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Not in all walks of life?

Social Differences in Suicide Mortality

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ACADEMIC DISSERTATION

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ABSTRACT

In Finland, the suicide mortality trend has been decreasing during the last decade and a half, yet suicide was the fourth most common cause of death among both Finnish men and women aged 15–64 years in 2006, meaning that every eleventh male and every fifteenth female death was a suicide. However, suicide does not occur equally among population sub-groups. Two of the notable sociodemographic factors that position people at different risk of suicide are socioeconomic and employment status: those with low education, employed in manual occupations, having low income and those who are unemployed have been found to have an elevated suicide risk.

The purpose of this study was to provide a systematic analysis of these social differences in suicide mortality in Finland. Besides studying socioeconomic trends and differences in suicide according to age and sex, different indicators for socioeconomic status were used simultaneously, taking account of their pathways and mutual associations while also paying attention to confounding and mediatory effects of living arrangements and employment status. Also the relation between unemployment and suicide was assessed during different levels of national unemployment rate in order to gain insight into its causal effects. We further incorporated area effects on mortality by studying the association between area-level social characteristics and suicide as well as the interaction between individual and area social status.

Register data obtained from Statistics Finland were used in this study. In addition to contingency-based data for the total Finnish population and individual-level random sample data with 80% of suicides, area-level information was also used. Suicide mortality trends were studied for a period of 30 years, 1971–2000, but otherwise suicides committed in the 1990s and at the beginning of the 2000s comprised the data. In some analyses suicides were divided into two groups according to contributory causes of death. The first group consisted of suicide deaths that had alcohol intoxication as one of the contributory causes, and the other group is comprised of all other suicide deaths. Methods included Poisson and Cox regression models.

Because of the decline in suicide among upper non-manual male workers and a slower decrease or even an increase among other socioeconomic groups, the relative mortality differences increased somewhat during 1970–1990. Resulting from a notable decrease in manual workers' suicide rate from 1991 onwards, absolute socioeconomic differences have decreased substantially during the study period among men. Nevertheless, relative differences still exist. Among women, suicide mortality was higher in the upper non-manual group than in other social class groups in the 1970s, but since suicide has decreased substantially in this group, and among women both absolute and relative social class differences have increased somewhat. Suicide mortality has decreased in all employment status groups since 1988 with the exception of long-term unemployed

women whose suicide mortality has remained constant. Relative suicide risks have, however, persisted with the long-term unemployed having the highest risks.

Education, occupation-based social class and household income were inversely and strongly related to both non-alcohol associated and alcohol-associated suicide among men and women alike. Social class was most strongly related to suicide following mutual adjustments for socioeconomic indicators, except among women where also educational differences remained very high when alcohol was a contributory cause of death. Among both men and women employment status explained quite a large part of the income differences, but living arrangements had little effect with the exception of attenuating suicide risk in the most deprived men. Among the long-term unemployed age-adjusted suicide mortality was at least three times higher than among the employed. Household income mediated some of this association. When the national unemployment level was high excess suicide mortality among the unstably employed was not as high compared to the stably employed as during low unemployment, but no such differences were found among the long-term unemployed.

Of area social characteristics, voting turnout was consistently related to suicide, and the proportion of manual workers and unemployment level to alcohol-associated suicide. The socioeconomic structure of areas may affect suicide through behavioural cultures. Those living in areas with a high level of unemployment possibly experience more hopelessness than people in better off areas, and this may be reflected in the excess alcohol use and suicidal behaviour. However, adjustment for individual-level variables partly attenuated these associations. The effects of individual social class status on suicide were not consistently mediated or modified by area characteristics, and thus the hypotheses of an interaction between individual socio-economic status and area social characteristics for suicide mortality were not supported.

Low social class proved to be an important determinant of suicide risk among both men and women, but the strong independent effect of education on alcohol-associated suicide indicates that the roots of these differences are probably established in early adulthood when educational qualifications are obtained and health-behavioural patterns set. High relative suicide mortality among the unemployed during times of economic boom suggests that selective processes may be responsible for some of the employment status differences in suicide. However, long-term unemployment seems to have causal effects on suicide, which, especially among men, may partly stem from low income.

In conclusion, the results in this study suggest that education, occupation-based social class and employment status have causal effects on suicide risk, but to some extent selection into low education and unemployment are also involved in the explanations for excess suicide mortality among the socially deprived. It is also conceivable that alcohol use is to some extent behind social differences in suicide. In addition to those with low education, manual workers and the unemployed, young people, whose health-related behaviour is still to be adopted, would most probably benefit from suicide prevention programmes.

TIIVISTELMÄ

Itsemurhakuolleisuus on pienentynyt Suomessa huomattavasti viimeisen reilun viiden-toista vuoden aikana, mutta edelleen itsemurha oli neljänneksi yleisin kuolemansyy 15–64-vuotiailla vuonna 2006. Joka yhdestoista miesten ja joka viidestoista naisten kuolema johtui itsemurhasta. Itsemurhakuolleisuus ei kuitenkaan jakaudu tasaisesti väestöryhmien välille, vaan sosioekonominen asema ja pääasiallinen toiminta määrittävät sitä edelleen voimakkaasti: suurin itsemurhan riski on vähän koulutetuilla, työntekijäasemassa olevilla, pienituloisilla sekä työttömillä. Vaikka terveydentilan ja kokonaiskuolleisuuden sosioekonomisten erojen syitä on tutkittu paljon, vain vähän tiedetään itsemurhakuolleisuuden sosioekonomisten erojen taustoista.

Tämän tutkimuksen tavoitteena oli kokonaisvaltainen analyysi itsemurhakuolleisuuden sosiaalisista eroista Suomessa. Tarkoituksena oli ensinnäkin kuvata ja selittää itsemurhakuolleisuuden sosioekonomisia eroja ja niiden ajallista muutosta. Erityisesti keskityttiin kolmen eri sosioekonomisen indikaattorin, eli koulutuksen, ammattiin perustuvan sosiaaliluokan sekä kotitalouden kulutusyksikköä kohden laskettujen tulojen, suhteelliseen merkitykseen, ja siihen, missä määrin ne selittivät tai välittivät toistensa vaikutuksia. Valikoitumis- ja kausaalivaikutuksia tutkittiin myös työttömyyden ja itsemurhakuolleisuuden yhteyttä tarkastelemalla. Kiinnostuksen kohteena olivat yksilön sosioekonomisen aseman merkityksen lisäksi alueiden sosiaalisten ominaisuuksien yhteys itsemurhakuolleisuuteen sekä näiden tekijöiden yhteisvaikutukset.

Tutkimuksessa käytetyt aineistot muodostettiin Tilastokeskuksen rekistereistä. Itsemurhakuolleisuustrendejä tarkasteltaessa käytössä oli aineisto, joka kattoi vuodet 1971–2000, mutta muuten aineistot muodostuivat 1990-luvun ja 2000-luvun alun itsemurhakuolemista. Osassa analyysistä tarkasteltiin erikseen myös sellaisia itsemurhia, joissa kuolemansyyselvityksen tehnyt oikeuslääkäri oli merkinnyt kuolintodistukseen alkoholipäihtymyksen myötävaikuttavaksi kuolemansyyksi. Menetelminä käytettiin pääasiassa Poisson'n ja Coxin regressiomalleja.

Vuosien 1971 ja 1990 välisenä aikana ylempien toimihenkilömiesten itsemurhakuolleisuus pieneni nopeasti, mutta muissa sosiaaliluokissa itsemurhakuolleisuus pieneni huomattavasti hitaammin tai jopa suureni, joten suhteelliset kuolleisuuserot näiden sosiaaliluokkien välillä kasvoivat hieman. Vuodesta 1991 eteenpäin työntekijämiesten itsemurhakuolleisuus alkoi kuitenkin pienentyä huomattavasti, ja absoluuttiset sosioekonomiset erot miesten itsemurhakuolleisuudessa ovatkin viime vuosien aikana kaventuneet. Siitä huolimatta suhteelliset erot ovat säilyneet lähes entisillään. Naisten osalta itsemurhakuolleisuus oli 1970-luvulla suurempaa ylempillä toimihenkilöillä kuin muissa sosiaaliluokissa, mutta koska ylempien toimihenkilönaisten itsemurhakuolleisuus on sen jälkeen pienentynyt nopeasti, naisten osalta sekä absoluuttiset että suhteelliset sosioekonomiset erot ovat jossain määrin kasvaneet. Sekä työllisten että työttömien osalta Itsemurhakuolleisuus on puolestaan pienentynyt vuoden 1988 jälkeen ainoana poikkeuk-

sena pitkäaikaistyöttömät naiset, joiden itsemurhakuolleisuus on säilynyt ennallaan. Suhteelliset erot ovat kuitenkin säilyneet suurina, ja pitkäaikaistyöttömillä riski on suurin.

Koulutus, sosiaaliluokka ja kotitalouden tulot olivat yksinään tarkasteltuina käänteisesti ja voimakkaasti yhteydessä itsemurhakuolleisuuteen. Sosiaaliluokka oli kaikkein voimakkaimmin yhteydessä itsemurhakuolleisuuteen vielä senkin jälkeen kun koulutuksen ja tulojen vaikutus oli vakioitu. Naisilla myös alhainen koulutus oli tärkeä riskitekijä silloin, kun tarkasteltiin itsemurhia, joissa alkoholipäihtymys oli myötävaikuttava tekijä. Sekä miehillä että naisilla pääasiallinen toiminta selitti suurelta osin kotitalouden tulojen yhteyden itsemurhakuolleisuuteen, mutta asumismuodon vakioiminen ei juuri vaikuttanut sosioekonomisiin eroihin. Pitkäaikaistyöttömien itsemurhakuolleisuus oli noin kolminkertainen työllisiin verrattuna, ja kotitalouden tulot selittivät osan tästä yhteydestä miehillä. Lyhytaikaisesti työttömien ylikuolleisuus oli pienempää korkean kansallisen työttömyysasteen aikana kuin alhaisen työttömyyden aikana, mikä kertoo valikoitumisen jonkinasteisesta vaikutuksesta työttömien ylikuolleisuuteen, mutta pitkäaikaistyöttömien osalta tällaista eroa ei havaittu.

Alueiden sosiaalista ominaisuuksista alhainen äänestysaktiivisuus oli johdonmukaisesti yhteydessä korkeampaan itsemurhakuolleisuuteen, ja työntekijöiden suuri osuus alueella ja korkea työttömyys olivat yhteydessä niihin itsemurhiin, joissa alkoholi oli myötävaikuttavana kuolemansyynä. Alueiden sosioekonomiset ominaisuudet saattavat vaikuttaa itsetuhoisuuteen käyttäytymiskonventioiden kautta. Korkean työttömyyden alueilla asuvat saattavat kokea useammin toivottomuutta kuin paremmassa tilanteessa olevien alueiden asukkaat, ja tämä puolestaan saattaa heijastua niin liialliseen alkoholin käyttöön kuin itsetuhoiseen käyttäytymiseen. Yksilötason tekijöiden vakioiminen pienensi kuitenkin näiden vaikutusten voimakkuutta. Koska alueiden sosiaaliset ominaisuudet eivät selittäneet tai välittäneet yksilötason sosioekonomisen aseman vaikutusta, hypoteesi yksilön sosioekonomisen aseman ja alueen sosiaalisten ominaisuuksien interaktiosta ei saanut tukea tässä tutkimuksessa.

Sekä miehillä että naisilla alhainen ammattiin perustuvan sosiaaliluokka osoitautui tärkeäksi itsemurhakuolleisuuden riskitekijäksi. Lisäksi koulutuksen voimakas itsenäinen vaikutus niihin itsemurhiin, joissa alkoholipäihtymys oli myötävaikuttava kuolemansyynä, indikoi, että osin sosioekonomisten erojen syyt juontuvat nuoruuteen tai varhaiseen aikuisuuteen, jolloin koulutus hankitaan ja terveyskäyttäytymistavat muodostuvat. Työttömien korkea suhteellinen itsemurhakuolleisuus taloudellisen nousukauden aikana viittaa siihen, että pääasiallisen toiminnan mukaiset erot itsemurhakuolleisuudessa johtuvat ainakin jossain määrin valikoitumisesta työttömäksi. Pitkäaikaistyöttömyys näyttäisi kuitenkin myös kausaalisesti nostavan itsemurhariskiä, ja erityisesti miesten osalta pienet tulot ovat tätä vaikutusta välittävä tekijä.

Kaiken kaikkiaan tämän tutkimuksen tulokset viittaavat siihen, että koulutuksella ja ammattiin perustuvalla sosiaaliluokalla sekä pitkäaikaistyöttömyydellä on kausaalista vaikutusta itsemurhakuolleisuuteen, mutta jossain määrin myös valikoituminen alhaiseen koulutukseen ja työttömyyteen selittävät itsemurhakuolleisuuden sosioekonomisia eroja. Tulosten perusteella voidaan sanoa, että myös alkoholinkäyttö vaikuttaa näiden erojen taustalla. Itsemurhien ehkäisyprojekteista hyötyisivätkin todennäköisimmin vähän koulutettujen, työntekijöiden ja työttömien lisäksi myös nuoret ihmiset, joiden terveyskäyttäytyminen on vasta muotoutumassa.

LIST OF ORIGINAL PUBLICATIONS

This thesis is based on the following original articles, referred to in the text by their Roman numerals as indicated below (I-V):

- I Mäki N.E. & Martikainen P.T.: Socioeconomic differences in suicide mortality by sex in Finland in 1971–2000: A register-based study of trends, levels and life expectancy differences. *Scandinavian Journal of Public Health*, 2007;35:387–395.
- II Mäki N. & Martikainen P.: The effects of education, social class and income on non-alcohol- and alcohol-associated suicide mortality: A register-based study of Finnish men aged 25–64. *European Journal of Population*, 2008;24:385–404.
- III Mäki N. & Martikainen P.: The role of socioeconomic indicators on non-alcohol and alcohol-associated suicide mortality among women. A register-based follow-up study of 12 million person-years. *Social Science & Medicine*, 2009;68:2161–2169.
- IV Mäki N. & Martikainen P.: Register-based study on excess suicide mortality of unemployed men and women during different levels of unemployment. Submitted to *Journal of Epidemiology & Community Health*, 2009.
- V Martikainen P., Mäki N. & Blomgren J.: The effects of area and individual social characteristics on suicide risk: A multilevel study of relative contribution and effect modification. *European Journal of Population*, 2004;20:323–350.

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ABBREVIATIONS

DALYs	disability-adjusted life years
HR	Hazard Ratio
ICD	International Classification of Diseases
OECD	Organisation for Economic Co-operation and Development
RII	Relative Index of Inequality
RR	Relative Ratio
SSRIs	selective serotonin reuptake inhibitors
WHO	World Health Organization
YLEL	years of life expectancy lost

1 INTRODUCTION

1.1 Suicide as a public health and societal problem

Suicide is a tragic event and a confusing death. It leads to the premature death of the committer, and the final act of suicide is usually preceded with periods of anguish and suffering. Suicide also causes extensive affliction to others. For those left behind it often has far-reaching consequences, which in addition to feelings of blame, grief reactions and mental disorders include even future suicides (Cerel, Jordan & Duberstein 2008).

Despite its individual feature, suicide is also to a great extent a public health problem. According to the World Health Organization (WHO 2000) each year worldwide approximately 900 000 individuals die of suicide, and the global mortality rate is about 16 suicides per 100 000 persons. Suicide mortality has increased during recent decades in many regions, and furthermore, suicide has been predicted to become an even larger global public health burden in the next two decades (Lopez & Murray 1998).

Among those aged 15 to 44 years suicide is among the three leading causes of death worldwide. As suicide often takes place in young or middle aged adults its burden on public health is large, and one way to estimate this is in terms of disability-adjusted life years (DALYs). According to this indicator, suicide was responsible for 1.8% of the total burden of disease worldwide in 1998. This is equal to the burden due to wars and homicide combined and roughly twice the burden of diabetes. (WHO 2000.)

Suicide is a common cause of death also in many European countries and in North America (Schmidtke, Weinacker, Apter et al. 1999). In Finland the suicide mortality trend has decreased during the last decade, yet among both Finnish men and women aged 15–64 years suicide was the fourth most common cause of death in 2006, meaning that every eleventh male and every fifteenth female death was a suicide (Statistics Finland 2007).

Considerable variation exists in suicide mortality rates between countries and in national trends (OECD 2007; Schmidtke Weinacker, Apter et al. 1999; Fernquist & Cutright 1998; La Vecchia, Lucchini & Levi 1994), and regionally within a country (Pesonen, Hintikka Karkola et al. 2001; Bunting & Kelly 1998; MMWR 1997). There are also specific mortality patterns according to sex and age, *inter alia* (e.g., McKeown, Cuffe & Schulz 2006; Morrel, Page & Taylor 2002).

One of the notable factors that position people at different risk of suicide is socioeconomic status: those with low education (Lorant, Kunst, Huisman et al. 2005a), those employed in blue-collar occupations (Valkonen & Martelin 1988), and those having low income (Martikainen, Mäkelä, Koskinen et al. 2001), have been found to have an elevated suicide risk. Closely related to socioeconomic status is employment status. Education and social class are important determinants of non-employment (both unemployment and economic inactivity) among people of working age, and this in turn is

a major determinant of low income, and increased suicide risk has also been observed among the unemployed (Blakely, Collings & Atkinson 2003). In this study socioeconomic status and employment status are perceived as the most important indicators of social differences.

Reducing social differences in health and mortality between population sub-groups has been a salient objective in many national and international programmes (Europa 2008; Ministry of Social Affairs and Health 2008; WHO 1978). One of the central aims of the Finnish Health 2015 public health programme by the Government is to decrease accidental and violent deaths (Ministry of Social Affairs and Health 2001). Yet, our current understanding of the trends and causes of socioeconomic and employment status differences in suicide mortality is insufficient, and the purpose of this study is to provide a systematic analysis of these social differences in suicide mortality in Finland.

1.2. Long research tradition

Suicide is an abundantly studied issue, and it has been discussed in a wide spectrum of disciplines. In an attempt to understand suicidal behaviour the authors of the International Handbook of Suicide and Attempted Suicide (Hawton & van Hering 2002) covered the following frameworks: biological, medical and psychiatric aspects, psychology, etiology, sociology and genetics. Edwin S. Shneidman – a noted American suicidologist – considers in his text book the following themes: historical and literary, sociological, biological as well as psychiatric and psychological insight into suicide (Shneidman 2001).

The main focus varies, however: some disciplines have concentrated on the proximate causes of suicide (e.g. psychiatric disorders or substance abuse), while more distal reasons have been the subject matter of other fields. To simplify, psychiatrists and psychologists have tended to study and explain why particular individuals committed suicide, while sociologists have looked for the social causes of a society's, or social group's, suicide rate (Taylor 1988).

Both traditions have long roots. During the first decades of the 19th century statistics on crime (so-called moral statistics) were generated both in France and Britain, and these can be considered a substratum for the social science perspectives. Statistical analyses on various suicide risk factors that are based on these statistics originate in Morselli's seminal study *Suicide. An essay on comparative moral statistics* (published in 1879) and in Durkheim's *Suicide. A study in sociology* (published in 1897) in consequence of which he is generally regarded as the founder of the scientific study of suicide (Goldney & Schioldann 2000). It was argued by these pioneers that even though suicide mortality varied between areas, it remained regionally consistent in time. According to Durkheim this derives from differences in the quality and quantity of constraints which collective social life forces on the individual's basic drives. Considering suicide, the two most important social orders are integration and regulation. Societies and social groups which are characterised by over-integration or over-regulation or, alternatively, those lacking necessary integration or regulation have high suicide mortality. Furthermore, Durkheim specified four different types of suicide resulting from the combination of these two characteristics of the social condition, and called them egoistic, altruistic, anomic and fatalistic. (Durkheim 1952; Taylor 1988.)

Both the aforementioned studies included, among other factors, indicators describing socioeconomic characteristics of geographical areas. Later during the 1900s similar ecological work was carried out, for example, by Ruth Cavan in Chicago in 1928 and by Peter Sainsbury in London in 1955. Furthermore, Andrew F. Henry and J. F. Short Jr. compared areas with different economic situation and unemployment level in 1954. Veli Verkko used population registers in Finland to analyse suicides in the 1940s and 1950s, and paid attention to the “influence of strong drink on suicide in Finland” (Verkko 1951).

Other studies in this sociological framework worth mentioning are those by Gibbs and Martin (1964), which expanded on Durkheim’s concept of *social integration* by concretising a notion of *status integration* which is more readily subject to empirical testing, and by Pope (1976), which suggested that egoism and anomie are actually the same phenomenon and two different aspects of one social state.

For a long time results on socioeconomic and other differences in mortality as well as in suicide were mainly derived from ecological research studying correlations between death rates and social characteristics of geographical regions. However, as Valkonen (1999a) remarks, the aggregate-level association between the socioeconomic position and mortality in particular areas may differ from individual-level relationships between these factors, and, for example, changes in mortality levels may in fact occur from changes in the socioeconomic composition of the area.

In some countries (e.g. in the United Kingdom since 1851) occupation or some other indicator of socioeconomic status of the diseased person has been reported in the death certificate, and the death registration system has enabled calculations of mortality by socioeconomic categories by relating this information to exposed population tabulated by characteristics reported on censuses or surveys. However, as the data on deceased persons and general population originate from different sources, there is a chance for so-called numerator/denominator bias, which can be quite notable (Kunst, del Rios, Groenhof et al. 1998). Vallin describes the possible source of this bias as follows:

“The social status indicated by the information recorded on the death certificate may be very different from the status defined by the replies to the previous census questionnaire by the same individual. [...] In a census declaration it is usually made by the individual himself; at death it is always made by a third party.”

Vallin (1993, 958)

In order to overcome the numerator/denominator bias a matched-records approach has been used in the United States since the 1960 census (Kitagawa & Hauser 1973). In this method a sample of death records is linked back to census records, and also suicide mortality has been studied with such data (ibid.; Pappas, Queen, Hadden et al. 1993). Manual linking of death records and censuses is, however, time-consuming and expensive, which limits the size of study populations (Valkonen 1999a). Countries with a system of personal identification numbers have no comparable problems, especially as the use of these numbers was introduced and became common (e.g. in Finland during the 1960s) together with the large-scale implementation of automatic data processing. This approach is being routinely adopted in the Nordic countries, but is only possible on a sample basis elsewhere (Fox 1993). In Finland there are results on social class differences

in mortality based on this kind of data since 1971–75 (Sauli 1979; Valkonen 1982). Socioeconomic and employment status differences in suicide mortality have been studied using this kind of research design in Sweden (Westerling, Gullberg & Rosén 1996), Norway (Strand & Kunst 2006), Denmark (Qin, Agerbo & Mortensen 2003; Iversen, Andersen & Andersen 1987) and Finland (Valkonen, Martelin, Rimpelä et al. 1993; Martikainen 1990a).

The current study follows the latter tradition, and data based on different official registers as well as on census records were used in this study on social differences in suicide mortality. Even though suicide mortality has decreased in Finland for over a decade now, we lack understanding of changes in socioeconomic trends in suicide. Furthermore, even if explanations concerning social differences in ill-health, morbidity and total mortality have evolved in the past few decades, few systematic analyses on the adequacy of such explanatory models in studying suicide mortality exist. This study aims to enhance prevailing knowledge and understanding of socioeconomic and employment status differences in suicide in a framework grounded on selection and causation theories using mostly individual but also contextual social conditions.

