401 384–419	392 376–407	84 58–110	–10 –33–13
Lung cancer (162) <sup>b</sup>	88 84–92	69 66–73	55 53–59	44 40–48	31 28–34	26 23–28	44 39–49	38 34–43	30 26–34	–6 –13–1	–9 –15 to –3
Other cancers (rest of 140–239)	112 108–117	109 105–114	104 100–108	101 96–107	95 90–101	88 83–92	11 4–18	14 7–21	16 10–22	3 –7–13	2 –7–11
Ischaemic heart diseases (410–414)	340 332–347	277 270–283	212 206–217	250 241–259	164 157–171	116 111–122	89 78–101	113 104–123	95 88–103	24 8–39	–18 –30 to –5
Cerebrovascular diseases (430–438)	59 56–62	56 53–59	47 45–50	41 37–45	31 28–34	28 25–30	18 13–23	25 21–29	20 16–23	7 0–13	–5 –11–0
Other cardiovascular diseases (rest of 390–459)	53 50–56	52 49–55	47 44–50	36 33–40	29 26–32	25 23–28	17 12–22	23 19–27	22 18–25	6 0–12	–2 –7–4
Alcohol-related causes <sup>c</sup>	62 59–66	89 85–93	96 92–100	34 31–37	41 38–45	45 41–48	28 24–33	48 43–53	51 46–56	19 13–26	3 –4–11
Other diseases (rest of 000–799)	83 80–87	93 89–97	91 87–95	52 48–56	49 45–52	44 41–47	32 26–37	44 39–49	47 42–52	12 4–20	3 –5–10
Suicide (E950–E959)	66 62–69	77 74–81	82 78–85	35 32–38	38 35–41	38 35–41	31 26–36	39 34–44	43 39–48	8 1–15	4 –2–11
Other accidents and violence (rest of E800–E999)	96 92–100	112 107–116	115 111–120	48 45–53	54 51–58	47 44–51	47 42–53	57 51–63	68 63–74	10 2–18	11 3–19
<b>Women</b>											
All causes	345 337–353	356 348–365	349 340–358	285 277–293	261 255–269	236 230–243	60 49–72	95 84–106	113 102–124	34 18–50	18 2–34
Breast cancer (174)	28 25–30	29 27–32	31 28–34	34 31–36	37 34–40	34 31–36	–6 –10––2	–8 –12––4	–3 –6–1	–2 –7–3	5 0–10
Other cancers	101 97–106	98 94–103	97 93–102	92 87–96	87 83–91	81 77–84	10 3–16	11 5–18	17 11–23	2 –7–10	5 –3–14
Ischaemic heart diseases	62 59–66	56 53–60	42 39–45	41 38–44	32 29–34	19 17–21	22 17–26	24 20–29	23 20–27	3 –4–9	–1 –7–4
Cerebrovascular diseases	38 35–41	33 31–36	29 27–32	28 26–31	22 20–24	19 17–21	10 6–14	12 9–15	10 7–14	2 –3–7	–1 –6–3
Other cardiovascular diseases	23 21–25	23 21–25	18 16–20	16 14–18	12 11–14	9 8–11	7 4–10	10 8–13	9 6–11	4 0–7	–2 –5–2
Alcohol-related causes <sup>c</sup>	9 7–10	17 16–20	21 18–23	8 7–9	10 8–11	11 10–13	1 –1–3	8 5–10	9 7–12	7 4–10	1 –2–5
Other diseases	46 43–49	50 47–53	55 51–59	36 33–39	29 27–32	29 27–32	10 6–14	20 16–24	25 21–30	11 5–16	5 –1–11
Suicide	15 14–17	21 19–24	24 22–27	15 13–17	15 13–17	16 14–17	0 –2–3	7 4–9	8 5–11	6 2–10	2 –2–6
Other accidents and violence	23 21–25	28 26–31	31 29–34	16 14–18	18 17–20	18 17–20	7 4–10	10 7–13	13 10–17	3 –1–7	3 –1–8

a: 95% confidence intervals below the death rates.

b: Codes according to the Classification of Causes of Death 1987 by Statistics Finland based on the 9th revision of the ICD, in parentheses.

c: Alcoholic psychoses (291), alcohol-dependence syndrome (303), alcoholic cardiomyopathy (4255), alcoholic diseases of the liver (5710–5713), alcoholic diseases of the pancreas (5770 D–F and 5771 C–D) and accidental poisoning by alcohol (851).

Mortality from these causes (except for 'other diseases') continued to increase in the manual class, but the increase was much smaller than in the 1980s. In the non-manual class mortality decreased slightly and the class difference in mortality from these causes taken together increased. However, the decrease in the class difference in mortality from cardiovascular diseases and lung cancer more than compensated for that increase.