2 CONTEXT OF THE STUDY

Suicide mortality is at a higher level among both men and women in Finland than in most other Western European countries. The latest figures available for the EU countries (Eurostat 2009) show that only in Latvia, Lithuania, Hungary and Slovenia among men, and in Lithuania, Hungary, Slovenia and Switzerland among women is the suicide rate higher than in Finland. Among both sexes suicide mortality has, however, decreased in most EU countries during the last decade (Eurostat 2009).

Figure 1 shows long-term trends in suicide mortality in Finland. During the 1920s suicide mortality increased rapidly among men (to about 40 deaths per 100 000 persons) and was still high on the eve of the Second World War. A lower suicide rate during the war and postwar years was followed by an increasing rate which fluctuated until the 1970s. Sharp increases in suicide mortality both at the beginning of the 1970s and during the latter part of the 1980s led to an all-time peak in the rate in 1990 (almost 50 deaths per 100 000 person), after which suicide mortality has decreased steadily and considerably. According to the most recent figures, suicide mortality among men (27.8 deaths per 100 000 persons in 2007) is now as low as during the postwar years. Among women, suicide mortality has doubled (from 5 to 10 deaths per 100 000 persons) during the same time period with the most rapid increase in the latter part of the 1950s, and was 8.5 deaths per 100 000 persons in 2007.

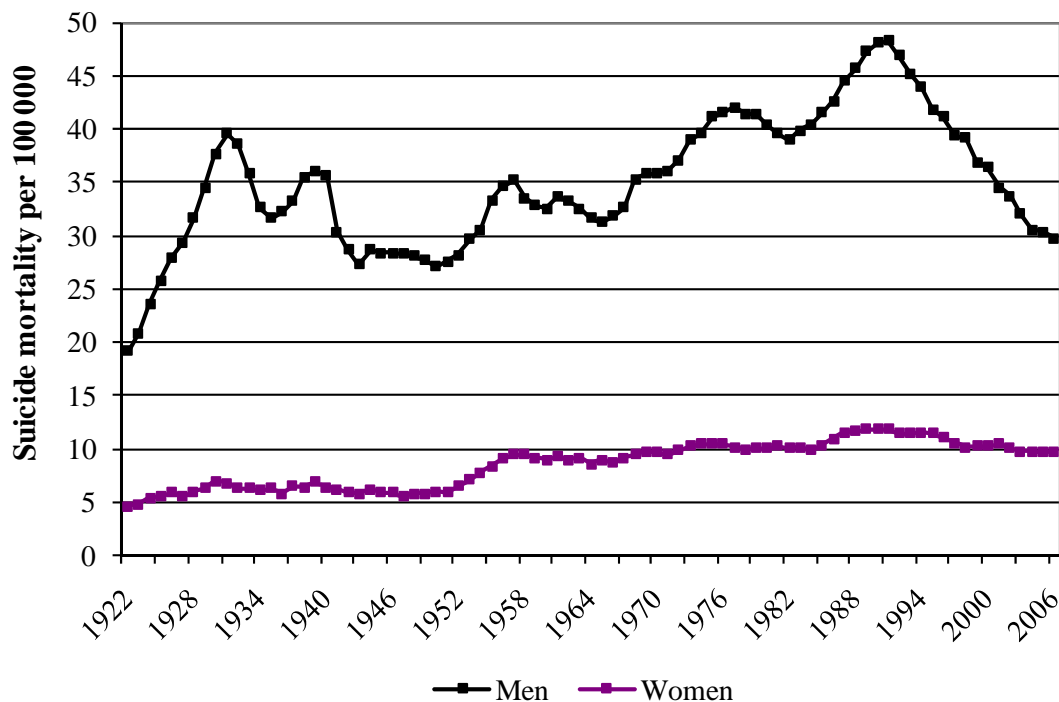


Figure 1 *Suicide mortality among men and women in Finland in 1921–2006.*

Source: Statistics Finland, various annual volumes of population statistics, Official Statistics of Finland

Unlike total and most cause-specific mortality which are directly related to age (i.e. mortality increases monotonically with age), suicide is associated with age in a more complicated way. Suicide mortality trends have also varied according to age. In many countries young and elderly men alike have lately experienced upward trends in suicide mortality (La Vecchia, Lucchini & Levi 1994), while in some countries age-specific suicide mortality rates have shown a tendency to converge since an increasing suicide mortality rate in young men has been counterbalanced by a decrease in elderly men’s suicide rates (Gunnell, Middleton, Whitley et al 2003; Allebeck, Brandt, Nordström et al. 1996).

In Finland suicide mortality among those aged 65 and over fluctuated around 60 deaths per 100 000 persons during the 1970s and 1980s until the beginning of the 1990s after which it has decreased (Figure 2). In the age group 25–64 years suicide mortality increased especially during the latter part of the 1980s and peaked in 1991 at 65 deaths per 100 000 persons after which it decreased substantially. Suicide mortality rate in young men (aged 15–24 years) was much lower at the beginning of the 1970s. It increased during the first part of the 1970s and again from the latter part of the 1980s to 1990 after which it decreased back to the same level it was at the beginning of the time period. Male suicide rates in these three age groups thus converged during the 35 years examined in Figure 2.

Women’s suicide mortality has been at a much lower level than that of men’s in all age groups, and only small changes have taken place. In the age group 25–64 years

suicide mortality was slightly higher during the first years of the 1990s (17.0 deaths per 100 000 persons in 1994) than before, and unlike the men's rate it started to decrease only after the middle of the 1990s. While in the oldest age group (65 years and over) suicide mortality decreased slightly between 1971 and 2005, the rate in young women (15–24 years) has increased, and there are no differences between these two age groups.

Despite these rather large alterations in suicide mortality, especially among men, we lack knowledge on how suicide mortality has changed in different socioeconomic and employment status groups, especially from 1993 onwards.

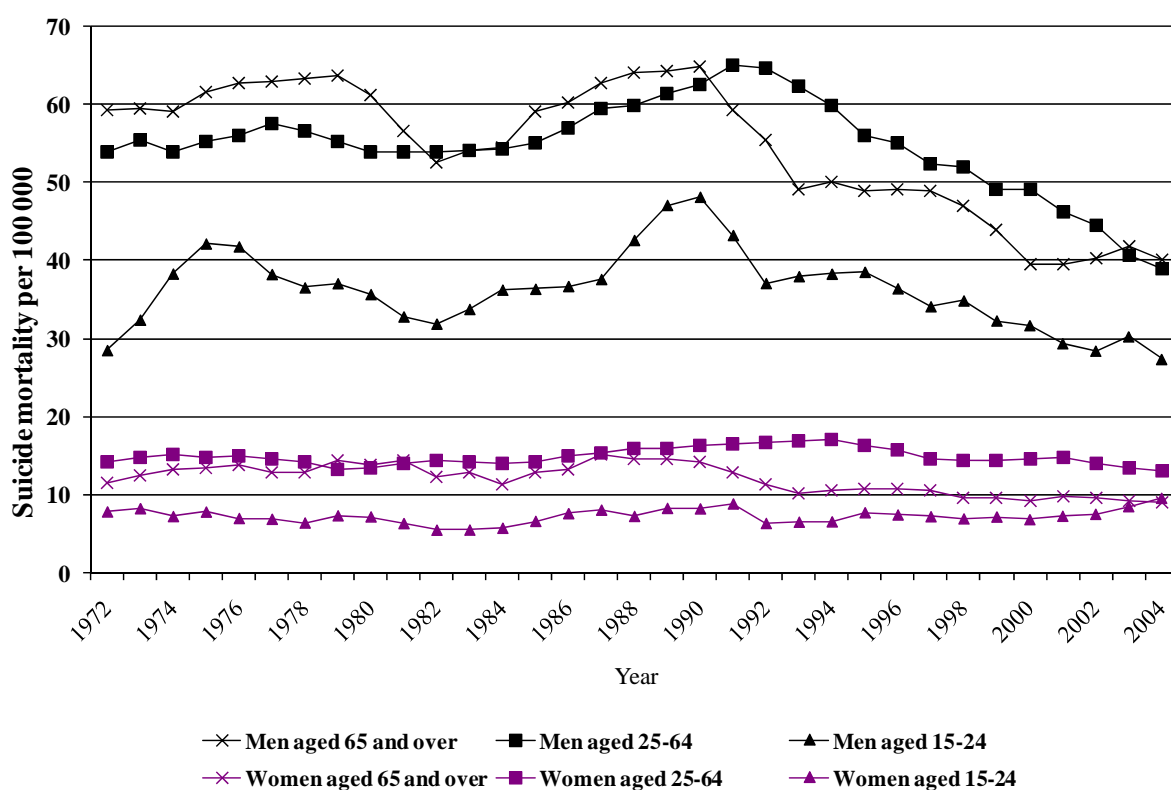


Figure 2 *Suicide mortality among men and women in three age groups in Finland in 1971–2005.*

Source: Statistics Finland, various annual volumes of population statistics, Official Statistics of Finland

As the Figures show, suicide mortality rate among men is much higher than among women, although the difference has decreased substantially during the 1990s and 2000s. The male to female rate ratio has diminished from about 4:1 to about 3:1, but it is still among the highest among the Nordic countries, while the Finnish female suicide rate is almost at the same level as in Sweden and Denmark (Cantor 2002).

3 CONCEPTUAL AND THEORETICAL FRAMEWORK

3.1 Suicide as a cause of death

Suicide is a complex cause of death. Suicide committers are usually ambivalent about their deeds. Menninger (1938) describes succinctly this dilemma as the will to live against the wish to die. According to Bille-Brahe (1998) in most cases the suicidal person does not want to die, but wants to stop living or, at least, cease being conscious, and perceives death as a means.

Suicide has usually been defined as willing and wilful self-termination, and minimally, suicide means self-killing: it is an overt explicit act in which a person *intentionally* ends his/her life (Maris 1981). The WHO has agreed on the following definition:

“Suicide is an act with fatal outcome, which was deliberately initiated and performed by the deceased, in the knowledge or expectation of its fatal outcome, and through which the deceased aimed at realizing changes he/she desired.”

WHO (1986)

Shneidman (1994) includes both intent and motivation in his definition: according to him suicide is a conscious act of self-induced annihilation, and best understood as a multidimensional malaise in an individual for whom suicide is perceived as the best solution. Bille-Brahe (1998) argues that none of the definitions proposed thus far can explain suicidal behaviour. Even if this contention is an exaggeration, it directs us to the importance of studying the – distal or proximate – risk factors for suicide.

Technically, suicide deaths are considered to be those in which suicide or some other condition brought about by intentional self-harm is stated as the underlying cause on the death certificate. Four conditions ought to be fulfilled in order to define a death as a suicide death (Maris 2002). First there was a death; second, the death was achieved by the individual who died; third, the death was intentional; and fourth, there was an active or passive agent (e.g., it was commission or omission of an act that resulted in the death).

According to Maris (2002) the concept of suicide can be perceived as a continuum that ranges from ideas to gestures, to risky lifestyles, suicide plans, suicide attempts, and, finally, suicide completion. Indeed, a growing body of research over the past few decades suggests that suicide is best defined as a complex process that evolves over time and across life conditions (Bonner 1992). In this view, suicide is not seen “simply as the act of self-inflicted deaths, but as a process by which certain maladaptive

processes of an individual [...] interacting with particular demands of environmental life conditions (e.g., negative life stress) over time, result in varying degrees of suicide intention” which eventually may culminate in suicide (ibid., 406–407). As a consequence of certain risk factors or vulnerabilities some individuals are less capable of handling stressful life events and less accomplished in adopting coping responses which may serve as protective factors. The balance between risk factors and coping responses varies during the lifecourse as well as the triggers and the intensity of the suicide ideation and intention. (Lönnqvist, Aro, Marttunen et al. 1993.) Overall, suicide attempts and deliberate self-harm thus greatly outnumber suicide deaths. In this study, however, only completed suicides are included, because reliable data describing prevalence and trends in different socioeconomic groups exist on completed suicides, which is not the case for suicidal behaviour or suicide attempts.

A widely accepted conception is that suicide indicates extreme unwell-being (Pirkola 1999) often related to psychiatric morbidity. Suicide risk is elevated particularly among those with depressive disorder (Lönnqvist 2002), but also among those with other mental disorders including schizophrenia, personality and anxiety disorders (Hawton & van Heering 2000). Also substance abuse (Murphy 2002) and, apparently, physical illnesses (Duberstein, Conwell, Conner et al. 2004; Quan, Arboleda-Flórez, Fick et al. 2002) as well as functional limitations (Kaplan, McFarland, Huguet et al. 2007) are related to increased suicide risk.

The introduction of newer antidepressants, and especially selective serotonin reuptake inhibitors (SSRIs), in the course of the 1990s advanced the treatment of depression and anxiety disorders. These pharmaceuticals seem to be well tolerated with relatively few side-effects (MacGillivray, Arroll, Hatcher et al. 2003; Mace & Taylor 2000). This has led to more widespread pharmacological treatment of depressed patients. Together with this increase in the use of antidepressants, many Western countries have experienced a decline in their national suicide rates. Several researchers (e.g., Hall, Mant, Mitchell et al. 2003; Isacson 2000) have coupled these two phenomena, and assume that increased treatment of depression has led to the observed decline in suicide, while others have found mixed evidence for this claim (Reseland, Bray & Gunnell 2006; Barbui, Campomori, D’Avanzo et al. 1999). In Finland the decline in suicide has been most marked in men (Figures 1 and 2, above), despite the fact that women are the greatest consumers of antidepressants and their use has also increased most rapidly in women (Klaukka, Idänpään-Heikkilä & Neuvonen 2005). It is unclear whether the use of selective serotonin reuptake inhibitors (SSRIs) reduces the risk of suicide in people with depression. Randomised control trials and observational studies seem to indicate that while SSRIs increase suicide ideation early in treatment (Hall & Lucke 2006) and increase the risk of suicide among adolescents, they decrease it among older adults (Barbui, Esposito & Cipriani 2009).

From the point of view of the current study this issue is of importance if depression, the use of antidepressant pharmaceuticals and the utilisation of mental health services differ between social status groups. Whereas a large European review study (Wittchen & Jacobi 2005) found generally low utilisation and treatment rates in mental disorders and suggested a considerable degree of unmet need in care, persons with the highest level of education have been found to be the most likely to use mental health services given the presence of a psychiatric disorder, even though they are the least likely to have such a disorder (Howard, Cornille, Lyons et al. 1996). In Finland antidepressant

treatment seems to be less common among low educational groups than among those with higher education, but only among men (Kivimäki, Gunnell, Lawlor et al. 2007). A study in Denmark (Hansen, Søndergaard, Vach et al. 2004), instead, suggests that compatible with the prevalence of depression, low socioeconomic status is associated with a higher incidence rate of antidepressant prescription. Notwithstanding the inconsistency of the evidence, there might be a larger mismatch in the treatment of depression relative to need in some socioeconomic groups than in others. Even though the effect of these disparities on socioeconomic differences in suicide mortality is probably rather small, it is necessary to be aware of it.

3.2 Social differences in mortality with special reference to suicide

3.2.1 Introduction and general overview

Health, morbidity and mortality have been found to relate inversely to both socioeconomic and employment status. In actuality, variations in mortality rates by social class are not only old knowledge (Whitehead 1997), but they are also one of the most consistent findings in epidemiology (Townsend & Davidson 1982). The concept of inequality usually refers not only to differences in mortality that exist between sexes or people of different age, but to outcomes which are socially or economically determined (Townsend & Davidson 1982). Elstad defines social inequalities as follows:

“Social inequalities in health are any type of persistent and important differences in aggregated health between social positions in the same social structure(s).”

Elstad (2000, 8)

The definition underlines the few basic features in health differentials: the consistency of social inequalities, the aggregated nature of these differences, and the important notion that the social positions compared should be linked to the same social structure in order to be relevant. Elstad (ibid.) argues that, for example, manual workers and single parents are not social positions in the same structure. One component of the definition is more equivocal: how large do the differences have to be to be significant? According to Elstad (ibid.) this criterion is a matter of debate, but perhaps also the source of the inequalities is relevant. Whitehead (1992) points out that much of the inequality between different groups in society cannot be accounted for on biological grounds, and the crucial factor of whether the resulting health or mortality differences are considered unfair depends, among other things, on the degree of possibility to choose lifestyles, to avoid exposure to unhealthy living or working conditions, and to access essential health services. Understanding the mechanism of how inequalities in health and mortality are generated is thus a prerequisite in order to decide whether these differences are wrongful. The existence of social differences in health and mortality and the unfavourable state of affairs among those in poorer socioeconomic and employment status have been shown by

a large and growing body of research. Mostly the evidence is based on studies including adults or middle-aged persons, but review articles and comparative studies among infants (Arntzen, Mortensen, Schnor et al. 2008), children (Chen, Matthews & Boyce 2002) and the elderly (Huisman, Kunst, Andersen et al. 2004) show that socioeconomic inequalities persist also in other age groups. Furthermore, gaps in health among different social groups within countries are not confined to the affluent nations (Braveman & Tarimo 2002). In the following, research on social differences in health, in specific diseases, in all mortality and in some causes of death is reviewed in more.

Health indicators used in review articles, meta-analysis and comparative studies on social differences have included self-rated health (Mackenbach, Stirbu, Roskam et al. 2008; Fuhrer, Shipley, Chastang et al. 2002), health expectancy (Sihvonen, Kunst, Lahelma et al. 1998), functional capacity (Huisman, Kunst & Mackenbach 2003), health behaviours (Hanson & Chen 2007; Power, Graham, Due et al. 2005) and psychological symptoms of depression (Montgomery, Cook, Bartley et al. 1999) and other mental health problems (Jin, Shah & Svoboda 1995). A calculation based on 40 studies on self-reported health even indicated that the cost-benefit ratio of investment in education on health is highly positive (Furnée, Groot & Maassen van den Brink 2008).

Review articles have observed similar results for many chronic diseases. An inverse relationship has been found for the incidence of ischaemic heart disease morbidity (González, Rodríguez Artalejo & Calero 1998), cerebrovascular disease, diseases of the nervous system and arthritis (Dalsta, Kunst, Boller et al. 2005) and diabetes mellitus (Espelt, Borrell, Roskam et al. 2008), for example. Relative socioeconomic differences have also been found in the incidence of many cancers, including lung cancer (Sidorchuk, Agardh, Aremu et al. 2009). Results on these differences in diagnosed depression (Muntaner, Eaton, Miech et al. 2004; Lorant, Deliège, Eaton et al. 2003) and schizophrenia (Muntaner, Eaton, Miech et al. 2004) are also consistent. Unemployment has also been found to associate with schizophrenia (Marwaha & Johnson 2004), bipolar disorder (Elgie & Morselli 2007) and social anxiety disorder (Lecrubier, Wittchen, Faravelli et al. 2000), *inter alia*.

International comparative studies on relative differences in total mortality have attained respective results with higher mortality among those with lower socioeconomic status (Mackenbach, Stirbu, Roskam et al. 2008; Mackenbach, Kunst, Groenhof et al. 1999) and among the unemployed (Korpi 2001; Jin, Shah & Svoboda 1995).

Socioeconomic inequalities can be observed also in most causes of death including cerebrovascular disease (Kunst, del Rios, Groenhof et al. 1998), gastrointestinal causes, respiratory disease (Kunst, Groenhof, Mackenbach et al. 1998), pneumonia (Huisman, Kunst, Bopp et al. 2005) and alcohol-related causes (Mackenbach, Stirbu, Roskam et al. 2008). According to Schrijvers & Mackenbach (1994) patients from higher socioeconomic status groups have better survival for four common cancers, and also for alcohol-related cancer mortality (Menvielle, Kunst, Stirbu et al. 2007). In conclusion, this prevailing pattern of mortality inequalities was found to appear for 65 of the 78 most common causes of death among men and for 62 of the 82 among women (Wilkinson 1996). Among men, differences seem to be larger in external causes of death as a whole (Mackenbach, Kunst, Groenhof et al. 1999), and also in suicide (Lorant, Kunst, Huisman et al. 2005a; Jin, Shah & Svoboda 1995), compared to diseases. Unemployment has been found to associate similarly with many causes of death including cancer (Lynge 1997),

cardiovascular diseases as a whole, myocardial infarction and cerebrovascular disease (Jin, Shah & Svoboda 1995) and accidents and violence (Martikainen 1990a).

Research on specific causes of death show, however, inconsistencies in the established pattern and inverse associations. Persons with lower socioeconomic status, for example, have higher mortality from cardiovascular diseases as a whole and also from cerebrovascular disease, but socioeconomic disparities in ischaemic heart disease are non-existent or small in Southern European populations (Mackenbach, Cavelaars, Kunst et al. 2000) and among those aged 60 years and more when compared to middle-aged persons (Avendano, Kunst, Huisman et al. 2006). Furthermore, results on socioeconomic differences in lung cancer mortality among women are inconsistent in some countries (Van der Heyden, Schaap, Kunst et al. 2009; Mackenbach, Huisman, Andersen et al. 2004). The most notable exceptions for the well-established socioeconomic pattern in mortality are malignant melanoma and breast cancer, but even in these the survival after diagnoses of cancer seems to be better for the highly educated and for those with high income (Dalton, Schüz, Engholm et al 2008).

Absolute and relative socioeconomic inequalities in different causes of death are of interest by definition, but when the cause-specific structure of socioeconomic inequalities in total mortality is in focus, the share of specific causes of death and their contribution to the difference in total mortality become particularly important. Where inequalities were large in the causes of death that are very common, the difference in total mortality also proved to be substantial.

In eight Western European countries (Huisman, Kunst, Bopp et al. 2005) cardiovascular diseases (34 percent among men and 43 percent among women), all cancers (32 and 21%, respectively) and other diseases (25 and 36%, respectively) contributed most to socioeconomic difference in total mortality among those aged 45 to 59 years. In Finland and other Nordic countries, and in Ireland, England and Wales the contribution of cardiovascular diseases was largest while in Southern Europe cancers other than lung cancer seem to be more important. In this age group the average contribution of external causes of death was 10%, but over 20% in Finland and Sweden. (Ibid.; Kunst, Groenhof, Mackenbach et al. 1998.)

Furthermore, as studies on trends in social inequalities in mortality have shown that the inequality gap has widened over time in many countries (Mackenbach, Bos, Andersen et al. 2003; Fein 1995), and as this has partly concurred with decreasing life expectancies of the disadvantaged groups in some cases (Kunst, Bos, Andersen et al. 2004), trends in mortality for different causes of death and their effect on this divide becomes most interesting. Changes in cardiovascular disease mortality have contributed most to the widening gap in total mortality, but in Finland external causes of death have had also played an important role (Valkonen 1999b). According to Martikainen, Valkonen and Martelin (2001), over the period from 1971–75 to 1991–91 mortality among Finnish men and women increased for some causes of death including suicide. This has slowed down the otherwise increasing trend in life expectancy.

3.2.2 Social differences in suicide mortality

While social inequalities in mortality have been well documented for total mortality and many diseases (*see above*), much less is known about socioeconomic and employment

status differences in suicide mortality. Research concerning the association is mostly descriptive and systematic studies that, for example, use various social status indicators are few.

Individual-level studies have shown that socioeconomic status is associated with suicide mortality in the same, inverse way as it is with total mortality – only the association seems to be stronger. This distinct association is consistent with results concerning external causes of death (accidents, suicide, and violence) as a whole (Steenland, Halperin, Hu et al. 2003). According to a study in eleven Western European countries, the mortality rate ratio of manual to non-manual groups was higher for external causes than in deaths caused by diseases in all but one country (Kunst, Groenhof, Mackenbach et al 1998).

Trends in suicide mortality have differed between socioeconomic groups in some cases. For example, over the period from 1971–75 to 1991–91 in Finland an increase in suicide mortality rate was found only among manual men and women (Martikainen, Mäkelä, Koskinen et al. 2001). The same trend has been observed in England and Wales: while suicide mortality in the professional classes decreased over the period from 1970–72 to 1991–93, within manual classes the rate increased, the rise being more rapid the lower social classes (Drever & Bunting 1997). The risk ratio of suicide was twofold in the lowest social class compared to the professional class during the first period, but fourfold during the latter period.

As already mentioned (*see above 3.2.1*), in Finland the contribution of suicides to socioeconomic difference in total mortality is substantial. Among 35–64 -year-old men suicide contributed 9 percent to the difference in mortality between manual and upper non-manual workers in 1987–1990 and 10.5% in 1991–1993. Among women the contribution of suicide was 7.9 and 6.6%, respectively (Martikainen & Valkonen 1995). However, not much is known about the contribution of social differences in suicide mortality to the equivalent differences in total mortality after the middle of the 1990s.

In the following, social differences in suicide are considered by different indicators: education, occupation-based social class, income and employment status.

3.2.2.1 Education

Education has been found to relate to suicide especially among men. In ten European populations (Lorant, Kunst, Huisman et al. 2005a) the age-adjusted risk ratio for low secondary-educated men compared with those having at least upper secondary education ranged from 1.04 to 2.72, and the overall risk ratio was 1.43. The respective figure for Finland was 1.42. A Finnish study (Valkonen & Martelin 1988) gave similar results, but also reported a risk ratio for the extremes: men with only basic education (nine years of education) had about a 2.1-fold increased risk compared to the highly educated (at least 13 years of education), when only age was adjusted for, but about 40% higher risk, when occupation-based social class was also taken into account. Recent Norwegian data (Strand & Kunst 2006) has assessed inequalities between several education categories, showing that the age-adjusted risk ratio among men with basic education was about threefold higher compared to those with at least 13 years of education.

While among men education is inversely associated with suicide so that every step down in the educational ladder is related to increased risk, among women there

appears to be small differences in suicide among the groups with more than basic education and the risk ratios between the extreme categories are also smaller (Strand & Kunst 2006). In the European study (Lorant, Kunst, Huisman et al. 2005a) the age-adjusted overall figure actually showed the lowest suicide mortality among those women with only low secondary education. Finland was included in the study with the rate ratio of 1.12. Again, with a more detailed classification, the Norwegian study (Strand & Kunst 2006) found much larger inequalities, and the age-adjusted risk ratio was almost twofold among women with only basic education. Apparently no other studies on educational inequalities in suicide including women, however, have been carried out.

3.2.2.2 Occupation-based social class

Elevated suicide risk has also been found in low occupation-based social class categories. In South-Korea (Kim, Hong, Lee et al. 2006) the association between social class and suicide was quite linear, and those in manual worker groups had about 2.3-fold age-adjusted increased risk among both men and women aged 20–64 years. In most other studies the association with occupation-based social class is less systematic. Lower white-collar and skilled male workers do have a higher suicide mortality rate than those in upper white-collar occupations, but the difference is especially large between unskilled workers and all other groups: various studies have shown differences of between two- and fourfold between male unskilled workers and those in upper white-collar or upper non-manual occupations (Steenland, Halperin, Hu et al. 2003; Drever & Bunting 1997; Martikainen & Valkonen 1995). When a more detailed classification (eight categories) was used, the rate ratio between the extreme ends was as high as 4.4-fold (Fitzpatrick & Dallamore 1999).

In a study using data for the latter part of the 1970s in Finland, the adjustment for education decreased the age-adjusted risk ratio from 3.2-fold to 2.5-fold among men (Valkonen & Martelin 1988).

Again, studies including women are much less common, but those that exist in addition to Kim, Hong, Lee et al. (2006) show either smaller difference than among men (Martikainen & Valkonen 1995) or non-linearity between occupational classes (Steenland, Halperin, Hu et al. 2003). A Finnish study including young adults (men and women aged 30–34 years) showed over twofold increased risks in all other social class groups compared to upper non-manual women and as high as fivefold higher risks among men (Pensola 2003). This is by no means an extraordinary fact as relative mortality differences tend to be at their largest during early adult years (*see also Chapter 3.3*).

3.2.2.3 Income

The results on differences in suicide mortality according to income vary depending on whether income is considered a continuous or categorised variable, and whether other adjustments are made. A Norwegian study using household income observed an age-adjusted relative index of inequality as high as 2.2 among men and 2.4 among women (Næss, Strand & Davey Smith 2007). In Finland (Martikainen, Mäkelä, Koskinen et al. 2001) a slope for household income deciles was found for both men and women: the age-

adjusted continuous linear regression coefficient was 1.116 for men and 1.103 for women. Adjustment for education, social class, family structure, spouse's economic activity and, especially, own economic activity reduced excess suicide mortality by about 60%, and an approximate four per cent increase in suicide was found for each step (decile) down the income ladder among both men and women.

Most studies considering categorised income have found that among men income is associated with suicide mortality rather linearly when only age is adjusted for (e.g., Mortenson, Agerbo, Erikson et al. 2000). However, following adjustment for other socioeconomic or sociodemographic factors, suicide risk among those in the middle income quartiles does not differ from that in the highest income group (Qin, Agerbo & Mortensen 2003). Instead, among women the association between income and suicide is U-shaped irrespective of the adjustments and those belonging to the middle quartile or quintile income groups have the lowest suicide risk (Strand & Kunst 2006; Qin, Agerbo & Mortensen 2003).

3.2.2.4 Employment status

Several studies have indicated that unemployment and a lack of full-time employment are also related to excess suicide mortality. Studies that have looked at unemployed men and women together have found a 1.7-fold excess suicide mortality among those aged 20–60 years in Denmark (Agerbo 2005) and 2.6-fold among those aged 15 years and over in England and Wales (Lewis & Sloggett 1998) following adjustment for, among other things, marital status.

Martikainen (1990a) using data from Finland and Blakely, Collings and Atkinson (2003) from New Zealand have both shown an excess suicide risk of 2.6-fold among 30–54 and 18–64 -year-old men, respectively, when adjusted only for age, and an approximately 2.0- and 2.3-fold increased risk when adjustment was made for a few other socioeconomic and sociodemographic factors. Kposowa (2001) and Iversen, Andersen, Andersen and others (1987) have also found very similar adjusted risk ratios.

Studies that have included unemployed women have found at least as high relative suicide risks as among unemployed men (Blakely, Collings & Atkinson 2003; Kposowa 2001; Iversen, Andersen, Andersen et al. 1987).

3.2.3 Explanations for social differences in mortality

In most of the studies described above, social differences in suicide mortality have not been the main focus, and one could say that in many cases these results are to some extent an offshoot. Two studies that have also reported the socioeconomic differences in suicide were chiefly interested in the effect of childhood living conditions on adulthood mortality (Næss, Strand & Davey Smith 2007; Strand & Kunst 2006). One study examined mainly the effects of a new socioeconomic classification scheme to be introduced (Fitzpatrick & Dallamore 1999), and some are interested in the association between social factors and suicide in people admitted to hospital with mental illness (Agerbo, Mortensen, Eriksson et al. 2001; Mortensen, Agerbo, Erikson et al. 2000). This naturally restricts the utility of the

discussion and conclusions made in those studies for the results that are in focus in the current study. That is why the concepts and explanations that have been given for socioeconomic and employment status differences in health, morbidity and total mortality will also be considered as a framework in this study for those differences in suicide.

Numerous studies attest to the long history of social differences in mortality (Whitehead 1997). However, despite the long-term decline in mortality, the steady increase in life expectancy as the obverse, and the epidemiological transition which refers to the fundamental change in the pattern of diseases that ultimately predicts the cause of death structure, socioeconomic differences in mortality have prevailed. Providing an explanation for this kind of persistency has not been easy, and the association between social factors and mortality is not fully comprehended. The Black Report (edited by Townsend and Davidson in 1982), a document published in 1980 by the Department of Health and Social Security in the United Kingdom, reviewed a large amount of research evidence on the association, and finally presented a typology of theoretical explanations which has led to valuable discussion..

The Black Report classified the explanations into four types: artefact, selection, and two types of causation, that is, behavioural and cultural, and material. The artefact explanation suggests that the difference in health and mortality between socioeconomic groups is actually ostensible and occurs because of difficulties in measuring and conceptualising health and class. According to Blane (1985) even though the concept of health is difficult to operationalise, the artefact explanation is more relevant to the measurement of “social class”, as this may be an insensitive measure of hierarchical differences. A review article by Davey Smith, Blane and Bartley (1994), however, came to the conclusion that this explanation has little effect and, if anything, the measures of the magnitude of socioeconomic differences in mortality are often an underestimate. The explanations of social inequalities in health and mortality as a whole are thus founded on two theories: those based on direct and indirect selection on the one hand and those based on causation on the other.

Figure 3 illustrates a simplified framework for the selection and causation models explaining the association between socioeconomic and employment status and health and mortality. Arrows (1) and (2) symbolise indirect selection according to which various pre-existing determinants (explanatory factors) influence both the subsequent socioeconomic or employment status and health and mortality. According to the direct health-based selection model, healthy people are more likely to achieve a better socioeconomic position and are more likely to be employed and stay employed (Arrow 3). Thus, in both selection models socioeconomic and employment status does not cause poor health or increase mortality. On the other hand, the causation model asserts that socioeconomic or employment status has an influence on health and mortality either directly or through mediating factors (Arrows 4 and 5). In the following these explanations are discussed in more detail.

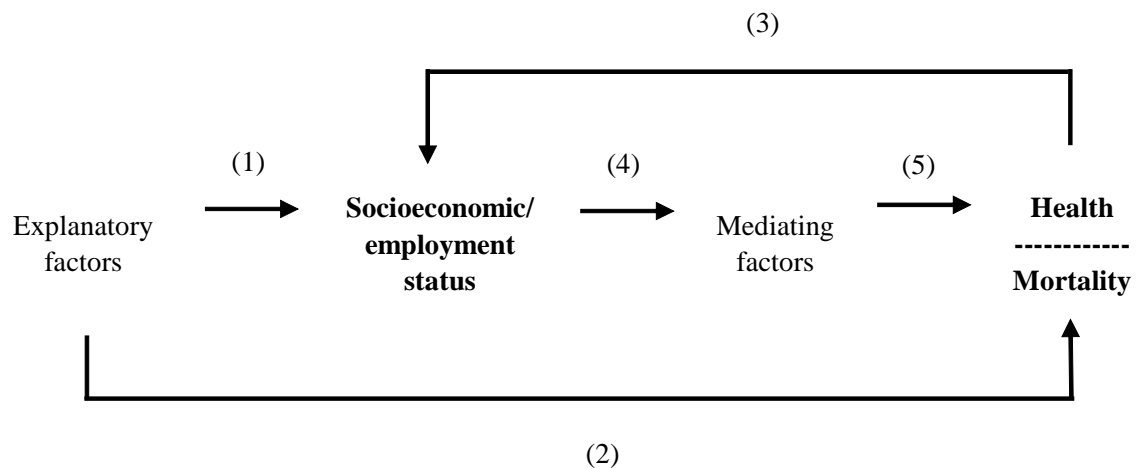


Figure 3 Schematic framework presenting the explanatory and mediating factors in the association between socioeconomic and employment status and health and mortality

3.2.3.1 Explanations based on selection

According to the Black Report (1982) the explanations based on **direct selection** assume that an individual's state of health affects the social status he/she reaches (Arrow 3 in Figure 3). The socioeconomic status structure is perceived as a sorter of people, and one of the major bases of selection is health. However, it seems that the contribution of direct selection (Panel (a) in Figure 4) on socioeconomic status differences in health (Bartley & Plewis 1997) and, especially, in mortality (Blane, Davey Smith & Bartley 1993; Fox, Goldblatt & Jones 1986) is small.

The Black Report has very little discussion on explanations based on **indirect selection**. According to Blane, Davey Smith and Bartley (1993) it was actually Richard Wilkinson in 1986, Patrick West in 1988 and Sally Macintyre and Patrick West in 1991 who extended the idea of selection to involve the indirect version. According to indirect selection explanations some third variable is responsible for the co-variation between social status and health. Therefore, factors which cause indirect selection must be able to cause variation both in health and mortality and in socioeconomic position (Blane, Davey Smith & Bartley 1993).

Social inequalities are thus caused by factors that precede and influence both socioeconomic status and health, or the risk factors for mortality (Panel (b) in Figure 4). Wilkinson (1986, 4) says about social class: "A person's chances of upward or downward mobility could be influenced directly by their current, or manifest, health status, or indirectly through selection according to factors associated with health, such as height or education". Childhood socioeconomic circumstances have also been found to relate to mortality in adulthood (Galobardes, Lynch & Davey Smith 2004). Poor social circumstances in childhood are also related to poor social circumstances in later life, and thus early socioeconomic status could be one selection factor. This pathway can also be

interpreted as part of the accumulation of social disadvantage (Ben-Shlomo & Kuh 2002), but it is challenging to distinguish between these concepts, and in any case it is beyond the scope of this study. Anyway, it is likely that the relevance of selection effects vary for specific causes of death (ibid).

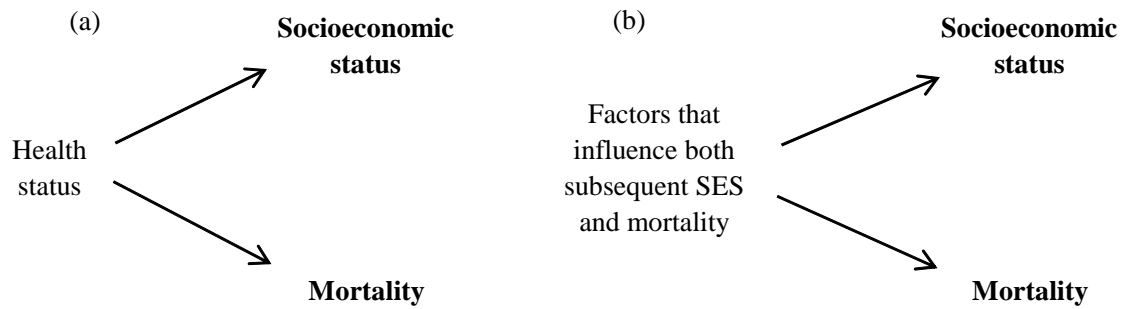


Figure 4 *Simplified models describing explanations based on direct (a) and indirect (b) selection*

The mechanism behind the association between socioeconomic status and psychiatric disorders has been much debated, but the findings suggest that the processes differ in relative importance by diagnostic type (Dohrenwend, Levav, Shrout et al. 1992). With special reference to suicide, Gunnell (2001) proposes that downward social mobility or social drift in people who develop mental illness may thus explain some of the socioeconomic differences in suicide mortality. Some other studies have also emphasised the importance of psychiatric disorders as a selection factor for socioeconomic differences in suicide (Qin, Agerbo & Mortensen 2003). Lorant Kunst, Huisman and others (2005a) found that suicide was more strongly related to home ownership than to education. Psychiatric illness is more likely to affect housing than education, because reverse causality is less likely in the latter case. According to Valkonen and Martelin (1988) some of the differences in suicide between social classes may derive from selection on the basis of the socio-psychological characteristics of individuals (e.g., intelligence and adaptability) that are shown and materialise in different educational paths. Martikainen, Mäkelä, Koskinen and others (2001) also suggest that reverse causality is to some degree behind the association between income and accident and violent mortality, and especially at later working age the effect of economic activity on this relation is strong. This occurs because those with a high risk of accidents and violence are more likely to withdraw from work, which then leads to decreased income.

According to the selection theory, unemployment is related to mortality because those who have a bigger risk of becoming unemployed or have difficulties in re-employment have pre-existing health-related problems or behaviours, or such socioeconomic or personal characteristics that increase future morbidity or mortality.

Consequently, attempts to explain the association between unemployment and suicide are much more abundant. Some studies favour selection explanations, and claim that the association stems directly from pre-existing psychiatric morbidity (Blakely, Collings & Atkinson 2003; Beautrais, Joyce & Mulder 1998), or from pre-existing social, behavioural or psychological factors (e.g., low socioeconomic status, drinking problems or an unstable personality (Voss, Nylén, Floderus et al. 2004)) that predict both employment status and suicide risk. Moreover, according to a previous study in the Finnish context (Martikainen 1990b), education and social class explained about 30 percent of the suicide differences between the unemployed and the employed among men, and about 15 percent among women.

When the association between employment status and mortality is studied, however, results from a single time period must be interpreted cautiously. Excess mortality among the unemployed has been found to vary between periods of low and high general unemployment (Martikainen, Mäki & Jäntti 2007; Martikainen & Valkonen 1996a). During times of low unemployment those without jobs are likely to be selected on the basis of health or other characteristics like low education, while in the period of high unemployment, presumably more healthy people become jobless, and the unemployed and the employed also share other characteristics causing lower excess mortality among the jobless (Martikainen & Valkonen 1996a). This implies problems with causal reasoning and suggests that excess mortality due to unemployment during favourable economic times may easily be overestimated and that these figures might depend on the context. However, no corresponding analyses using such natural experimental designs have been carried out on specific causes of death, including suicide, and these results may well differ.

On the other hand, Blane, Davey Smith and Bartley (1993) point out that educational qualifications may influence social mobility but they do not affect health directly, and therefore it would be useful to see indirect selection as the process by which socioeconomic influences on health accumulate through the life course. “What is certain, however, is that it is very different from the idea of health related social selection as originally conceived” (ibid, 8). Bartley (1996) adds regarding unemployment and selection that those out of work may differ from the employed in unmeasured ways that could have made them more vulnerable to mortality whatever their employment status, but whether this effect is regarded as health selection is debatable.

3.2.3.2 Explanations based on causation

The explanations for social inequalities in health and mortality based on causation suggest that socioeconomic or employment status has an effect on the material, behavioural and psychosocial determinants of health and mortality (Figure 5). These different determinants are intertwined and causation explanations are thus integrated. For example poor material circumstances may lead to poor choices in relation to health behaviour. According to Elstad (2000, 27) “health inequalities are believed to arise because the circumstances of different social positions are so diverging that each of them develops a particular health profile, different from the health profiles of other social positions”. Instead, people’s innate potential for attaining health (ibid.) is assumed to be similar.

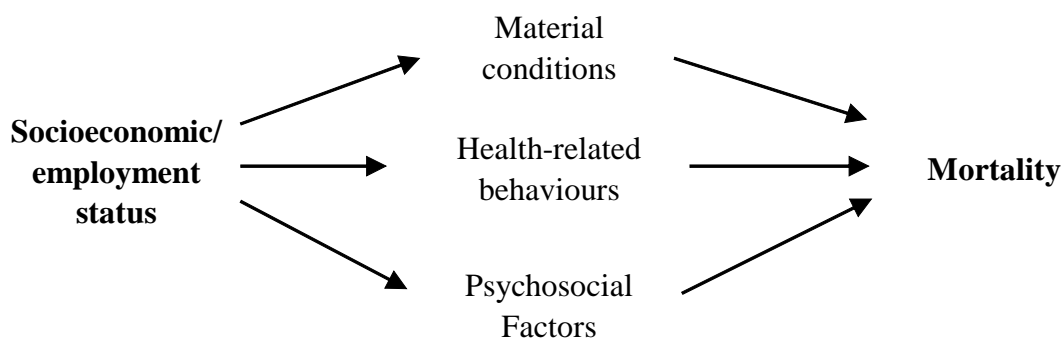


Figure 5 A Simplified model describing explanations based on causation

The Black Report emphasised **materialist explanations**. The role of economic and associated socio-structural factors was considered important, and poverty and deprivation were perceived both as absolute and relative concepts. Each socioeconomic status has in-built and structurally settled conditions. Thus some people are unable to avoid exposure to hazards inherent in society (Davey Smith, Blane & Bartely 1994). Moreover, unemployment through loss of income and financial difficulties has been seen to have negative effects on health and to increase the risk of premature death.

Poverty can mean fewer opportunities to engage in healthy life options. The mechanism from lack of income to mortality could also materialise through difficulties in access to health-related services. The issue has been studied and debated in depth, but the conclusions are inconsistent (van der Meer, van den Bos & Mackenbach 1996). However, when the utilisation of mental health services was considered, persons in the lowest socioeconomic status group were the least likely to use the services (Howard, Cornille, Lyons et al. 1996) or have access to the special care sector (Alegria, Bijl, Lin et al. 2000).

The evidence has consistently shown that income is strongly associated with mortality. However, a large part of this association is confounded by health and other aspects of socioeconomic status that precede income. Also, by comparing different income measures, that is individual taxable income, household taxable income and household disposable income, Martikainen, Valkonen and Moustgaard (2009) have shown that the magnitude and curvature of the association between income and mortality largely depends on the measure used. Furthermore, some studies suggest that a large part of the relationship between income and total mortality disappears when own employment status or economic activity is adjusted for (Martikainen, Valkonen & Moustgaard 2009; Blakely, Kawachi, Atkinson et al. 2004; Martikainen, Mäkelä, Koskinen et al. 2001). The causal effects of income on mortality are thus difficult to establish with certainty.

Similar results have been attained in studies on income and suicide (Lewis & Slogget 1998) suggesting that it is not, after all, financial hardship as such, but possibly the fact of not having a job and the latent consequences of employment (giving a time structure to the day, self esteem, the respect of others (Jahoda 1981)) that are significant. In addition to the social drift hypothesis (*see above 3.2.3.1*), Gunnell (2001) argues that explanations for the associations between socioeconomic status and suicide include the effects of material deprivation in people of lower socioeconomic status on mental health.

Poverty can thus mean fewer opportunities to engage in healthy life options, but unhealthy behaviour can also be a means to adapt to difficult financial circumstances. Another approach to a causal explanation for socioeconomic differences in health and mortality emphasises **health-related behaviours and lifestyles**. Lynch, Kaplan and Salonen (1997) have asked: “Why do poor people behave poorly?”, and the answers vary according to how significant a role is given to the individual’s autonomous decision-making. According to the Black Report some argue that behaviour that systematically deteriorates health is a consequence of low education, or individual thoughtlessness and indifference. The explanation is thus based on individual characteristics – and at the same time on a free choice of lifestyles. On the other hand, others see that while individuals make choices about how they act related to health, those choices are situated within, for example, economic, cultural and political contexts (Lynch, Kaplan & Salonen 1997). In other words, the choices are structurally determined (Elstad 2000). The strong association between education and smoking, for example, could be interpreted as sub-cultural lifestyles that are rooted in the level of education and govern behaviour (the Black Report).