Among women the class mortality difference continued to increase in the 1990s, but the absolute increase was only approximately half of that in the 1980s (table 3). As among men, the decrease in cardiovascular mortality was larger in the manual than in the non-manual class. Due to the low level of female cardiovascular mortality this was not sufficient to end the widening of the mortality gap, to which all causes other than cardiovascular diseases contributed.

## DISCUSSION

It appears that the severe recession in the first half of the 1990s has not had negative short-term effects on the overall level of mortality among the middle-aged population in Finland: all-cause mortality diminished more during the recession than during the economic boom in the late 1980s. However, the period covered by the study is relatively short. For many chronic causes of death the effects of recession may only become evident after a prolonged follow-up.

Absolute and relative class differences in total mortality increased markedly among both men and women in the 1980s. During the recession in 1991–1995, the relative differences continued to grow, but not as rapidly as earlier; among men the increase in absolute difference actually ended. The slowing down of the relative increase in the class mortality gap during the recession was against the expectations presented in the Introduction of this paper. Since the study covers all deaths among 35–64 year old Finns from 1981 to 1995, there is no bias in the representativeness of the results. We avoided the frequent problem of bias in class mortality rates caused by the 'healthy worker effect' by classifying persons outside the labour force on the basis of their former occupation or the occupation of the head of household. The change from the 8th revision of the ICD to the Finnish version of the 9th revision has only a negligible effect on the comparability of the results over time when, as was the case here, broad groups of causes of death are used.<sup>27</sup>

The reasons for the unexpected results for both the overall positive trends in mortality and changes in class differences are not obvious. At the general societal level one explanation could be that the Finnish system of unemployment compensation was capable of protecting the unemployed from a drastic deterioration in living conditions. The inequality in disposable income as measured by the Gini coefficient remained almost constant from 1990 to 1994 (0.204 versus 0.208). In 1995 the coefficient was somewhat higher (0.216).<sup>23</sup> More specific tentative explanations are presented below on the basis of the cause-specific results and results from studies

on factors affecting mortality from cardiovascular diseases and alcohol-related causes.

### *Mortality from cardiovascular diseases*

A major factor affecting trends in total mortality during the period studied was the marked continuous decline in mortality from ischaemic heart disease and other cardiovascular diseases. According to results concerning eastern Finland, changes in smoking, serum cholesterol levels and blood pressure explain most of the decline in mortality from ischaemic heart disease and stroke during the 1970s and 1980s in the total population.<sup>28,29</sup> Among manual workers these risk factors well explain the decline in mortality from ischaemic heart disease.<sup>30</sup> However, among non-manual employees, the mortality decline in the 1980s was considerably larger than could be expected on the basis of trends in risk factor levels.<sup>30</sup>

New methods in treatment and secondary prevention of cardiovascular diseases were adopted during the 1980s; these included coronary artery bypass grafting, coronary angioplasty, thrombolytic treatment and prophylactic use of acetosalicylic acid. It is plausible that the upper socioeconomic strata have better access to such new treatments when they are not yet widely available. When knowledge about and the availability of new treatment methods increase, their use may spread more evenly in the population. Such a diffusion process could have contributed to the marked increase in cardiovascular mortality differentials during the 1980s and their stabilisation during the 1990s in Finland.

The evidence regarding coronary surgery lends some support to this interpretation. During the first half of the 1980s, on average approximately 400 coronary bypass operations and angioplasties were performed annually in Finland; during the late 1980s the figure climbed to 1,400 and in 1990–1994 to 3,500 (Finnish Heart Association, unpublished data). In the late 1980s bypass operations were 35% more common among male non-manual than manual workers in Finland and among women the corresponding excess was 19%, despite the marked mortality and morbidity differences running in the opposite direction.<sup>31</sup> As rates for surgical treatment of ischaemic heart disease have sharply increased since then, it seems reasonable to assume that the wide socioeconomic inequities in the use of coronary surgery relative to need have declined during the 1990s, contributing to a greater absolute decrease in mortality in the manual than in the non-manual class.

The decline in male lung cancer mortality had almost no effect on changes in the class difference in total mortality, because the trends in male lung cancer mortality were similar in both classes during the period studied here. Mortality from cancers other than lung cancer also played only a minor role in the development of mortality differentials.