Of the *holy four* (McQueen 1987) health behaviours, namely smoking, drinking, eating and physical exercise, alcohol use is the most relevant in the context of suicide. The causal link between unemployment and changes in health behaviour is also much discussed. There may be heavier drinking due to the greater amount of leisure time and possibly a higher level of stress, but consumption may also decrease due to a drop in income. The findings on the effects of unfavourable employment status on alcohol consumption are, indeed, inconsistent (Catalano, Dooley, Wilson et al. 1993; Morris, Cook & Shaper 1992), and simple behavioural explanations may be insufficient to explain social difference in suicide.

Another possible pathway through which socioeconomic status can have an effect on health, morbidity and mortality consists of **psychosocial factors**. Factors that conceivably mediate the association between socioeconomic and employment status and mortality include depression, hopelessness, lack of social support, hostility, lack of control, loss of self-esteem and feelings of worthlessness (Martikainen & Valkonen 1996a). Most of these negative emotions and cognitions seem to be more prevalent in low socioeconomic status (Gallo & Matthews 2003). Differences in social support in relation to socioeconomic status have, indeed, been suggested to lie behind social differences in suicide (Gunnell 2001).

Psychological stress is one of the mediators between psychosocial factors and ill health. Very briefly, stress has short-term effects on the human body, which in most cases are positive. However, if the biological stress response is activated too often or for too long, this may lead to pathophysiological changes and further to illnesses. Life events such as the death of a family member, divorce or unemployment that require adaptation may act as precipitating factors in the process. The progress of disturbance of usual homeostatic equilibrium leading possibly to somatic symptoms is meticulously described elsewhere (e.g., Brunner & Marmot 1999).

According to Martikainen, Bartley and Lahelma (2002) the central constituent in the psychosocial process is that social proceedings lead to “psychosocial” perceptions at the individual level, and these changes can influence health through either biological processes or behaviours. People in different socioeconomic status groups not only encounter stressful situations differently (Baum, Garofalo & Yali 1999) but also have

different resources to confront stress and strain (Taylor & Seeman 1999; Adler, Boyce, Chesney et al. 1994). Furthermore, it has been suggested that the larger the income inequality in a society, the greater the effects of psychosocial factors (Marmot & Wilkinson 2001).

Explanations for the associations between socioeconomic status and suicide have included higher levels of job insecurity and more negative life-events such as unemployment in people of lower socioeconomic position. Unemployment may elevate the suicide risk by increasing stress or the likelihood of other stressful life-events such as psychological, social or financial problems that predispose the individual to suicide. A New Zealand workplace closure study found that exposure to involuntary job loss increased the risk of mental distress leading to serious self-harm followed by hospitalisation or death (Keefe, Pappaarangi, Ormsby et al. 2002).

The widening gap in mortality differences between socioeconomic groups can result from changes in the effects of different processes. On the one hand it is possible that selection processes have strengthened, on the other hand it is equally possible that causality now has a stronger influence than before. This would mean that those with e.g. low education have become poorer or socially more isolated. However, changes in these processes are little studied.

3.2.4 Pathways and causal interdependence

One way to assess the significance of these explanatory models for social differences in mortality is to use different socioeconomic indicators simultaneously, as the influence of selection or causality can be assumed to vary according to different measures of social status. Education, social class and income are interrelated but not fully overlapping (Adler, Boyce, Chesney et al. 1994). According to Lahelma, Martikainen, Laaksonen and others (2004) rather than being interchangeable, various indicators of socioeconomic status are partially independent and partially inter-dependent determinants of health as they partly implicate different impacts and causes. They can also be conceptualised as causally preceding or succeeding each other over the life course, education being typically the first indicator to be acquired. Education exerts its effect on health partly through causally succeeding social class and income, while the effect of income, for example, is partly explained by education and social class which precede it (ibid.). Empirically the idea is thus to study how much the effects of socioeconomic and employment status indicators that chronologically and causally precede other social status indicators explain the effect of these factors on suicide, and, respectively, to what extent indicators following the one in question mediate the effect.

More specifically, education could be considered to incorporate non-material resources such as knowledge and skills that make a person more receptive to health education messages, and better able to access health services (Galobardes, Shaw, Lawlor et al. 2006). Furthermore, education has been said to be likely to capture aspects of lifestyles and behaviour (Shavers 2007). A formal requirement for most occupations, education is also a determinant of social class over the life-course. As education is unlikely to change after early adulthood, morbidity in later life is also likely to have less of

an influence on education than it has on occupation or income. For the same reason it does not adequately describe social or economic status achieved over the life cycle.

Occupation-based social class signifies not only social standing, power and control, and working conditions generally, but also social networks and support at the workplace, where most adults spend a large proportion of their waking hours. Social class is a major structural link between education and income (Shavers 2007), and, furthermore, unemployment and job insecurity are more likely to be related to lower occupation-based social class (Gunnell 2001).

Income, which is linked to occupation, naturally provides material resources that allow access not only to consumables such as proper housing and wholesome food but also to health services that may improve health directly or indirectly. Income is the most probable indicator in terms of responding to changes in social or economic circumstances, for instance to changing employment status as well as to changes in health.

Closely related to socioeconomic status is employment status. Education and social class are important determinants of non-employment (both unemployment and economic inactivity) among people of working age, and this in turn is a major determinant of low income.

As the frequency and nature of health problems varies substantially by age, the importance of socioeconomic indicators as well is likely to vary across the life cycle. According to Næss, Claussen, Thelle and others (2005) in Norway causes of death that are known to be related to early-life circumstances (cardiovascular disease and stomach cancer, for example) were strongly related to education, while causes of death that were more likely to be determined by adult social situation (violent and unexpected deaths) were more strongly linked to occupation. Similarly, following mutual adjustment, education was most strongly associated with cardiovascular disease in Scotland (Davey Smith, Hart, Hole et al. 1998).

Only a few studies have considered the pathways between different social indicators and suicide. Of these Valkonen and Martelin (1988) have discussed the interrelationship between education and social class and their association with suicide. In their study adjustment for education decreased social class differences in suicide by 40%. However, instead of interpreting this result as causal they argue that the school system may be selective (selection based on e.g. adaptability, intelligence and high socioeconomic status of parents), and controlling for education would therefore remove the part of the differences between social classes that is due to selection on the basis of socio-psychological characteristics of individuals.

Martikainen, Mäkelä, Koskinen and others (2001) found that household income measured as a continuous variable was associated with suicide mortality, but due to the mainly linear nature of the relationship and the strong attenuation (about 60%) following adjustments for several sociodemographic and socioeconomic factors, a large proportion of the association between income and suicide is unlikely to be due to direct causal effects of current material hardship. Blakely, Collings and Atkinson (2003) have also found that income was not associated with suicide when education, marital status, employment status and car access were adjusted for.

Corresponding results for unemployment indicate that suicide mortality among the unemployed remained over twofold higher after adjustment for other socioeconomic indicators, but with only one multivariate model (all variables adjusted for) it is difficult to assess the pathways between these indicators (Blakely, Collings & Atkinson 2003).

Martikainen (1990b) studied excess suicide mortality among the unemployed and showed by adding one by one different socioeconomic and sociodemographic variables and factors describing health to the model that occupation-based social class and marital status were the most important factors explaining about 30 and 10%, respectively, of the association. The remaining excess suicide risk varied according to the duration of unemployment, and it was highest (about 2.5-fold) among those unemployed for at least 7 months. The association between unemployment and suicide was thus not fully explainable by other social factors, and it seems that causal explanations have relevance when suicide is considered. For unemployment, in particular, natural experimental designs are also applicable (*see 3.2.3.1 above*).

3.3 Other sociodemographic risk factors for suicide

In addition to socioeconomic and employment status many other sociodemographic factors have been found to relate to suicide mortality. As described above (*Chapter 2*) suicide mortality differs substantially according to sex and age. Furthermore, marital status and family type, that is living arrangements, are strongly and consistently associated with suicide risk. Studies on the individual level have found that those with elevated suicide risk include those who are not married (Cutright, Stack & Fernquist 2006; Lorant, Kunst, Huisman et al. 2005b; Heikkinen, Isometsä, Marttunen et al. 1995), divorced (Kposowa 2000) or separated (Wyder, Ward & De Leo 2009), widowed (Martikainen & Valkonen 1996b) and especially those widowed young (Luoma & Pearson 2002). Children have been found to have a protective effect in reducing parents' suicide risk (Qin & Mortensen 2003; Høyer & Lund 1993).

In addition, it is possible that some part of the widening of the gap in suicide mortality trends between socioeconomic groups results from changing marital status distributions. However, such changes have not been assessed for suicide mortality.

An interaction effect between socioeconomic status and other sociodemographic factors on suicide could be assumed to exist. Individuals who are vulnerable on account of both their socioeconomic status and sociodemographic situation – for example divorced or separated with low income - could be expected to have an elevated suicide risk compared to individuals having distress concerning only one of these aspects. It can be hypothesised that socioeconomic resources buffer the effects of stressful life events taking place in other fields of life (cf. Martikainen & Valkonen 1998).

However, only a few studies exist on these interaction effects on suicide mortality risk. According to some British studies, interaction between occupation-based socioeconomic status and age exists: while in higher social classes suicide mortality increases as age increases, in lower social classes the pattern is convex. Socioeconomic difference in suicide mortality is thus much larger (even sevenfold) in younger and middle age groups, but it diminishes so that it is approximately twofold in older age groups. (Fitzpatrick & Dollamore 1999; Drever & Bunting 1997; Kreitman, Carstairs & Duffy 1991.) There are, however, no comparable results from other countries.

Of family types and living arrangements, only the interaction between socioeconomic status and lone motherhood has been studied. Among manual workers lone

motherhood seems to entail higher suicide risk, but not in other occupational groups (Ringbäck Weitoft, Haglund, Hjern et al. 2002).

3.4 Alcohol as a contributory cause in suicide

Heavy drinking has been observed to be associated with suicide both in studies among alcohol abusers and in the general population. Review of studies on alcohol dependence has estimated a 7% life time risk of suicide (Inskip, Harris & Barraclough 1998), and an elevated attempted suicide risk has also been found among female alcohol abusers (Lisansky Gomberg 1989). In the general population alcohol abuse or dependence has been found altogether among 15–56% of suicide cases (Pirkola 1999).

In addition to alcohol disorders, mental health problems are important proximate determinants of suicide. Alcohol abuse and major depression are likely to be strongly intertwined, often possibly being facets of the same phenomenon (e.g., Joutsenniemi, Martelin, Martikainen et al. 2006), and a large community-based investigation in the U.S. found the association between alcohol disorders and depression to be higher in women than in men (Kessler, Crum, Warner et al. 1997). Both alcohol disorders and mental health problems, again, are associated with socioeconomic status. A meta-analysis found compelling evidence of socioeconomic inequality in depression (Lorant, Deliège, Eaton et al. 2003), whereas no compensating socioeconomic differences in antidepressant treatment were found in a study carried out in Finland (Kivimäki, Gunnell, Lawlor et al. 2007). Educational status and occupation-based social class have also been shown to be associated with alcohol-related mortality among both men and women (Mäkelä 1999), and those suicide committers who were alcohol abusers were more often manual workers and/or currently unemployed than non-abuser suicide victims (Pirkola, Isometsä, Heikkinen et al. 2000).

The acute effects of alcohol intoxication may act as proximal risk factors for suicide among both alcoholics and nonalcoholics (Hufford 2001). The mechanisms responsible for this risk in suicide include, among others, alcohol's ability to propel suicidal ideations into action (Welte, Abel & Wieczorek 1988), to increase aggressiveness, and to inhibit or constrict coping strategies that might otherwise forestall the act of suicide (Sayette, Wilson & Elias 1993). It has also been suggested that the use of alcohol prior to suicide could be interpreted as a way of overcoming the natural restraints against committing suicide (Himmelhoch 1988) or the fear of pain (Hufford 2001). By impairing judgment, alcohol tends to be associated with less predictable and impulsive behaviour (Welte, Abel & Wieczorek 1988) and may lower the threshold to committing suicide (Öhberg, Vuori, Ojanperä et al. 1996). Previous studies have indicated that those who committed impulsive suicide have less completed school years and number of working years, and have much lower personal income (Zouk, Tousignant, Seguin et al. 2006). Furthermore, suicide among the highly educated is very seldom a consequence of the impulsivity associated with alcohol, especially among women (Chaudron & Caine 2004). This may be because alternative ways of coping with problems (Droomers, Schrijvers, Stronks, et al. 1999) and the help-seeking attitudes (Fischer & Cohen 1972) possibly are associated with education. According to Pirkola, Isometsä, Heikkinen and others (2000) those persons with no alcohol dependence who were unemployed preceding suicide were

more often intoxicated than those who were employed, but, as far as we know, in-depth studies on socioeconomic status differences in suicides involving alcohol intoxication have not been carried out.

3.5 Individual social status and area social characteristics

Individual-level research into social inequalities in mortality has often been complemented by ecological analyses of the effects of social characteristics of areas on mortality. The rationale behind this conception is that the characteristics of areas have an effect on the health of individuals in addition to these individuals' own characteristics. The high unemployment rate of an area would, thus, have a negative effect on people living in that area over and above a person's individual employment status. Probably the most studied and debated socioeconomic indicator in this research tradition is income inequality. Some researchers have emphasised the positive significance of small income differences and the corrosive effects of large inequalities (Wilkinson 1996), but large differences in mortality have also prevailed in countries where income inequalities are relatively small (Mackenbach, Kunst, Cavelaars et al. 1997). The contextual circumstances at issue have also included several characteristics of neighbourhood and residential areas in addition to income and wealth.

However, most studies have difficulty in differentiating true area social effects, also called contextual effects, from the compositional effects of areas having different proportions of individuals with increased risk of mortality. Multilevel analyses enable the reconciliation of individual risk factors and area contextual effects (Panel (a) in Figure 6). A few analyses of mortality have shown some area effects following adjustment for individual characteristics (Riva, Gauvin & Barnett 2007; Turrell, Kavanagh, Draper et al. 2007; Lochner, Pamuk, Makuc et al. 2001; Sloggett and Joshi 1998), while other studies show more modest independent effects or effects only in specific population sub-groups (Martikainen, Kauppinen & Valkonen 2003; Davey Smith, Hart, Watt et al. 1998).

Furthermore, area socioeconomic characteristics may affect low and high socioeconomic or employment status residents differently (Panel (b) in Figure 6), which is called a cross-level interaction effect. At least three kinds of interactions are plausible in the context of this study. It is possible that, firstly, individual social disadvantage may put people at a particularly high risk of mortality in socioeconomically depressed areas. Experience of social detriments in two spheres of life may accumulate to increase negative health outcomes.

Second, socioeconomically deprived individuals living in socially advantaged areas may be protected from ill-health and mortality. Socioeconomically better areas often have better material and social infrastructures, including public amenities, job opportunities and social cohesion, and the less well-off individuals may overly benefit from these collective resources (Stafford & Marmot 2003).

Third, socioeconomically advantaged individuals may not be influenced by the area they live in to the same extent as less advantaged persons. Better-off people can manage to avoid the harmful effects of the economically depressed areas, for example, by

privately purchasing goods and services and by having better access to facilities outside the areas they live in.

A few studies have considered such interactions between area and individual-level socioeconomic variables, and the results for total mortality are inconsistent (Henriksson, Allebeck, Ringbäck Weitof et al. 2007; Martikainen, Kauppinen & Valkonen 2003; Ecob & Jones 1998; Sloggett & Joshi 1998).

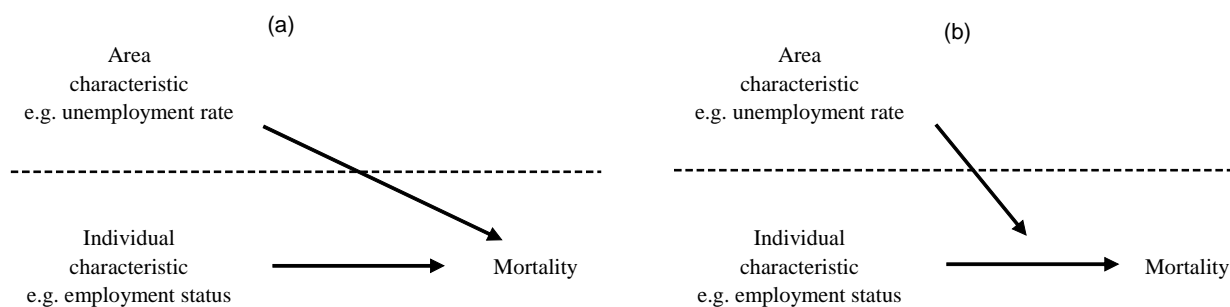


Figure 6 *The structure of multilevel proposition (a) and cross-level interaction (b).*

Adapted from Snijders & Bosker (2004)

In the history of suicide mortality research, the contextual effect approach has been used for a long time. At the end of the 19th century Durkheim (1952) outlined how the degree of integration and regulation in society influenced the risk of suicide, and later ecological, aggregate-level studies have shown that, for example, the level of income per capita in a region (Chuang & Huang 1997), economic deprivation (McLoone 1996), unemployment level (Middleton, Sterne & Gunnell 2006; Gunnell, Lopatzidis, Dorling et al. 1999; Morrel, Taylor, Quine et al. 1993), as well as the proportion of manual households (Middleton, Sterne & Gunnell 2006) are associated with suicide rates. Differences in the way that mental health services are organised and function have also been suggested to be behind differences in suicide rates. For example, Italy has been said to have pioneered an integrated and community-based mental health system, which has helped to tackle suicide inequalities more effectively (Lorant Kunst, Huisman et al. 2005a). Also the welfare system in Sweden and Finland has been acknowledged (Kim, Hong, Lee et al. 2006), which, however, has not decreased the inequalities in suicide in Finland at least. Pirkola, Sund, Sailas and others (2009) find that the prominence of outpatient services was related to low suicide rate even after adjustment for municipal-level social characteristics including e.g., marital status distribution and unemployment rate.

Only relatively little evidence, however, exists on the importance of area socioeconomic effects on suicide mortality using area- and individual-level information simultaneously, that is through multilevel modelling, and the results vary. According to Agerbo, Sterne and Gunnell (2007), suicide mortality risk adjusted for individual-level socioeconomic status was lower in areas with a high proportion of employed residents and

in areas belonging to the highest income quartile. In a study by Cubbin, LeClere and Smith (2000) five neighbourhood characteristics had significant effects on the risk of suicide even after adjustment for individual variability. However, the relation between variables was not linear: for residential mobility, family income, poverty rate, black racial concentration and poor female-headed households, significantly increased suicide risks are seen at intermediate levels only. According to Valkonen and Martelin (1988) both the region of residence and the poverty of the region of birth were related to suicide mortality, the former relationship being stronger. On the other hand, as reported by O'Reilly, Rosato, Connolly and others (2008) area deprivation was not associated with suicide after individual characteristics were adjusted for, and, furthermore, Borrell, Rodríguez, Ferrando and others (2002) found no relationship between the percentage of neighbourhood unemployment or the proportion of men in jail and suicide after controlling for individual variables.

Overall, the research evidence on suicide mortality that simultaneously uses both individual and area-level information is partial and limited. This scarcity of research probably arises from the shortage of follow-up studies that have a sufficiently large number of subjects to study suicide mortality at the area level. Furthermore, we almost completely lack evidence on possible interaction effects between individual socioeconomic status and area socioeconomic characteristics on suicide mortality. Such cross-level interactions are little studied, and Agerbo, Sterne and Gunnell (2007) found no consistent effects.

4 AIMS OF THE STUDY

The purpose of this study was to provide a systematic analysis of social differences in suicide mortality in Finland (Figure 7). Besides studying socioeconomic trends and differences according to age and sex in suicide mortality, different indicators for socioeconomic status were used simultaneously while also taking into account some confounding and mediatory factors. One way to assess the significance of the explanatory models for social differences in mortality is to use different socioeconomic indicators simultaneously, as the influence of selection or causality can be assumed to vary according to different measures of social status. Also the relation between employment status and suicide was assessed during different levels of national unemployment rate. We further incorporated area-level effects by studying the association between area-level social characteristics and suicide, as well as the interaction between individual and area social status. In order to better understand the mechanisms behind social differences in suicide, in some analyses suicides were divided into two groups according to contributory causes of death. The first group consisted of suicide deaths that had alcoholic intoxication as one of the contributory causes, and the other group is comprised of all other suicide deaths.

The specific aims of the study were to

1. determine how socioeconomic differences in suicide mortality have changed during the last few decades when the level of suicide rate has fluctuated and decreased substantially, and to assess socioeconomic difference in life expectancy due to suicide, and its contribution to socioeconomic difference in total mortality (Substudy I);
2. assess the effects of different socioeconomic indicators on non-alcohol and alcohol-associated suicide, to study whether their impact is independent of each other and of employment status and living arrangements, and to study employment status differences in suicide mortality during different levels of national unemployment (Substudies II, III and IV); and to
3. study whether area contextual factor have an effect on suicide mortality independent of the population composition of the area, and to assess how the association between occupation-based social class and suicide depends on area socioeconomic characteristics (Substudy V).

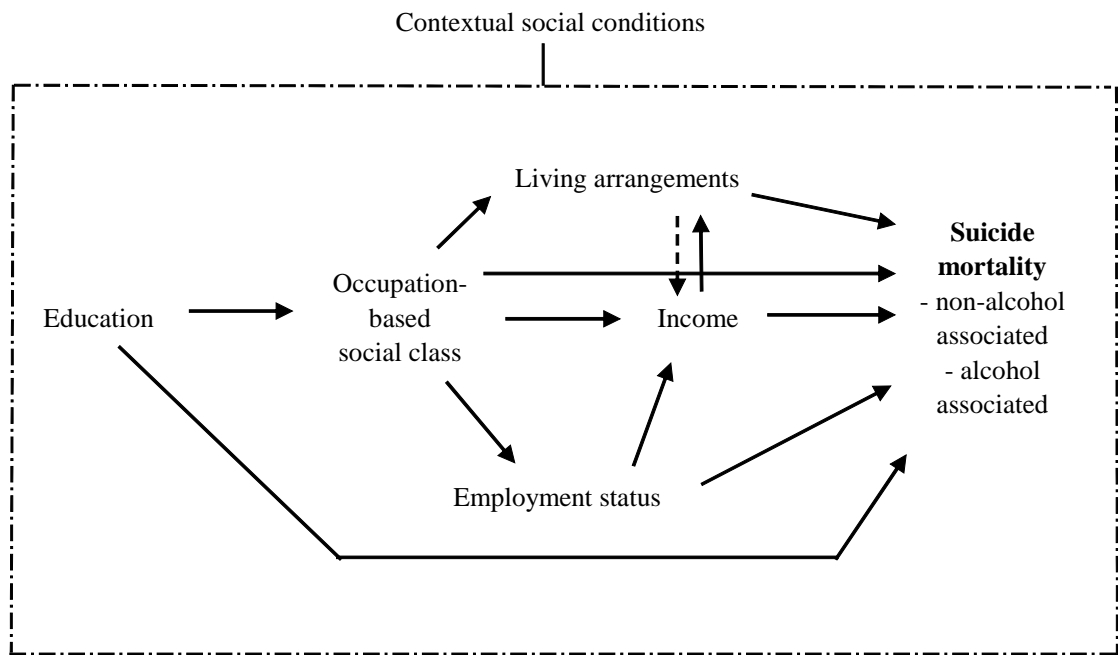


Figure 7 *A simplified framework of the design and variables used in this study.*

5 STUDY DESIGN

5.1 Data source and the outcome measure

Register data obtained from Statistics Finland were used in this study. All linkages between register census data and records from the death register were carried out by Statistics Finland by means of personal identification codes. The data for the total Finnish population were tabulated for Substudy I (permission TK-53-1783-96) and Substudies II, III and V (permission TK-53-1783-96), and in Substudy IV (permission TK-53-601-06), individual-level sample data were used.

Because socioeconomic status and employment status are an important aspect of this study, most analyses included only those who were between 25 and 64 years of age. Education, occupation-based social class and income are not well established at very young ages, and on the other hand practically all of the workforce has retired by the age of 65. Table 1 shows study periods and age groups used in different Substudies as well as the number of person-years and suicides.

Table 1. *Study periods, age groups, numbers of person-years and suicides in different Substudies.*

Substudy	Study period	Sex ¹	Age groups	Number of person-years	Number of suicides
I	1971 - 2000	M & F separately	25 and over	116 572 001	32 409
II	1991 - 2001	Males	25-64	11 567 890	6 452
III	1991 - 2001	Females	25-64	12 204 463	1 926
IV	1988 - 2003	M & F separately	25-64	4 539 905	7 388
V	1991 - 2001	M & F separately	15-64; 65-99	41 273 743	13 589

¹M=Males; F=Females

Suicide deaths are those for which suicide or some other condition caused by intentional self-harm was given as the underlying cause in the death certificate (in 1971–86 ICD8 codes E950–E959, in 1987–95 ICD9 codes E950–E959, in 1996–2003 ICD10 codes X60–X84 and Y870).

In Substudies II, III and V suicides were divided into two groups on the basis of three contributory causes of death as recorded on the death certificate: one group

comprised cases where alcoholic intoxication was stated as one of the three contributory causes, and the other group comprised all other suicide deaths. Blood alcohol content is analysed by a toxicology screening practically in all medico-legal autopsies if suicide is foreseen as a cause of death. However, the level of alcohol is not the determining point: in order for alcohol to be classified as a contributory cause the pathologist must determine that intoxication played a role in the process that ended in suicide (cf. Mäkelä 1998).

5.2 Study populations, variables and methods used in Substudies

5.2.1 *Substudy I*

Data

The tabulated register data used in the first Substudy on long-term trends in social class differences in suicide mortality comprised census records for the years 1970, 1975, 1980, 1985, 1990, and 1995 of all men and women aged 25 or more linked with death records for the periods 1971–1975, 1976–1980, 1981–1985, 1986–1990, 1991–1995, 1996–2000. In this Substudy, study subjects entered the analyses the year they turned 25 and left it when aged 65. Thus the age range was from 25 to 64 throughout the time period of 30 years that was studied.

The data consist of about 56 million person-years among men and 61 million among women. There were 32 409 suicides over the study period, of which 78% involved men.

Variables

The classification of occupation-based social class was based on the Statistics Finland standard (Statistic Finland 1989). In Substudy I we used a four-category classification of occupation-based social class including upper non-manual, lower non-manual, manual and farmers. Because we assessed changes in trends between social class groups over a period of 30 years a finer classification of the indicator would probably have increased random variation. Furthermore, the distribution of social class groups changed somewhat during the period studied (*see Substudy I*).

In order to minimise the bias related to so-called “healthy worker effect” (Martikainen & Valkonen 1999), economically inactive persons such as pensioners and the unemployed were classified according to their occupation in earlier censuses. Homemakers and others working at home were classified according to the occupation of the head of the household.

Method

Suicide and relative suicide rates were directly age-adjusted in five-year age groups using the total population of men and women in 1971–2000 as the standard population. Corresponding figures were calculated also for total mortality for comparative purposes.

As the data used in Substudies I to III were contingency data cross-tabulated by the variables of interest, Poisson regression models were estimated in SAS (1999). Cells in the cross-tabulation were the units of analyses in the Poisson models and included information on the number of suicides and person-years of exposure. The results are presented in terms of relative rates (RR), which were obtained as exponential of regression coefficients.

In order to estimate the contribution of social class differences in suicide to social class difference in total mortality, we calculated socioeconomic differences in life expectancies and the proportion of this difference that was attributable to suicide. The method applied here was developed by the United Nations Secretariat (1988).

5.2.2 Substudies II and III

Data

Substudies II and III, which assessed the pathways and causal interdependence between different measures of socioeconomic status, used tabulated data comprising the 1990 census records linked to the death register for the years 1991–2001 for those who were 25–64 years old in 1990. At the end of the follow-up, the study population was thus 11 years older than at the baseline. However, as the follow-up was relatively short, this was not likely to have an impact on the results. If anything, it is possible to decrease the number of cases, and also to diminish the relative differences because these are smaller among the older age-groups as was shown in Substudy I.

We excluded students and those whose socioeconomic status was unknown as well as farmers and other entrepreneurs, because it is impossible to position these classes hierarchically on the social class continuum.

Substudy II included men, and in total the study population lived about 11.6 million person-years and experienced 6 452 suicide deaths, and in 2 703 (42%) of these cases alcohol intoxication was a contributory cause. In Substudy III there were 12.2 million person-years among women, and 1 926 suicides of which 563 (29%) were alcohol-related.

Variables

The indicators for socioeconomic status used in Substudies II and III were education, occupation-based social class and income. The figures were also adjusted for employment status and living arrangements. Education was determined as the completed level in the register of education and classified by the Finnish Standard Classification of Education by Statistics Finland (Statistics Finland 1997). It comprised four groups: those with basic schooling and no qualifications (in practice up to nine years of schooling), those with lower-secondary education (about 11 years of schooling including vocational qualifications attained in two or three years), upper-secondary education (about 12 years

of schooling including those with a matriculation examination) and tertiary education (13 or more years of schooling).

Compared to Substudy I in these Substudies we used a more detailed categorisation of occupation-based social class comprising upper non-manual, lower non-manual in autonomous or non-autonomous work, and skilled and non-skilled manual. The Statistics Finland (1989) standard classification includes categorisation of lower non-manual workers by the degree of autonomous work, but the differentiation of skilled manual from non-skilled manual workers was done according to Pensola (2002), which was based on international classifications. Because the absolute number of manual workers is considerable and the probability of dying differs between skilled and non-skilled manual workers (Valkonen, Martelin, Rimpelä et al. 1993), it is reasonable to separate these groups e.g., whenever the data size allows for this possibility. Similar exclusions from the final data used in this study were made as in Substudy I.

Household income per consumption unit rather than personal income was used because, especially among women, it better indicates disposable income. In addition to wages, household income consists of other income sources liable to state taxation, including pension income, unemployment benefits and most other social security benefits, as well as possible entrepreneurial income, of all household members. Consumption units were calculated by giving the first adult in the household the value of 1.0 and any additional adult and each child the value of 0.5. For the analyses household income per consumption unit was categorised into four groups at the nearest quartile points.

Employment status was categorised into four groups in Substudy II (employed, unemployed, retired, and others), and into five groups in Substudy III, where in examining women homemakers was the fifth group. Employment status was based on the main activity in the past 12 months. Thus, for example, being employed did not assume full-time or full-year employment. However, of the persons who were categorised as employed 4% had experienced unemployment that had lasted for less than three months, and less than 2% had experience of unemployment that had lasted for three to six months. Those who were categorised as unemployed had been out of work for at least 6 months.

Living arrangements comprised five categories: married or co-habiting without children, married or co-habiting with children, single fathers/mothers, those living with a parent and those living alone. Because the proportion of institutionalised persons and others was so small, we combined them with those living alone as the suicide rate was closest in these two categories.

Method

Statistics Finland cross-tabulated suicide deaths and person-years with the variables of interest (*see also chapter 5.2.1 above*), and Poisson regression models (SAS 1999) were used to estimate the adjusted relative suicide rates.

The modelling principle used in this study and, especially, in Substudies II and III was based on the logic of “elaboration”. Basically, elaboration starts with a relationship between two phenomena that are correlated and conceived to be causally associated. Following adjustment for some another factors, changes in this established relationship are then examined. These third factors are introduced into the statistical models following their presumed causal order, and the aim is to find out to what extent they affect – explain or mediate – the original association. The idea is not to find a statistically best fitted model

so much as to learn to understand the pathways between the original relationship and other factors. (Valkonen & Martelin 1988.)

Because comparison of different socioeconomic indicators in terms of the relative rates as such may have suffered from the fact that the compared socioeconomic variables have different distributions, we also estimated a Poisson regression-based relative index of inequality (RII), which is a summary measure of the total population impact that takes into account both the socioeconomic gradient in the outcome and the population distribution of the socioeconomic variable (Pamuk 1985; Kunst & Mackenbach 1994). The RII represents the total size of the mortality difference between extremes (the bottom and the top) on the socioeconomic status scale. It is also most useful when making comparisons between the size of the effects of different indicators of socioeconomic status on mortality (Shaw, Galobardes, Lawlor et al. 2007). We further calculated percentage changes in RII for each measure of socioeconomic status by comparing a model that only adjusted for age to those with adjustment for other variables. These percentage figures show how much each variable in the analyses explains or mediates the originally observed association between socioeconomic status and suicide mortality.

5.2.3 Substudy IV

Data

This study focused on the effects of unemployment on suicide. The data used in this Substudy differed from the other datasets. They were based on (1) a representative 11 percent sample obtained from a register-based data file covering all Finns with (2) a random oversample of deaths so that, altogether, 80 percent of all suicides were covered. For the purposes of the analyses in this study we first extracted the men and women who were 25–64 years old on the 31st of December for each year in the period 1987–2002, and who were non-institutionalised and in the labour force (either employed or unemployed). They were followed for suicide mortality for twelve months beginning from the 1st of January 1988, 1989, ..., 2003, respectively. We then aggregated these annual cohorts.

In addressing the research question on the impact of selection we split the data to cover the period of low general unemployment (about four percent) in 1988–1991, very high unemployment (about 15 percent) in 1992–1995, and the two most recent four-year periods 1996–1999 and 2000–2003 (with unemployment rates of twelve and nine per cent, respectively).

Variables

In this Substudy social status was used as the indicator of employment status. The study subjects were classified according to unemployment experience, and three categories were formed: (1) the stably employed were those who were employed at the beginning of the follow-up year and who had been employed for the whole of the previous year; (2) the unstably employed had experiences of both employment and unemployment during the previous year; (3) the long-term unemployed were jobless at the beginning of the follow-up and for the whole of the previous year.

In the analyses, adjustments made were for occupation-based social class, living arrangements covering both the partnership situation and the household composition, and income. Social class comprised ten categories (including upper non-manual, lower non-manual in autonomous or non-autonomous work, and skilled and non-skilled manual (Statistics Finland 1989), for example). Similar exclusions from the final data used in this study were made as in Substudy I. Living arrangements were categorised in eight groups, of which married with children (46 percent of person-years among the men and 44 percent among the women), single (21 and 16 percent, respectively) and cohabitators (15 and 17 percent, respectively) were the largest. Household income per consumption unit during the year in which employment status was measured was used as a continuous variable. Consumption units were calculated as follows: the first adult in the household was given the value of 1.0, any additional adults and children aged 14 years and over the value of 0.5, and each child younger than 14 years the value of 0.3.

Method

We applied the Cox regression models given in Stata (2008) to analyse the data using appropriate sample design weights to take account of the unequal sampling probability and thus to obtain results that are representative for the population. In addition, we used robust estimators to account for repeated measures on the same individual at different baselines. The results are presented in terms of hazard ratios (HR) which were obtained as exponential of estimated regression coefficients.

5.2.4 Substudy V

Data

In Substudy V, which assessed the contribution of the contextual characteristics of residential areas on suicide, two kinds of data were used, that of individuals and that of areas describing the residential context of individuals. The individual-level dataset was the same as used in Substudies I–III and included men and women who were 15–99 years old in 1990. For the analyses the study population was divided into two broad age groups. Each individual in this data set was allocated to a unique area at the baseline of the study, and the functional regions of Finland (NUTS 4 level in the EU classification of areas) were used as the area units.

Variables

At the individual level we adjusted for several suicide risk factors including social class, household income, employment status and marital status. Classifications were the same as those used in Substudies II and III. Similar exclusions from the final data used in this study were made as in Substudy I.

The area characteristics used in this study included socio-economic structure and deprivation, represented by the proportion of manual workers in 1990, the average unemployment rates for 1990 and 1993, and the median household income per consumption unit in 1990. We also measured income inequality in 1990 (Gini coefficient),

and two dimensions of social cohesion, namely family cohesion and civic participation. Family cohesion represents conformity to traditional forms of family and living arrangements, and it was measured as a composite index of three variables: the proportion of persons divorced between 1990 and 1993 of those married in 1990, the proportion of persons living alone, and the proportion of one-parent families of all families with children in 1990. Civic participation was measured as the average voting turnout in the 1988 and 1992 municipal elections.

The proportion of manual workers was obtained by aggregating individual-level data over the functional regions from the individual-level census data used in the study. Median income, Gini, family cohesion variables were obtained from an 11% sample of the 1990 census data. Unemployment rate and civic participation were derived from external sources, i.e. databases by Statistics Finland containing information on municipalities and functional regions. For a more itemised report of the area-level variables, see Blomgren, Martikainen, Mäkelä and others (2004).

Each area-level variable was categorised into quartiles according to the number of regions. Consequently, each quartile class of area-level variables includes 21 or 22 functional regions. The size of the population of the regions was not taken into account in the categorisation of the variables because we were interested in comparing the areas with each other as equivalent units of analysis without weighting them by their populations.

Method

In Substudy V, a multilevel method with two-level models was used in order to investigate the independent effects of the area-level variables on suicide mortality after controlling for the individual-level variables (Snijders & Bosker 2004). Multilevel models were fitted with GLIMMIX-macro (SAS 1999), and in the models a Poisson distribution assumption was used.

5.3 Ethical considerations

We followed data protection guidelines approved by the data protection authorities, Statistics Finland and the University of Helsinki in the forming, use and reporting of the data.

Special care was taken to protect the anonymity of individuals. Statistics Finland used personal identification codes to link the information on the date and the underlying and contributory causes of death from the death certificate data to the information in the population-register data in all data sets and, also, addresses used in the fifth Substudy to locate individuals into functional regions. Personal identification codes were deleted before the researchers had access to the data. Birth dates were rounded and set at the fifteenth day of the month.

First and foremost, individual-level data were only accessible at the main frame computers of Statistics Finland. Outside the premises of Statistics Finland we were only able to apply aggregated data (Substudies I, II, III and V) or sample data (Substudy IV).

6 RESULTS

6.1 Suicide mortality rates and social differences

Age-standardised suicide mortality was 56.3 per 100 000 person-years among men aged 25 and more and 14.5 among women over the total period 1971–2000 (Substudy I, Table I). When a narrower age group (25–64 years old) and a shorter time period (1991–2001) was studied, the age-adjusted rates for non-alcohol associated suicides per 100 000 were 32.4 among men and 11.2 among women. Rates for those suicides that had alcohol intoxication as a contributory cause of death, were 23.4 per 100 000 person-years among men and 4.6 among women. (Substudy II, Table 1; Substudy III, table 1.) Among men, alcohol-related suicide mortality was highest in the youngest age group (15–34 -year-olds), but among women the highest alcohol-associated suicide rate was among those aged 35 to 64 years (Substudy V, Table 1).

Social differences in suicide rates were notable. Among men, age-adjusted mortality rates by education varied from 16 (tertiary educated) to 42 (basic education) per 100 000 person-years in non-alcohol-associated suicide. Alcohol-associated suicide rates were at a little lower level. Among women the corresponding figures were smaller and differed much less.

In the total period of 1971–2000, the age-adjusted suicide rate was about 30 per 100 000 person-years among upper non-manual men but almost 70 per 100 000 person-years among manual men. Among women, the corresponding figures diverged much less and they were 13 among both upper and lower non-manual and 17 among the manual group. Compared to the total period of 30 years, the rates for the shorter period of 1991–2001 were very similar among non-manual men and women, but even higher among the manual groups of both sexes. Alcoholic suicide mortality rates differed more between social class groups than non-alcohol-related suicide rates (Tables 1 in Substudies II and III).

Income-related suicide rates were mostly J-shaped. Lowest age-adjusted suicide mortality rates were found in those belonging to the second highest income groups among both men and women. The highest rates among men were among those with the lowest incomes: 54 in non-alcohol-associated and 35 in alcohol-associated suicide per 100 000. Among women there were no differences in non-alcohol-associated suicide rates between the two lowest income groups, and very small variation was found also in alcohol-associated suicide between these groups.

Among stably employed men, age-adjusted suicide mortality rate was 32 per 100 000 person-years for the period 1988–2003. The corresponding rate was 84 for the unstably employed and up to 118 for the long-term unemployed. Among women relative differences were chiefly similar, but the rates were at a much lower level.

Years of life expectancy lost were calculated for social class. Because of high suicide mortality among the manual men, the most years of life expectancy (0.61 years) was lost in this group compared upper non-manual men. Among lower non-manual, the corresponding figure was 0.20 years. The contribution of suicide to the total difference in life expectancy between these social class groups and upper non-manual workers was about 10% among manual workers and 8% among lower non-manual workers. Among women life expectancy lost was 0.15 years and 5% among manual and 0.05 years and 5% among lower non-manual as compared to upper non-manual workers. (Substudy I, Table II.)

6.2 Trends in social differences in suicide

The first major aim of this study was to determine how social differences in suicide mortality have changed during the last few decades when the level of suicide rate has fluctuated and decreased substantially. This issue was mostly studied in Substudy I. Employment status differences and changes in the trends were examined in Substudy IV.

6.2.1 *Occupation-based social class*

Figures 8 and 9 below show social class differences in suicide mortality rates in 1971–2005 adjusted for age and marital status among those in the age group 25–64 years. Suicide mortality among men was higher among manual workers compared to other socioeconomic groups throughout the 35-year study period.

Because of the steady decline in suicide among upper non-manual men and a slower decrease or even an increase among other socioeconomic groups, the relative mortality differences among men increased considerably from 1970 to 1990. Resulting from a quite remarkable decrease in manual workers' suicide rate from 1991 onwards, absolute socioeconomic inequalities have decreased substantially during the study period. Nevertheless, relative differences have remained. While suicide mortality was 1.5-fold higher among manual men compared with upper non-manual men at the beginning of the 1970s, it was about twofold higher in 2005.

The adjustment for marital status (solid line in Figure 8) had opposite effects on male suicide mortality among different socioeconomic status groups. Among upper non-manual class men, the suicide rate that was adjusted not only for age, but also for marital status was higher while the opposite held for manual men, especially after the mid-1980s. The difference in suicide rates between social class groups was thus smaller following adjustment for marital status than when only age was adjusted.

Among men, suicide mortality by age and social class has been very similar during the 1970s, 1980s and 1990s (results not shown in the original article), with somewhat larger differences between social class groups observed in age groups from 35–39 to 50–54 years.

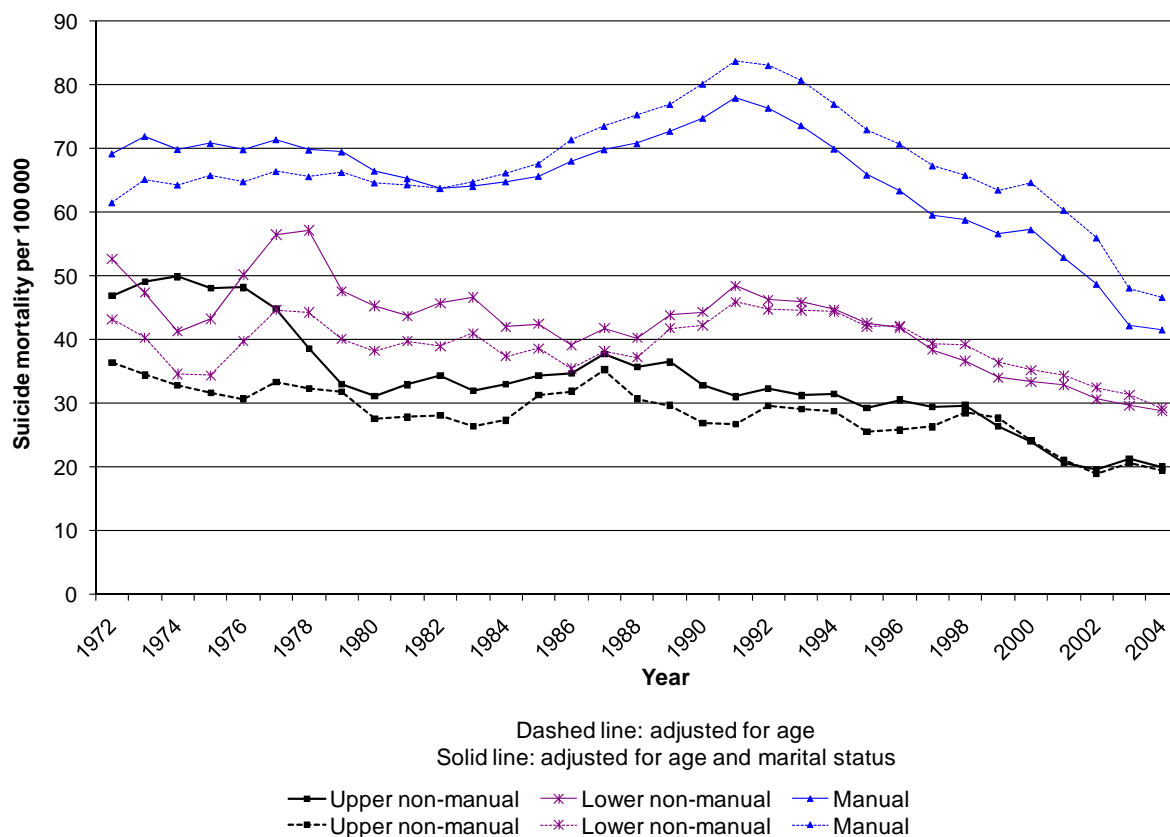


Figure 8 Socioeconomic trends in suicide mortality among men aged 25–64 years and older in Finland in 1971–2005. Three-year moving averages adjusted for age and marital status

Among women, suicide mortality started to decrease rapidly among the upper non-manual group in the 1970s and halved during the study period. Suicide mortality in the lower non-manual group fluctuated during the period, but no changes in the overall level followed. On the other hand, the rate in the manual group increased in the 1980s, peaked in 1990, and started to decrease only after the middle of the 1990s. Furthermore, it seems that the positive trend has stopped in the 2000s. Among women the absolute difference in suicide has remained almost similar from the beginning of the 1990s onwards and, as with men, the relative difference has increased (from about 1.9-fold to 2.3-fold).

Among women, suicide mortality rate by age and social class has changed somewhat during the 1970s, 1980s and 1990s (results not shown in the original article): while in the 1970s age-specific suicide rates were rather similar between different social class groups (with upper non-manual having slightly the highest rate in all age groups), during the 1990s suicide mortality among manual women aged from 40–44 to 50–54 was notably high (about 26 per 100 000 person-years).