### *Mortality from alcohol-related causes*

Differences between social classes in trends in mortality from alcohol-related causes of death made a marked con-

tribution to the increase in the gap in all-cause mortality in the 1980s. In addition, the slowing down of the relative increase in the all-cause mortality gap in the 1990s was partly due to changes in these trends. The changes in mortality from accidents and suicide were similar to those in mortality from alcohol-related causes. This parallel development is not surprising as nearly half of the middle-aged men who died from accidents and suicides in 1987–1993 were intoxicated according to information on contributing causes of death in the death record.<sup>32</sup> It seems likely that both the rapid increase in mortality from alcohol-related causes and the simultaneous increase in mortality from accidents and suicides was largely caused by the rapid increase in the consumption of alcohol in the 1980s: annual per capita alcohol consumption (including estimated unrecorded use) increased by almost 20% from 1985 to 1990.<sup>33</sup> The increase in the late 1980s was connected with the growth in purchasing power which followed with the rapid economic growth. Our results indicate that the increase in alcohol consumption had more harmful effects in the manual than in the non-manual class.

Similarly, the slowing down of the increase in mortality from alcohol-related causes, accidents and suicide in 1991–1995 is probably related to the decline in alcohol consumption during the recession. Annual per capita alcohol consumption dropped by more than 10% from 1990 to 1994, but increased again in 1995.<sup>33</sup> The decline in alcohol consumption was most likely due to the negative effect of recession on income. Thus, the recession indirectly prevented premature deaths.

#### Concluding comments

Covering varying periods ending in the 1980s or early 1990s, all studies in developed countries have found an increase in relative socioeconomic inequalities in mortality among working age men, a major cause of which has been the more rapid decline in cardiovascular mortality in the higher social classes.<sup>10–15</sup> Our results for the 1990s suggest that the decline in cardiovascular mortality in Finland may be reaching a phase during which the absolute decrease is more rapid in the manual class than in the non-manual class. It seems likely that, sooner or later, this phase will be reached in all countries with declining cardiovascular mortality because the rapid decline of mortality in the non-manual class cannot continue indefinitely.

In conclusion, our results show that economic recession slowed down rather than sped up the growth of socioeconomic inequalities in mortality. Changes in inequalities in Finland have resulted from a complex combination of different and even opposite trends for various causes of death, which vary by sex, class and period. In the light of this complexity it seems unlikely that there exists any single economic or other explanation for class inequalities and changes in inequalities which would be universally valid. For example, the suggestion that changes in income inequality are a major cause of the widening of inequalities in mortality does not fit in the case of Finland,

since inequalities in disposable income diminished rapidly from 1965 to 1975 and there was no increase before the end of the period covered by this study.<sup>34</sup> Detailed cause-, country- and period-specific analyses are needed to gain a better understanding of trends in socioeconomic inequalities in mortality.

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#### REFERENCES

- 1 Kunst AE. Cross-national comparisons of socio-economic differences in mortality [dissertation]. Rotterdam: Erasmus Univ, 1997.
- 2 Mackenbach JM, Kunst AE, Cavelaars AEJM, Groenohof F, Geurts, JJM, the EU Working Group on Socioeconomic Inequalities in Health. Socioeconomic inequalities in morbidity and mortality in western Europe. *Lancet* 1997;349:1655–9.
- 3 Marmot M. The social pattern of health and disease. In: Blane D, Brunner E, Wilkinson R, editors. *Health and social organization: towards a health policy for the 21st century*. London and New York: Routledge, 1996:42–67.
- 4 Preston SH, Taubman P. Socioeconomic differences in adult mortality and health status. In: Martin EG, Preston SDH, editors. *Demography of aging*. Washington, DC: National Academy Press, 1994:278–318.
- 5 Valkonen T. Adult mortality and level of education: a comparison of six countries. In: Fox J, editor. *Health inequalities in European countries*. Aldershot: Gower, 1989:142–72.
- 6 Ministry of Social Affairs and Health. Health for all by the year 2000: the Finnish national strategy. Helsinki: Ministry of Social Affairs and Health, 1987.
- 7 World Health Organization. *Targets for health for all*. Copenhagen: WHO Regional Office for Europe, 1985.
- 8 Borgan J-K. Socioeconomic trends in differential mortality among middle-aged males in Norway 1960–1990. *Yearbook Popul Res Finland* 1996;33:73–81.
- 9 Diderichsen F, Hallqvist J. Trends in occupational mortality among middle-aged men in Sweden 1961–1990. *Int J Epidemiol* 1997;28(4):782–7.
- 10 Drever F, Whitehead M, editors. *Health inequalities*. Decennial Supplement. London: The Stationery Office, 1997.
- 11 Ingerslev O, Madsen M, Andersen O. *Sociale forskelle i dødeligheden i Danmark (Social differences in mortality in Denmark)*. Copenhagen: Sundhedsministeriets Middellevevedsudsvalg, 1994 (in Danish).
- 12 Pappas G, Queen S, Hadden W, Fisher G. The increasing disparity in mortality between socioeconomic groups in the United States, 1960 and 1986. *New Engl J Med* 1993;329:103–9.
- 13 Preston SH, Elo IT. Are educational differentials in adult mortality increasing in the United States? *J Aging Health* 1995;7:476–96.
- 14 Regidor E, Gutiérrez-Fisac JL, Rodríguez C. Increased socioeconomic differences in mortality in eight Spanish provinces. *Soc Sci Med* 1995;41:801–7.
- 15 Valkonen T, Martelin T, Rimpelä A, Notkola V, Savela S. Socio-economic mortality differences in Finland 1981–90. Helsinki: Statistics Finland, 1993.
- 16 Carrol D, Davey Smith G. Health and socioeconomic position: a commentary. *J Health Psychol* 1997;2:275–82.
- 17 Davey Smith G, Egger M. Socioeconomic differentials in wealth and health: widening inequalities in health - the legacy of the Thatcher years. *BMJ* 1993;307:1085–6.
- 18 Morris JK, Cook DG, Shaper AG. Loss of employment and mortality. *BMJ* 1994;308:1135–9.
- 19 Wilkinson RG. *Unhealthy societies: the afflictions of inequality*. London: Routledge, 1996.
- 20 Valkonen T, Martikainen PT. The association between unemployment and mortality: causation or selection? In: Lopez A, Caselli G, Valkonen T, editors. *Adult mortality in developed*