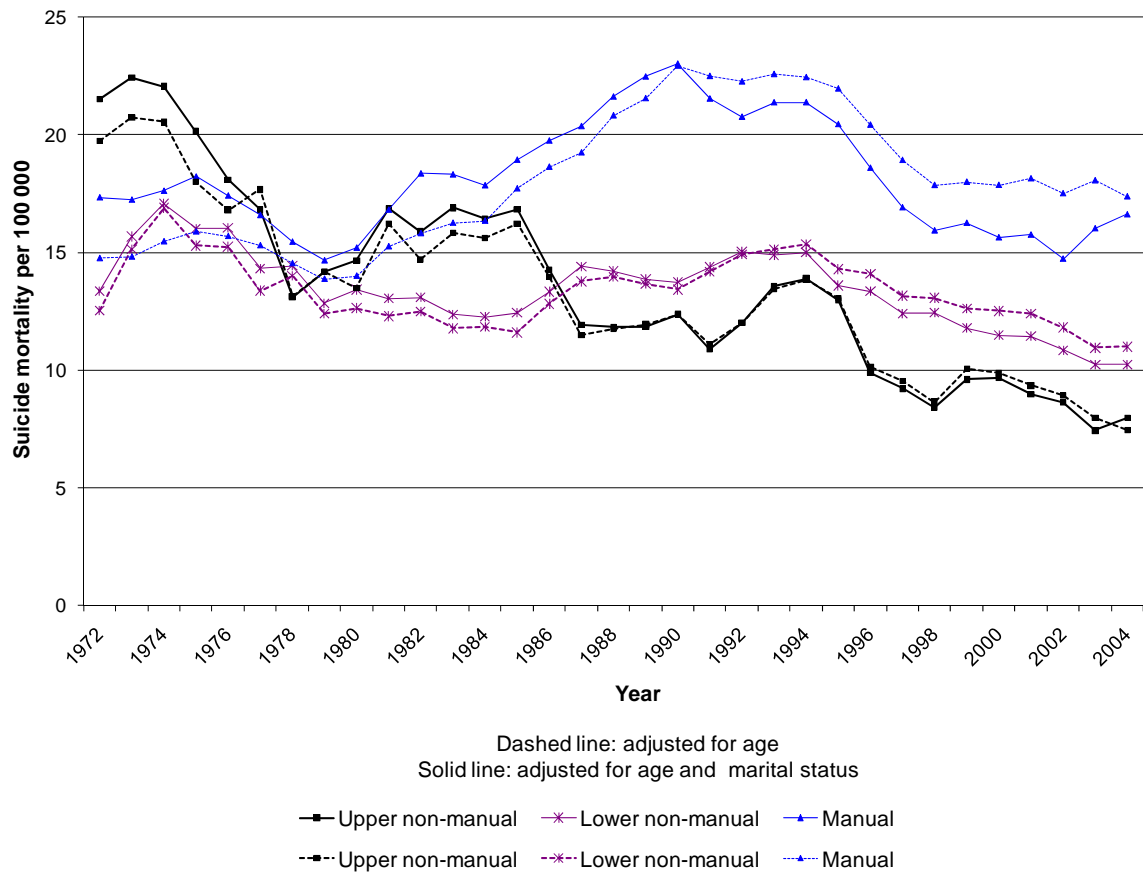


Figure 9 Socioeconomic trends in suicide mortality among **women** aged 25–64 years and older in Finland in 1971–2005. Three-year moving averages adjusted for age and marital status

Among women, the adjustment for marital status (solid line in Figure 9) reduced social class differences in suicide analogously to men, but the changes in rates following this adjustment were smaller. Preceding the peak in the suicide rate among manual women in 1990 adjustment for marital status increased the rate, but during the 1990s and 2000s adjustment decreased it.

6.2.2 Employment status

Age-adjusted suicide mortality rates have decreased in all employment status groups among men during the period 1988–2003 (Figure 10). However, the pattern of this decrease is different. The suicide rate decreased significantly more among the unstably employed between 1988–1991 and 1992–1995 than in other employment groups, but after that it has not changed much.

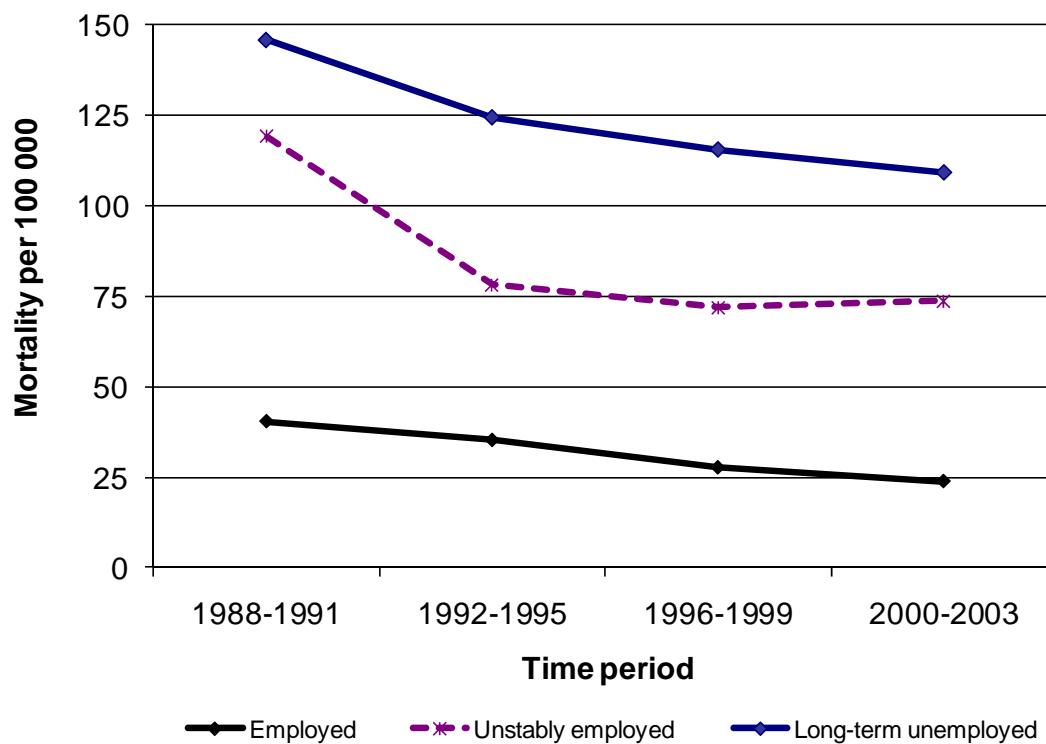


Figure 10 *Age-adjusted suicide mortality by employment status in 1988–2003, men aged 25–64 years.*

Among women, age-adjusted suicide mortality rate has decreased among the stably and unstably employed during the period 1988–2003 (Figure 11). Suicide mortality seems to have increased among long-term unemployed women, but due to the small number of cases, the interaction effect was not statistically significant.

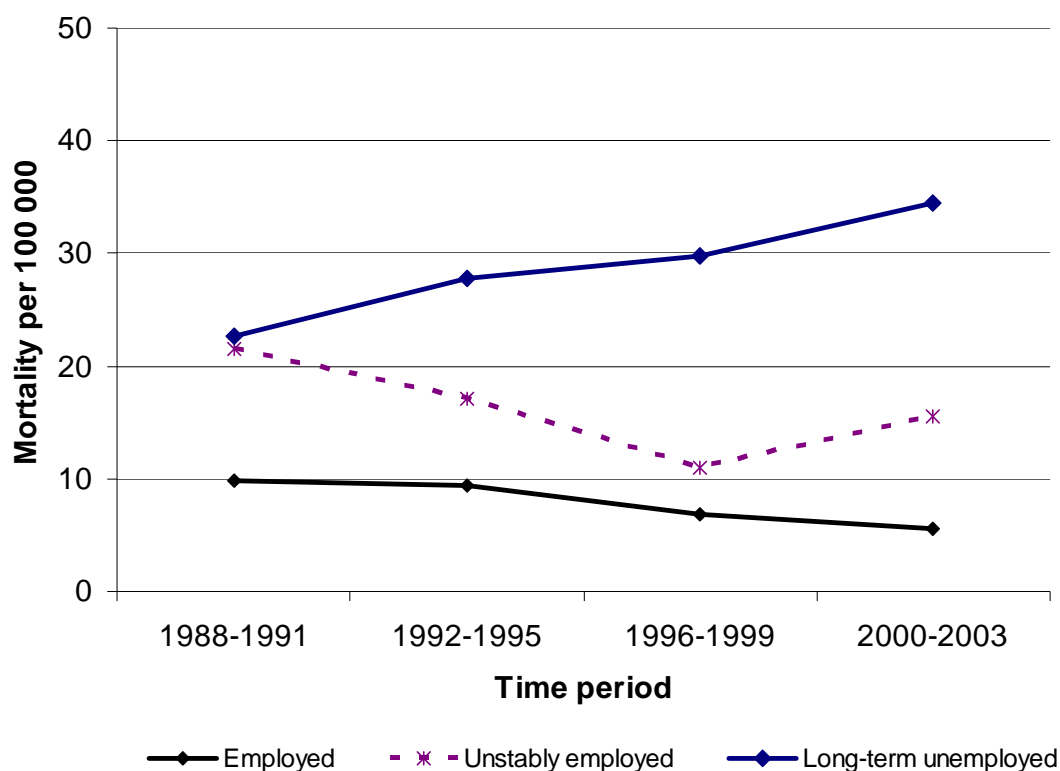


Figure 11 Age-adjusted suicide mortality by employment status in 1988–2003, *women* aged 25–64 years

6.3 Effects of different social indicators

The second research question aimed to assess the effects of different socioeconomic indicators on non-alcohol and alcohol-associated suicide. This involved analysing whether their impact is independent of each other and of employment status and living arrangements, and studying employment status differences in mortality for suicide. The analyses that seek to answer these issues are carried out in Substudies II, III and IV. In Substudies II and III we divided suicides into two groups according to three contributory causes of death recorded on the certificate: those cases where alcohol intoxication was one of the three contributory causes, and other cases. Among men, in 42% of suicides alcohol intoxication was a contributory cause of death, and among women the corresponding figure was 29.

Results among men

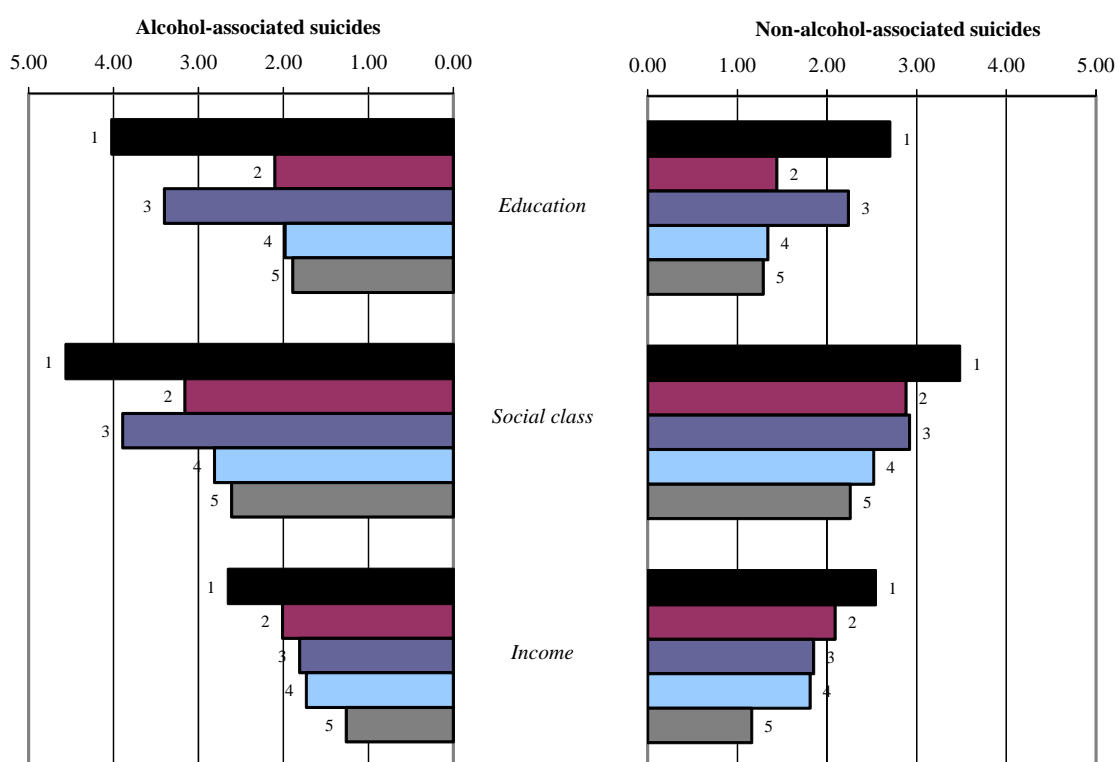
For all socioeconomic indicators, suicide was more common in the lower groups. Among men, the age-adjusted relative indexes of inequality (RII) were 2.7 for education and 3.5 for social class in non-alcohol-associated suicide, but notably greater when alcohol was

involved (4.0 and 4.6 respectively). The RII figures for income were almost the same (2.54 and 2.65 respectively) (Model 1 in Figure 12).

When non-alcohol-associated suicide was considered, adjustment for social class decreased the educational differences, and the RII decreased by almost three-quarters (Model 2 in Figure 12, right panel). When income was adjusted for, the RII was reduced much less and decreased by 27%. The association between education and suicide mortality was thus mediated largely by social class, and also by income, although only a slight further reduction was brought about by simultaneous adjustment. Adjustment for education reduced the relative social class difference somewhat, and the RII decreased by a quarter. Adjustment for income had a very similar effect, and altogether 40% of the original association was explained by education and mediated by income. However, the relative rates were quite large even after all these adjustments, and the RII was as high as 2.52. The RII between income groups was attenuated more by adjusting for social class (RII decreased by 45%) than for education (29%), but on the whole, income maintained a little more than half of its original association.

The findings for alcohol-associated suicide (Models 2–4 in Figure 12, left panel) were to some extent similar: adjustment for social class rather than for income (reductions in the RII of 64% and 21%, respectively) attenuated the association between education and suicide. However, the net effect of education was substantially larger when alcohol was involved than otherwise (RII=1.98 vs. 1.34). Adjusting for education decreased the association between social class and alcohol-related suicide notably and the RII diminished by 39%. Income mediated the association by about a fifth, and simultaneous adjustment caused a total reduction of 50%. The association between income and alcohol-associated suicide declined more when adjusted for social class (RII decreased by 51%) than for education (39%). Simultaneous adjustment for these two indicators attenuated income differences only a little further, and the total reduction in the RII was 56%.

We then looked at whether the associations between socioeconomic indicators and suicide were independent of living arrangements and employment status (Model 5 in Figure 12). Adjustment for these variables decreased the effect of income substantially in both types of suicide, and most of this attenuation was caused by controlling for employment status (Substudy II, Tables 2 and 3). Compared with model 4 in Figure 12, the RII diminished by 80 and 64% for non-alcohol- and alcohol-associated suicide, respectively, and after this adjustment the RII figures for income were 1.16 for the former and 1.26 for the latter. The effect of adjustment for living arrangements and employment status was much smaller on educational and social class differences: the RII decreased by only a few per cent. However, regarding specific socioeconomic categories, a point worth mentioning is that in line with the results in Figure 8, the adjustment for living arrangements decreased suicide risk to some extent among the manual workers, and especially among non-skilled manual workers (Tables 2 & 3 in Substudy II).

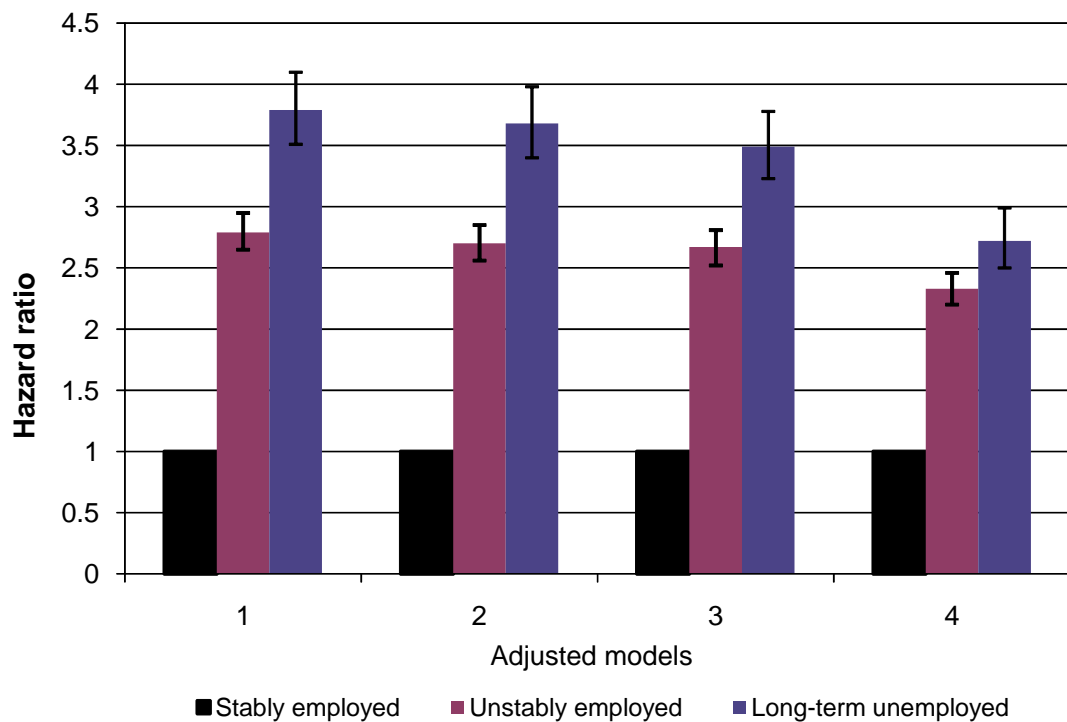


Models:

- 1) Adjusted for age
- 2) Education is adjusted for age and social class / social class and income are adjusted for age and education
- 3) Education and social class are adjusted for age and income / income is adjusted for age and social class
- 4) Socioeconomic variables are adjusted for age and each other
- 5) Socioeconomic variables are adjusted for age, each other, living arrangements and employment status

Figure 12 *The effects of education, social class and income on suicide mortality among men, relative index of inequality RII.*

Men who had experiences of unemployment had a higher suicide mortality risk than the stably employed (Figure 13). Unstably employed men had over 2.6-fold higher age-adjusted suicide mortality while the respective figure was 3.5 among the long-term unemployed. Adjustment for social class and living arrangements had little effect on the hazard ratios (12% at the most), but adjustment for household income per consumption unit decreased the differences by a further 24% among the unstably employed and 36% among the long-term unemployed. Following this adjustment there were no more differences in suicide risk between unstably employed and long-term unemployed men.



¹Adjusted for age

²Adjusted for age and social class

³Adjusted for age, social class and living arrangements

⁴Adjusted for age, social class, living arrangements and household income per consumption unit

Figure 13 *Adjusted relative suicide mortality among stably employed, unstably employed and long-term unemployed men in 1988–2003.*

Among the unstably employed men, relative suicide mortality was highest (2.76) when the national unemployment rate was low, and lowest (2.04) during the period of high general unemployment (Figure 14). The relative rates were again higher during the two most recent time periods with intermediate levels of unemployment: 2.24 and 2.44. A different pattern occurred among the long-term unemployed men: relative mortality compared to stably employed was much more similar irrespective of the national unemployment rate, the lowest rate (2.56) occurring during the period of twelve per cent unemployment and the highest (2.93) during the period of highest unemployment.

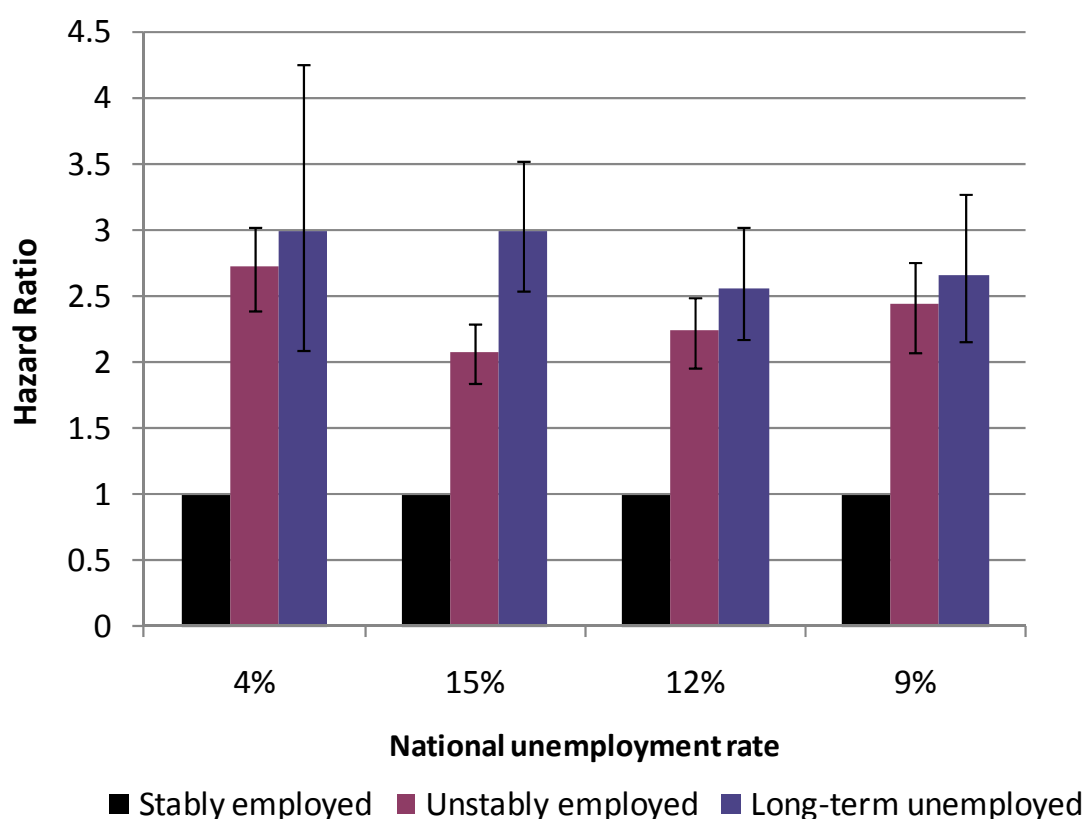


Figure 14 *Relative suicide mortality by employment status among men during different levels of national unemployment in 1988–1991 (unemployment rate 4%), 1992–1995 (15%), 1996–1999 (12%) and 2000–2003 (9%).*

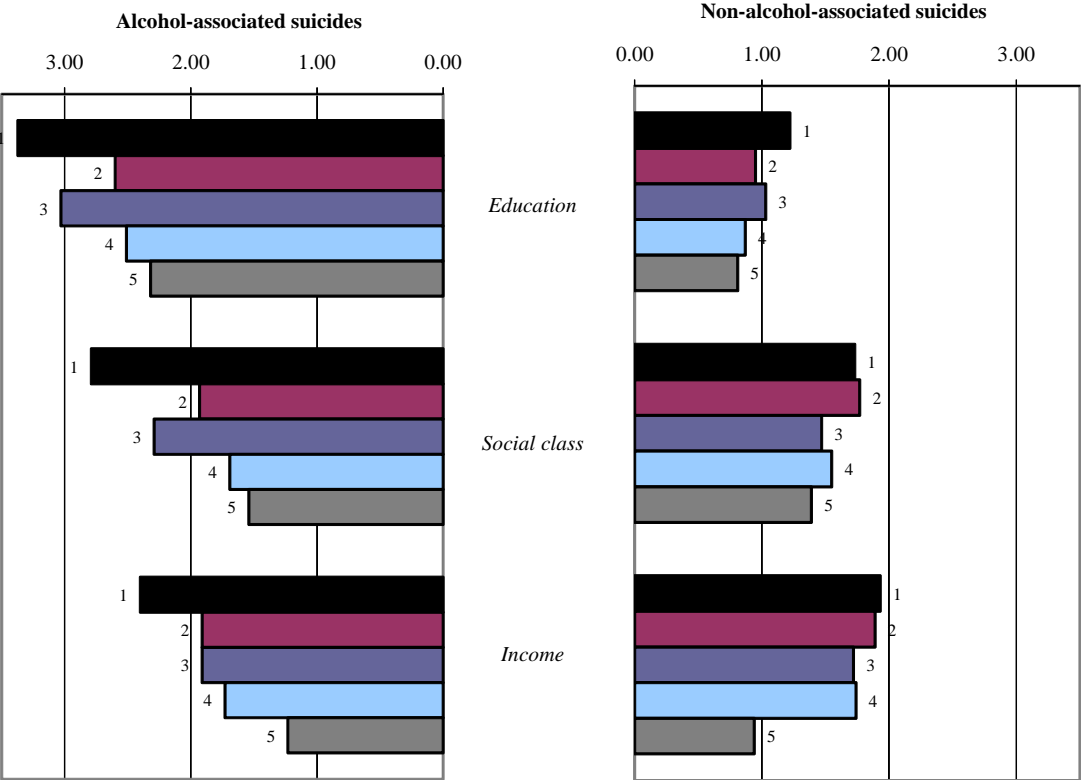
Results among women

Socioeconomic differences were smaller among women (Figure 15) than among men. However, among both sexes differences were much larger in alcohol-related suicide. The relative index of inequality (RII) was 1.2 for education and 1.7 for social class in non-alcohol-associated suicide among women, but notably higher when alcohol was a contributory factor (RII=3.4 and 2.8 respectively). The differences in RII were not as large for income: 1.9 and 2.4, respectively.

The independent effects of each socioeconomic indicator were studied next (models 2–4 Figure 15). Adjustment for social class and income attenuated the RII of education, and no association or, at the most, a slightly inverse association (RII was 0.87) between education and non-alcohol-associated suicide was left. Adjustment for education increased the RII of social class a little, but income attenuated the index, and the RII decreased by a quarter altogether (from 1.73 to 1.55). Adjustment for education had no effect on the income differences, and social class caused an attenuation of 20%.

The findings for alcohol-associated suicide were somewhat different. Age-adjusted educational differences were substantial, and even though the adjustment for social class diminished (that is mediated) the RII by a third, following simultaneous adjustment the RII was still as large as 2.5. Education explained almost half of the association between social class and alcohol-associated suicide. Income, on the other hand, mediated almost 30% of this association, and simultaneously these indicators decreased the RII for social class by about 60%. Both education and social class explained a third of the association between income and alcohol-associated suicide, and when adjusted simultaneously, the RII was diminished by almost a half.

Adjustment for living arrangements and employment status had very little effect on educational and social class differences in both non-alcohol- and alcohol-associated suicide (model 5 in Figure 15), but like among men, employment status mediated most of the effects of income on both non-alcohol- and alcohol-associated suicide, and the RII was no longer significant.

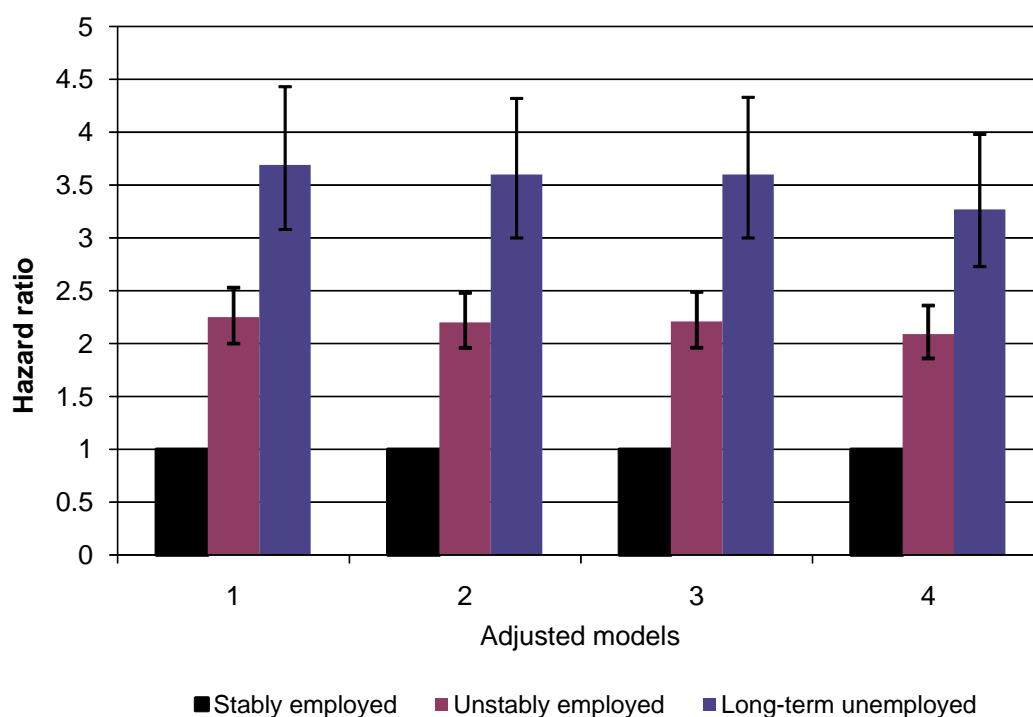


Models:

- 1) Adjusted for age
- 2) Education is adjusted for age and social class / social class and income are adjusted for age and education
- 3) Education and social class are adjusted for age and income / income is adjusted for age and social class
- 4) Socioeconomic variables are adjusted for age and each other
- 5) Socioeconomic variables are adjusted for age, each other, living arrangements and employment status

Figure 15 *The effects of education, social class and income on suicide mortality among women, relative index of inequality RII.*

Similarly to men, women who had experiences of unemployment had higher suicide mortality than the stably employed (Figure 16). The unstably employed women had an over twofold higher age-adjusted suicide hazard ratio, and for long-term unemployed women the risk was as high as among men: almost 3.5-fold. Only adjustment for household income per consumption unit had an effect on employment status differences, and the risks were attenuated by 13% among unstably employed and 16% among the long-term unemployed.



- ¹Adjusted for age
- ²Adjusted for age and social class
- ³Adjusted for age, social class and living arrangements
- ⁴Adjusted for age, social class, living arrangements and household income per consumption unit

Figure 16 *Adjusted relative suicide mortality among stably employed, unstably employed and long-term unemployed women in 1988–2003.*

As with the men, the highest relative suicide rate among the unstably employed (2.39) was during the period of lowest unemployment (Figure 17). The risk was lower during the two periods with the highest unemployment level in the 1990s but increased somewhat to 2.25 again during the latest time period, when unemployment was lower than in the 1990s. Relative suicide mortality increased among the long-term unemployed

women, being at its highest (4.02) during the most recent time period. The small number of suicides may explain some of these more inconsistent results among women.

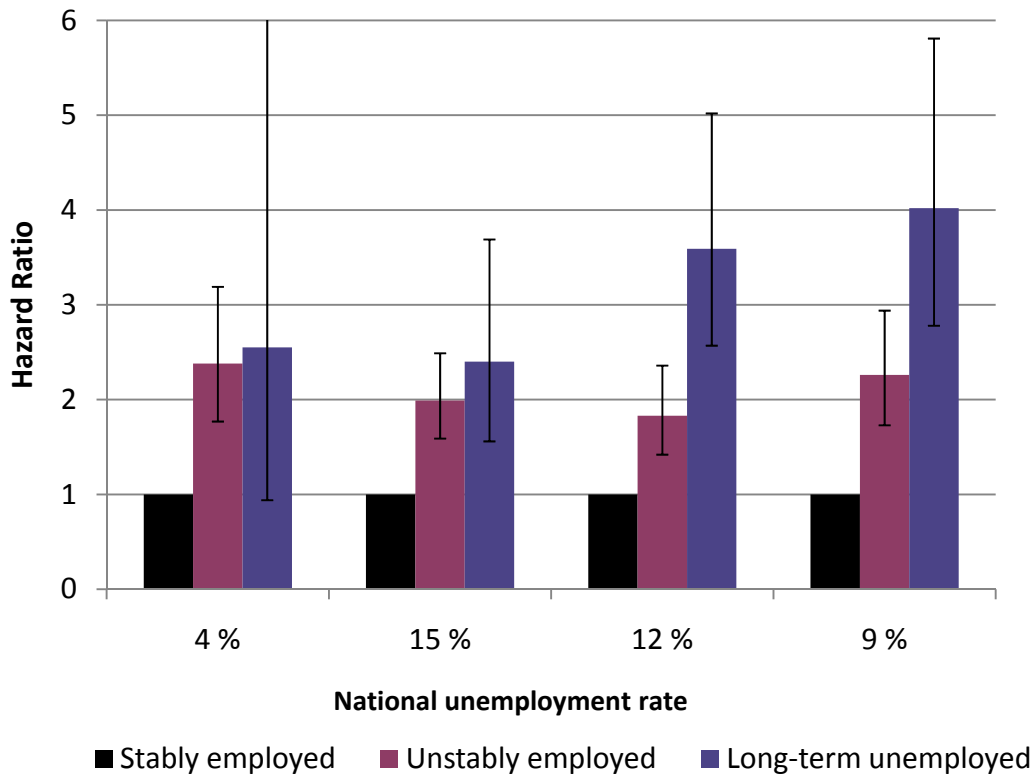


Figure 17 *Relative suicide mortality by employment status among women during different levels of national unemployment in 1988–1991 (unemployment rate 4%), 1992–1995 (15%), 1996–1999 (12%) and 2000–2003 (9%).*

6.4 Area effects

Thirdly, the idea was to study whether area contextual factors have an effect on suicide mortality independent of the composition of the area. Substudy V aimed to answer these questions.

The unemployment level of the area and median household income per consumption unit among men (Figure 16) and family cohesion and voting turnout among women (Figure 17) were associated with increased non-alcohol-associated suicide mortality, while median household income per consumption unit was related to decreased non-alcohol-associated suicide among women in the age group 15–64 years. The differences were much larger in alcohol-associated suicides. The proportion of manual

workers and the unemployment level were associated with increased alcohol-related suicide among men and voting turnout among both men and women.

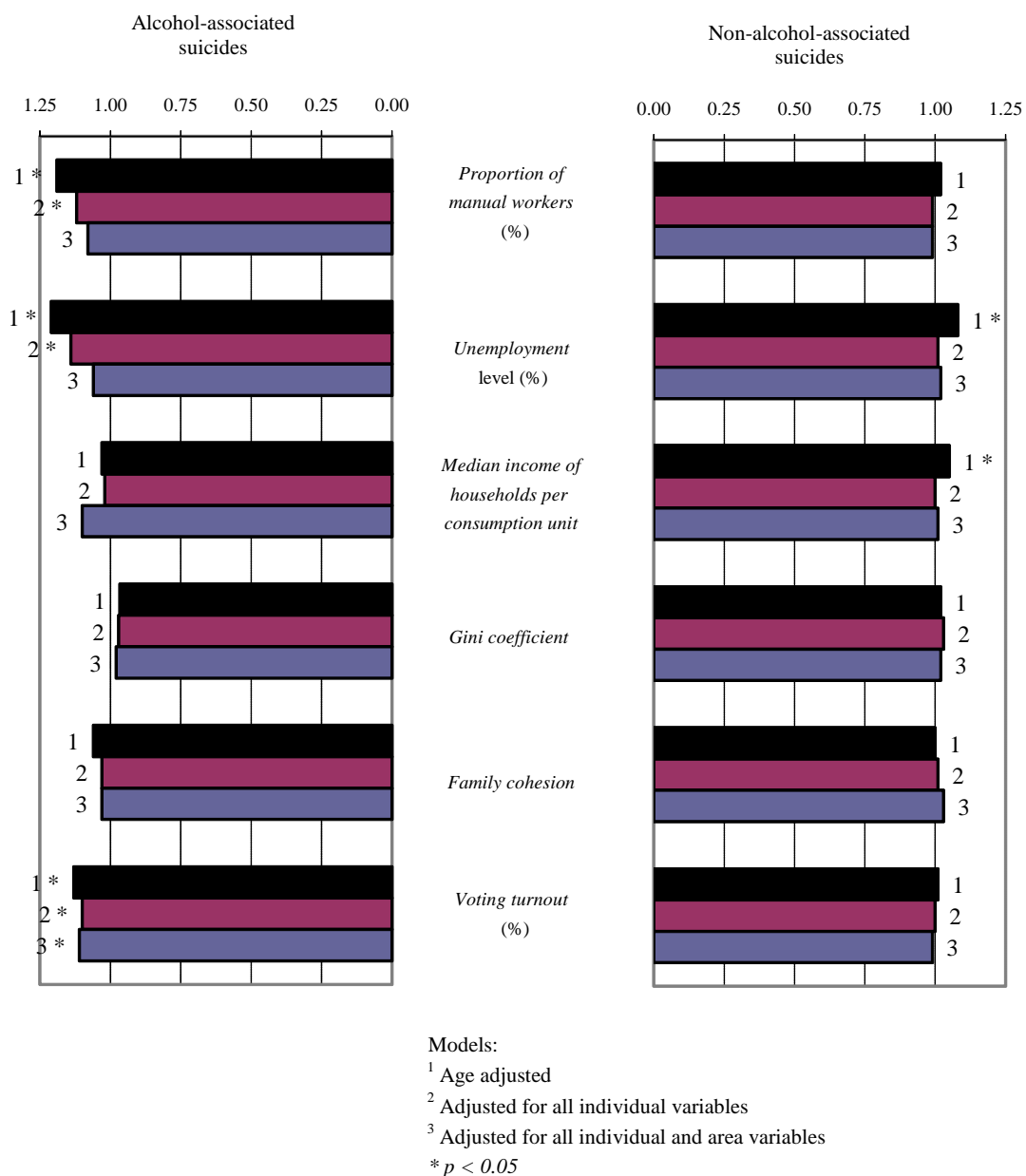


Figure 18 Adjusted suicide rate indexes by area-level variables, *men* aged 15–64 years in 1991–2001.

The age-adjusted differences changed, however, following adjustment for the individual-level and other area-level characteristics. The small effects of area variables

The effects of area-level variables on alcohol-associated suicide were attenuated among men when all individual-level variables were adjusted for. However, clear area effects still remained. After simultaneous adjustment for individual-level factors and for all other area-level factors, the effects were further reduced, with the effect of median income becoming stronger. Low voting turnout was still associated with higher suicide, as well as the high proportion of manual workers, which, however, was not a statistically significant factor.

Among women, area effects for alcohol-associated suicides were smaller and less consistent than for men. All these effects were attenuated when individual-level variables were adjusted for. After simultaneous adjustment for individual-level factors and for all other area-level factors only the effect of voting turnout was significantly associated with alcohol-associated suicide mortality.

A further aim in this substudy was to examine how the association between individual social class and suicide depends on area socioeconomic characteristics, in this case on the proportion of manual workers and the unemployment level. Figure 20 below shows suicide mortality rate ratios for manual and white collar men in areas with different unemployment levels and different proportions of manual workers, respectively. Figure 21 shows similar results for women. Figure 1 in Substudy V shows similar results with mortality rates (absolute mortality differences), and Figure 2 shows results for women.

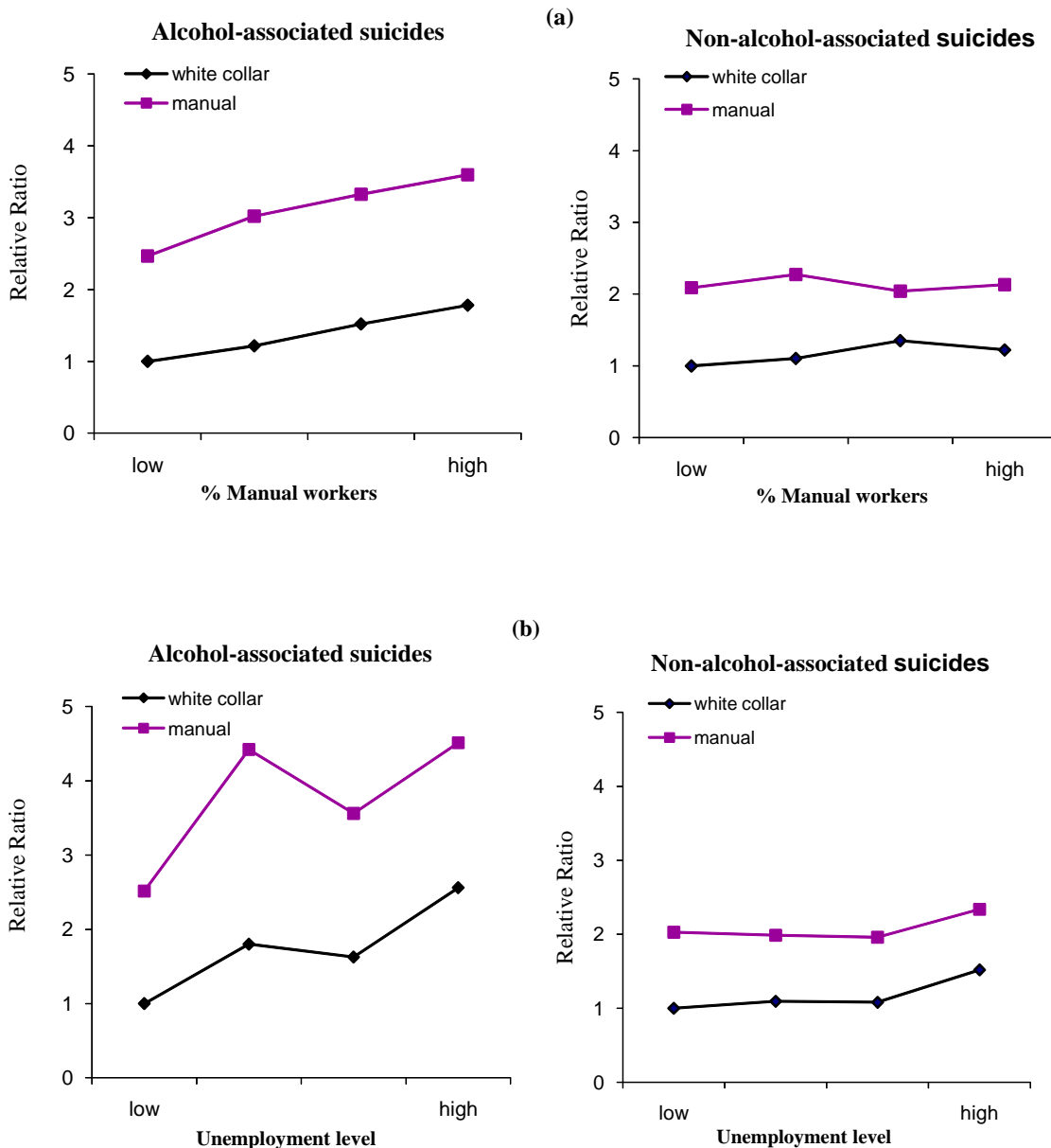


Figure 20 Age-adjusted relative ratios of alcohol- and non-alcohol-associated suicide by individual socioeconomic status by area proportion (%) of manual workers (panel a) and by unemployment level (panel b), 15–64 year old Finnish men in 1991–2001.

The interactions between individual social class status and area characteristics of unemployment level and proportion of manual workers were modest or inconsistent. Among both men and women, this is indicated by the roughly similar form of the social class status specific mortality patterns by area characteristics (Figures 20 and 21). If anything, the non-alcohol-associated suicide rate difference between manual and white collar workers appears to be slightly smaller in areas with a high proportion of manual

workers and a high unemployment rate. However, these differences were very slight indeed.

Also, for alcoholic suicides no strong modifying effects of area characteristics emerged, and overall, there do not appear to be strong and consistent patterns of interaction that apply to both men and women or both types of suicide.

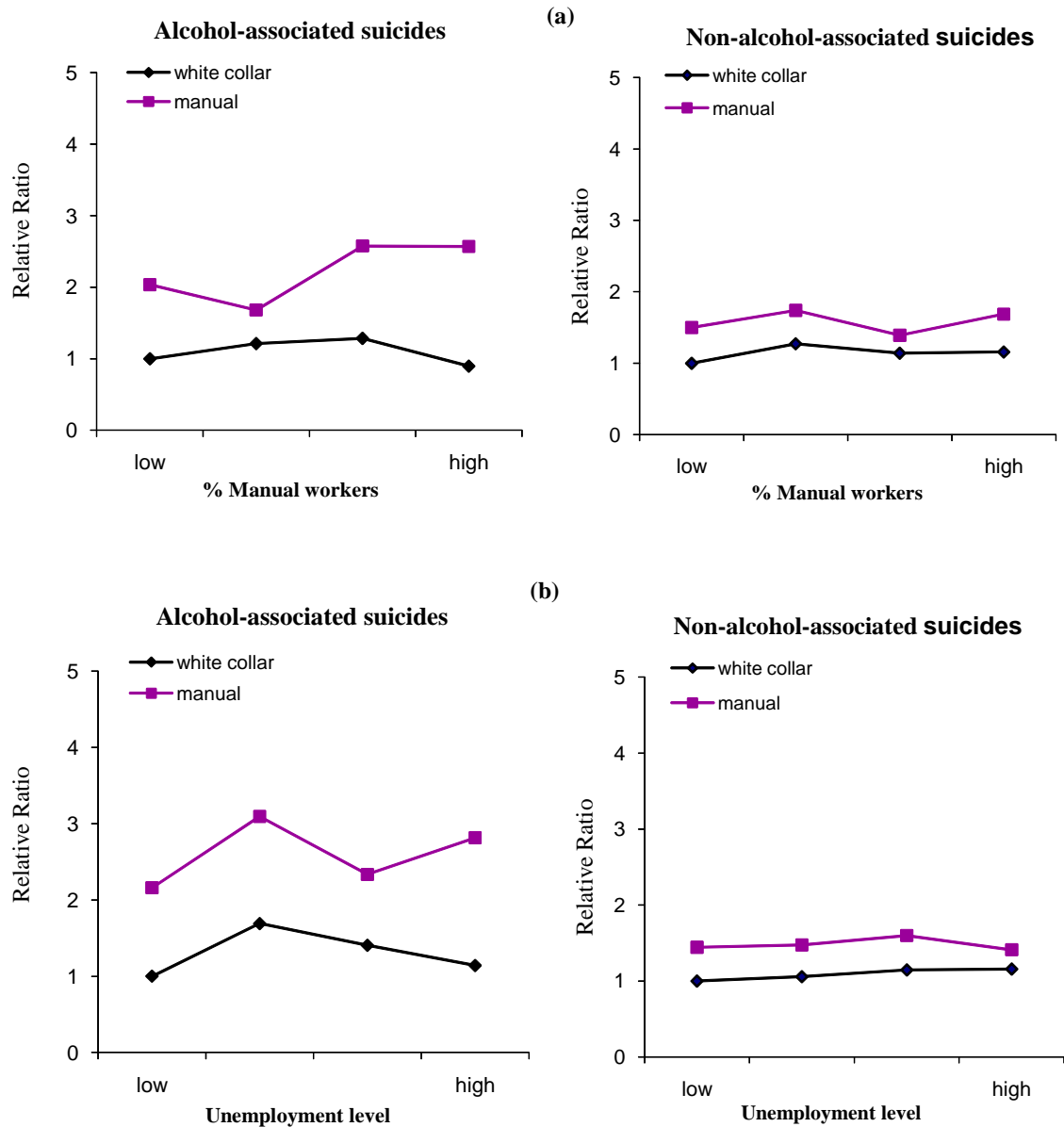


Figure 21 Age-adjusted relative ratios of alcohol- and non-alcohol-associated suicide rates by individual socioeconomic status by area proportion (%) of manual workers (panel a) and by unemployment level (panel b), 15–64 year old Finnish women in 1991–2001.