countries: from description to explanation. Oxford: Clarendon Press, 1995:201-22.

21 Martikainen PT, Valkonen T. Excess mortality of unemployed men and women during a period of rapidly increasing unemployment. *Lancet* 1996;348:909-12.

22 Judge K. Income distribution and life expectancy: a critical appraisal. *BMJ* 1995;311:1282-5.

23 Jäntti M, Martikainen P, Valkonen T. Unemployment and mortality in Finland. In: Cornia GA, Panizza R, editors. *The transition's mortality crisis*. Oxford: Oxford University Press, in press.

24 Statistics Finland, Työvoimatilasto (Labour force statistics). Helsinki: Official Statistics of Finland, Labour market, 1996 (in Finnish).

25 Lääkintöhallitus. Tautiluokitus 1987, osa 1 (Classification of diseases, Part 1). Helsinki: Lääkintöhallitus, 1986 (in Finnish).

26 Clayton D, Hills M. *Statistical models in epidemiology*. Oxford: Oxford University Press, 1993.

27 Official Statistics of Finland. Comparison of causes of death between the International Classification of Diseases (ICD8) and the Finnish classification of diseases 1987. Helsinki: Official Statistics of Finland, 1992.

28 Vartiainen E, Puska P, Pekkanen J, Tuomilehto J, Jousilahti P. Changes in risk factors explain changes in mortality from ischaemic heart disease in Finland. *BMJ* 1994;309:23-7.

29 Vartiainen E, Sarti C, Tuomilehto H, Kuulasmaa K. Do changes in cardiovascular risk factors explain changes in mortality from stroke in Finland? *BMJ* 1995;310:901-4.

30 Vartiainen E, Pekkanen J, Koskinen S, Jousilahti P, Salomaa V, Puska P. Do changes in cardiovascular risk factors explain the increasing socioeconomic difference in mortality from ischaemic heart disease in Finland. *J Epidemiol Commun Health* 1998;52:416-9.

31 Keskimäki I, Koskinen S, Salinto M, Aro S. Socioeconomic and gender inequities in access to coronary artery bypass grafting in Finland. *Eur J Public Health* 1997;7:392-7.

32 Mäkelä P. Alcohol-related mortality by age and sex and its impact on life-expectancy: estimates based on the Finnish death register. *Eur J Public Health* 1998;8:43-51.

33 Hein R. Alkoholi ja huumeet 1996: kulutus, käyttö ja haitat (Alcohol and narcotics: consumption, use and harmful effects). Helsinki: National Research and Development Centre for Welfare and Health, 1997 (in Finnish).

34 Uusitalo H. Neljä laman vuotta: mitä on tapahtunut tulonjaossa? (Four years of recession: what has happened in income distribution?). In: Heikkilä M, Uusitalo H, editors. *Tutkimuksia sosiaaliturvan leikkauksista ja niiden vaikutuksista 1990-luvun Suomessa (The price of cuts. Studies on cuts in social security and their effects in Finland in the 1990s)*. Helsinki: National Research and Development Centre for Welfare and Health, 1997:135-52 (in Finnish).

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