7 DISCUSSION

7.1 Main results and their discussion

7.1.1 Large social differences in suicide still exist

The *first* main finding in this study was that both socioeconomic and employment status are strongly associated with suicide mortality, and this association has persisted even though suicide mortality has decreased during the 1990s and 2000s. Furthermore, even though absolute social differences have decreased among men, relative differences still exist. Among women, suicide mortality rate is at a lower level than among men, but both relative and absolute differences have increased during the period studied. During the 2000s the positive trend in manual women's suicide mortality ceased, and the relative difference has increased and is now larger than for total mortality.

The decrease in suicide rate in Finland coincides with the suicide prevention project implemented in 1992–1996 (Upanne, Hakanen & Rautava 1999). This nationwide suicide prevention strategy aimed to reduce the incidence of suicide by a fifth, the practical implementation of the strategy being based on research information (Lönqvist, Aro & Marttunen 1993). One of the main goals of this project was to increase public and professional attention to the treatment of depression, as till then depression was apparently both underdiagnosed and undertreated (Suominen, Isometsä, Henriksson et al. 1998). The aim was e.g., to create regional and local care and activity models for people suffering from depression. High social status, and especially high education, are said to relate to alternative ways of coping with problems (Droomers, Schrijvers, Stronks et al. 1999) and to more positive help-seeking attitudes (Fisher & Cohen 1972). In this study, we found that suicide mortality also decreased among manual men and women and among unemployed men. It is possible that as a result of a national project those who otherwise would have difficulties finding help (e.g., those with low education), benefitted from these measures most. Possibly the threshold of access to remedy has been lowered and also the more disadvantaged receive the help they need more readily. Another study in the Finnish context using a mental health service system level showed that, indeed, the prominence of outpatient service types was associated with decreased suicide risk suggesting that the role of easily approached, versatile services, with an outreach component is essential in suicide prevention (Pirkola, Sund, Sailas et al. 2009). Overall, however, the link between the prevention project and suicide trends needs further research.

In particular, the association between increased use of anti-depression medication, especially selective serotonin reuptake inhibitors (SSRIs), and suicide is much debated. The declining suicide rate coincides with the increase in antidepressant sales in Finland. Unfortunately, in this study no data were available on medications used. In the

Nordic study based on aggregated data, a causal association between increase in antidepressant use and decrease in suicide trend was not established (Reseland, Bray & Gunnell 2006). Added to this, research based on ecological analyses always has difficulties in drawing conclusions on individual-level associations, and thus the effect of the antidepressants on socioeconomic suicide differences remains dubious. Furthermore, as our results show, the decline in suicide has been most marked in men and especially among manual men, despite the fact that women, and especially older women, are the greatest consumers of antidepressants, their use has also increased most rapidly in this group (Klaukka, Idänpään-Heikkilä & Neuvonen 2005). During the 2000s, working-age Finnish men have also increased their use of depression medication, but in all age groups men lag behind women in this respect (Klaukka 2008).

While a study in Denmark (Hansen, Søndergaard, Vach et al. 2004) proposes that low socioeconomic status is associated with a higher incidence rate of both depression and antidepressant prescription, in Finland antidepressant treatment seems to be less common among low educational groups than among those with higher education, even though low socioeconomic position was associated with mental-health-related mortality, indicating a possible mismatch in treatment of depression relative to apparent need (Kivimäki, Gunnell, Lawlor et al. 2007). It is possible that some part of the large socioeconomic differences in suicide mortality might occur because of unmet depression treatment in low socioeconomic groups, but in order to draw firm conclusions on causality between increase in antidepressant use and declining suicide mortality and, especially, changes in socioeconomic differences in suicide, more research is needed.

The latter part of the 1980s was an era of notable economic boom in Finland, and even though the unemployment level was low during those years, suicide mortality increased rapidly among manual workers, and was also at its highest level among the unemployed. Correspondingly, when the economic boom was followed by a deep recession and the unemployment rate started to increase in 1991, suicide in these two groups started to decrease. This finding is in line with results concerning suicide attempts: in Helsinki their rate remained stable over the study period 1989–1997 (Ostamo & Lönnqvist 2001). It thus appears that even though relative differences in suicide still exist, unemployment and recession have not had an increasing influence on suicide. This may be understood by applying the concepts of stigmatisation and relative deprivation. During a time of economic growth, possible failure and losses are compared with the conditions of other people, and an uptrend can highlight social differences. An economic downswing, on the other hand, will make one's own position more acceptable under the circumstances. Economic recession may not, after all, have such widespread detrimental effects on health and mortality than is often predicted (cf. Tapia Granados 2005).

The factors behind increasing socioeconomic differences in suicide are likely to be related to changes in the determinants that create socioeconomic differences at any one point in time. On the one hand, it is possible that selection processes have strengthened, on the other hand it may be that causality now has a stronger influence than before. For example, increasing suicide differences may reflect changes in marital status distributions among different socioeconomic groups. That would mean that those with e.g. low education have become socially more isolated. However, changes in these processes have been little studied. The results shown in Figures 8 and 9 suggest that, indeed, a larger part of those in low socioeconomic groups now live alone, and this has increased at least to some extent their suicide mortality since the middle of the 1980s among men, and since

the beginning of the 1990s among women. Among upper non-manual men, marital status seems to have had a protective effect against suicide, especially during the 1970s, as the marriage rate was very high in this group (85%). Changes in marital status may also partly explain the reversal of socioeconomic differences in suicide among the upper non-manual and manual women between the 1970s and the 1990s. There were far fewer women in the upper non-manual group in the 1970s than in the 1990s, and in the 1970s membership of this group may have been typified by several factors that increase suicide risk: for example, it included relatively more single persons during the 1970s (Koskinen & Martelin 1994). On the other hand, in the 1970s many more women in the upper non-manual group were homemakers compared to other social class groups (results not shown) and were located in this social class group by their husband's socioeconomic status, and the adjustment for living arrangements appears as increased suicide mortality in the 1970s (Figure 9).

7.1.2 Education, social class and employment status are important determinants of suicide mortality

The *second* main finding was that among both men and women of working age education, social class and employment status were demonstrated to be the most salient social determinants of suicide mortality, even though the significance of these factors was to some extent different regarding non-alcohol- and alcohol-associated suicides.

Following adjustments for each other, and for income, employment status and living arrangement, education and social class were inversely and strongly related to both non-alcohol- and alcohol-associated suicide among men. Similar results were attained among women with the exception of the effect of education on non-alcohol-associated suicides. The direction of this association was the opposite, even if very small. After adjustment for employment status, the effect of income was strongly attenuated among men, and among women no effect was left.

Education

Among men the association between education and non-alcohol-associated suicide was to a great extent mediated by social class. A very similar result was obtained by Valkonen and Martelin (1988) for all suicide in 1976–1980. However, those with only basic education had almost 40% increased suicide mortality compared to the tertiary educated. Among women education was not systematically associated with non-alcohol-associated suicide before all adjustments, and in the fully adjusted model those with tertiary education had a slightly higher suicide risk than those in any other educational group. This finding is in agreement with a U.S. study (Cubbin, LeClere & Smith 2000), but differs from the findings of research covering a range of European countries (Lorant, Kunst, Huisman et al. 2005a), in which educational differences in total suicide among women aged 30 and over were weakly U-shaped. However, the differences between these two studies are rather small and probably stem from differences in study design e.g., educational classification and definitions of suicide (non-alcohol- and alcohol-associated vs. total).

When non-alcohol-related suicides are considered, education does not seem to have or has only a slight direct effect on suicide, that is independent of other social determinants as measured in this study. Instead, its effect is for the most part mediated by social class. Among women the inconsistent association between education and non-alcoholic suicide may partly stem from the structure of the educational groups: among highly educated women there were more individuals who lived alone, and the suicide risk was higher in this group. Secondly, it could be that in cases where the highly educated reject professional help and are determined to commit suicide, they have the prerequisites to do so. It has been suggested that a link exists between suicide and access to, and knowledge of, effective means of carrying it out, and especially among women suicide mortality rates are very high in many medical professions requiring a high level of education, for example (Pensola, Ahonen & Notkola 2004).

Educational differences were much stronger in alcohol-related suicide than in non-alcohol-associated suicide. Among both men and women, adjustment for social class and income as well as for employment status and living arrangements attenuated educational differences in suicide much less when alcohol was a contributory factor than when it was not, and education had a strong independent effect on alcohol-associated suicide (RII=1.89 in men and 2.32 in women).

At the proximate level, educational differences in alcohol-associated suicide may be related to differences in drinking patterns and to the health-related effects of these behaviours and patterns. Heavy episodic drinking seems to be quite common among both Finnish men and women from an international perspective (Mäkelä, Gmel, Grittner et al. 2006), and education is strongly associated with drinking patterns: especially among men, higher rates of binge drinking are observed among Finns with less education (Mäkelä, Mustonen & Huhtanen 2009; Lynch, Kaplan & Salonen 1997). Even though educational differences in heavy drinking among Finnish women have appeared only during the most recent years (Mäkelä, Mustonen & Huhtanen 2009), it seems that alcohol problems have been more common among the less educated (Bloomfield, Grittner, Kramer et al. 2006). Overall, at similar levels and patterns of total alcohol consumption, the health effects differ between educational groups (Mäkelä & Paljärvi 2008).

Education might influence health through several mechanisms, of which socio-psychological ones are probably some of the most important in relation to suicide. These include alternative ways of coping with problems (Droomers, Schrijvers, Stronks, et al. 1999) and the positive help-seeking attitudes (Fisher & Cohen 1972). Furthermore, the highly educated may, for example, be more likely to be socialised to accept and follow health-promoting behaviour and lifestyles (Shavers 2007) and may incorporate non-material resources and skills that make a person more receptive to health education messages (Galobardes, Shaw, Lawlor et al. 2006). The well educated have also reported a greater sense of control over their lives as well as higher levels of social support (Ross & Wu 1995).

It must also be acknowledged that educational careers are established relatively early in life, that health behaviour is strongly determined at younger ages, and a disadvantaged educational lifecourse may actually impede good health behaviour in adulthood (Lynch, Kaplan & Salonen 1997). The possibility of explanations for educational differences in alcohol-associated suicide based on selection cannot thus be discarded: those with alcohol or mental health problems at younger ages may be more likely to have left school without any qualifications and be less likely to have gone into

further education, for example. Mortality differences by education, once adjusted for social class and other socioeconomic factors in adulthood, could be interpreted to reflect the magnitude to which experiences at young ages create socioeconomic differences in mortality (Martikainen 1995), regardless of the ways in which education and the patterns and effects of alcohol use and excessive drinking are ordered on the causative pathway.

Social class

Occupation-based social class was associated with non-alcoholic suicides more strongly among men than among women. Furthermore, while all social class groups differed from the upper non-manual male group, with non-skilled manual men having almost threefold higher mortality than the upper non-manual men, among women the three non-manual groups did not differ from each other, and the main difference was between these and the manual groups, which had 30–50% higher mortality. For men the association between social class and non-alcohol-related suicide was explained by about a quarter by the different educational structures in the categories and mediated by income by 23%, whereas among women adjustment education had no effect on social class differences, and income mediated the association by a third. Following all adjustments the RII was 2.26 among men and 1.39 among women.

The results for men in this study are mostly in line with previous research evidence. Those studies that have had a more coarse classification of social class have found slightly smaller relative differences (Kim, Hong, Lee et al. 2006; Steenland, Halperin, Hu et al. 2003), and when a more detailed classification has been used, the rate ratio between the extreme ends has been higher (Fitzpatrick & Dallamore 1999) than found in the current study. A Finnish study showed, in agreement with our results, smaller social class differences among women than among men (Martikainen & Valkonen 1995), but other studies have also found either larger differences (Kim, Hong, Lee et al. 2006) or non-linearity between occupational classes among women (Steenland, Halperin, Hu et al. 2003). The inconsistency in these findings concerning women may result from technical issues related to the study designs or to difficulties in classifying women into social class categories, or it may relate to actual differences in risks between social class groups. In order to make a conclusion whether occupation-based social class relates to suicide mortality differently among women in Finland compared to other countries or contexts, more comparative research is needed.

Since Næss, Claussen, Thelle et al. (2005) found that sudden unexpected deaths and violent deaths were better or similarly well predicted by occupational class or housing conditions as by education, they propose that these causes of death are perhaps less likely to be influenced by childhood social conditions and more by occurrences proximal to the event. The strong association between current social class and suicide found also in the current study suggests that social circumstances in later life are important risk factors.

Explanations for the social class differences in suicide have included higher levels of unemployment and job insecurity in people of lower socioeconomic status, as well as differences in workplace social support (e.g., Gunnell 2001). However, in this study, adjustment for employment status decreased the social class differences in non-alcohol- and alcohol-associated suicide only marginally (7 and 5 percentage units respectively) among men, and only slightly (by 22 and 8 percentage units, respectively)

among women. Our study was set at a time of very low general unemployment in Finland, and even though job insecurity is more likely to be related to lower occupation-based social classes and the relative suicide rate of the unemployed was high, employment status had little effect on the social class differences.

Also differences in living arrangements between social class groups have been suggested to explain suicide differences. In a study conducted by Valkonen and Martelin (1988) using data for the latter part of the 1970s, marital status explained as much as 37% of the suicide difference between unskilled manual and upper white collar male workers, but much less of the difference between other groups. In the current study, adjustment for living arrangements had a similar effect concerning the difference between the same social class groups, but otherwise very little effect was shown. However, this attenuation in the differences was evident only for non-alcohol-related suicides.

As with education, social class differences showed more strongly in alcohol-related suicide among both men and women. Among women the associations were different from non-alcohol-related suicides in that women in the lower non-manual social class also had a higher suicide risk than those in the upper non-manual class. On the basis of data in Finland Pirkola (1999) has shown that suicide committers who misused alcohol were not only much more often manual workers or unemployed than from higher social groups, but were also more likely to be intoxicated immediately prior to their suicide.

The explanatory significance of education for social class differences in alcohol-associated suicide appeared much stronger than in non-alcohol-related suicide, and accordingly it explained a larger part of the social class differences than in non-alcohol suicides: two-fifths among men and a half among women. The adjustment for income attenuated the social class differences less, and adjustment for employment status and for living arrangements had no significant effect. Our observation that social class differences in alcohol-related suicide were attenuated most strongly by adjustment for education suggests that social class differences are also associated with factors set earlier in life, such as alcohol consumption patterns and possible mental health problems experienced at a young age or personality characteristics (Valkonen & Martelin 1988) that have made the achievement of a higher class position more difficult.

Income

The relative mortality risks according to household income were quite similar in non-alcohol- and alcohol-associated suicide among both men and women. The age-adjusted RII was 2.5 for non-alcohol associated suicide and 2.7 for alcoholic suicide among men and 1.9 and 2.4, respectively, among women. Results based on income quartiles showed that the second highest income group actually had the lowest suicide mortality. Otherwise a threshold effect was observed with particularly high suicide mortality in the two lowest income groups. This is also in line with previous studies either without adjustments (Strand & Kunst 2006; Qin, Agerbo & Mortensen 2003) or with them (Qin, Agerbo & Mortensen 2003).

Among men the pathways between other socioeconomic determinants and income on all suicides were also very uniform: education, social class and employment status, that is factors set prior to income, explained a broadly equal share. Among women,

education explained very little of the income differences in non-alcohol-related suicide, whereas employment status attenuated all the differences that were left.

The relative suicide mortality risk among those with the lowest income, in particular, diminished among men. This group turned out to have a high relative risk because it contained a much lower proportion of employed people than the other groups (results not shown). On the other hand, adjustment for living arrangements again increased the relative risk in this group because being married or cohabiting and having children, which was relatively common in this group, functions as a protective factor. This was also a phenomenon observed among women for both suicide outcomes.

Men in the second-highest income group had a lower suicide risk than men in the highest income group, but this effect disappeared following adjustment for living arrangements. In other words, the difference between these well-off groups resulted from different living arrangements. Being married or cohabiting with or without children - and thus at less risk - was much more common among those at the second-highest income level. Similarly, among women the J-shaped association between income and suicide was observed as long as only education and social class were adjusted for, and it disappeared when living arrangements were added to the model.

Income is the socioeconomic indicator most likely to respond to changes in economic circumstances, for instance to changes in labour market participation. Being unemployed was strongly associated with suicide in this study, and because the lowest income quartile includes a higher proportion of unemployed as well as retired people, adjusting for this effect explained most of the income differences.

Income provides material resources that, in addition to other effects, allow access to health services, and possibly also to mental health services. A Canadian study found that household income did not independently predict mental health services use, whereas high education was associated with increased use of these services among those in need (Steele, Dewa, Lin et al. 2007). In Finland approximately only one-half of those suffering from major depressive disorder use health services to treat this condition, but socioeconomic factors had little effect on being treated (Hämäläinen, Isometsä, Sihvo et al. 2008). On the other hand, because The Social Insurance Institution in Finland provides those suffering from mental disorders with psychotherapy that aims at improving or restoring the ability to work or study, it has been suggested that at least those excluded from work life are unlikely to receive this subsidised psychotherapy (Manderbacka, Häkkinen, Nguyen et al. 2007).

In addition to access to mental health services, also differentials in the response to these services may be important (Power 1994). This is probably more likely to reflect educational differences than income differences, as this study showed that much of the association between current family income and suicide appears to be explained in terms of socioeconomic disadvantage at earlier stages of the life-course, including education (except among women in non-alcohol associated suicides), social class, as well as employment status, which is a major determinant of income.

Employment status

The *third* main finding in this study was that even though the unemployed had high excess suicide mortality, the size of this excess depended on the level of national unemployment only to some extent.

In accordance with most previous studies (Voss, Nylén, Floderus et al. 2004; Blakely, Collings & Atkinson 2003; Kposowa 2001; Iversen, Andersen, Andersen et al. 1987), we found that the relative suicide risk among unemployed women was at least as high as among unemployed men. Adjustment for social class decreased the age-adjusted relative differences only a little, and the effect of living arrangements was similar, except among long-term unemployed men (also the case with non-skilled manual men, *see above*), but income attenuated the association notably, especially among the men. According to a previous study in the Finnish context in 1981–1985 (Martikainen 1990b) education and social class explain about 30 percent of the suicide differences between the unemployed and the employed among men, and about 15 percent among women.

The current study also found an independent effect of socioeconomic status after controlling for labour force status, which differs from the findings of some other research (Blakely, Collings & Atkinson 2003; Lewis & Sloggett 1998). This suggests that in our data these variables each had a more independent effect on suicide instead of being mostly filtered through the causally succeeding effect.

In the study design used in Substudy IV education had no effect on employment status differences in suicide (and it was left out of the final models). This probably stems from the length of mortality follow-up – only 12 months. In the longer run the effects of education and social class could, for example, be reflected in enhanced re-employment (Claussen 1999) opportunities, which for one thing might alleviate the suicide risk. This follow-up length may also explain the discrepancy with this study as opposed to Blakely Collings and Atkinson (2003) and Martikainen (1990b).

When the association between employment status and mortality is studied, results from a single time period must be interpreted cautiously: excess *total* mortality among the unemployed has been found to vary between periods of low and high general unemployment. During times of low unemployment, those without jobs are likely to be selected on the basis of health and other characteristics like low education, or of factors often unobserved or poorly measured, such as alcohol problems. In the period of high unemployment when the risk of unemployment is high, presumably more healthy people become jobless, and the unemployed and the employed also share other characteristics associated with suicide (Martikainen & Valkonen 1996a). In the current study, those in a precarious employment situation, i.e. unstably employed, had a lower suicide risk during times of high national unemployment, but among the long-term unemployed the risk either remained quite similar between periods (among the men) or was related inconsistently to general unemployment (among the women). This highlights the difficulties of causal reasoning and suggests that excess mortality due to unemployment may easily be overestimated: the results suggest that some part of the excess suicide mortality among those in a precarious employment situation may be due to selection into unemployment. Furthermore, it is conceivable that also among those who were made redundant, there was selection for re-entry into work life on the one hand, and for long-term unemployment, on the other (cf. Claussen 1999). This explains the somewhat larger suicide risk among the long-term unemployed.

Anyway, long-term unemployment seems also to have a more robust causal effect. Hypotheses concerning the mechanisms that explain the causal association between unemployment and ill health and suicide mortality include financial strain caused by lack of earned income. Among men, some support for this was found as some part of the suicide risk was explained by an adjustment for income, but only regarding long-term

unemployed. We also found that income attenuated employment status differences much less among women: it seems that it is not financial hardship as such, but possibly the fact of not having a job and the latent consequences of employment (giving a time structure to the day, self esteem, the respect of others (Jahoda 1981)) that are significant especially for women. This interpretation is supported by a study regarding depression that found an interaction between sex and type of employment: unemployed men, irrespective of their type of unemployment, have higher risks for depression, while among women low risk of depression was found in those unemployed who participated in subsidy programmes that suspend long-term unemployment for six months (Virtanen, Liukkonen, Vahtera et al. 2003).

Another mechanism through which unemployment might increase suicide mortality is changes in health-related behaviour following the commencement of unemployment, and, in the case of suicide, changes in alcohol consumption patterns appear to be the most evident mediator. There may be heavier drinking due to the greater amount of leisure time and possibly a higher level of psychosocial stress, but consumption may also decrease due to a drop in income. The findings on the effects of unemployment on alcohol consumption are, indeed, inconsistent. Some studies show no association between loss of employment and drinking (Morris, Cook & Shaper 1992), or find that alcohol-related changes are if anything favourable (Leino-Arjas, Liira, Mutanen et al. 1999), while others claim that unemployment causes alcohol abuse (Claussen 1999) or disorder (Catalano, Dooley, Wilson et al. 1993). Substudies II and III showed that suicide mortality risk among the unemployed was much higher in alcohol-associated suicide than in non-alcohol-associated suicide (relative ratio was 3.6 vs. 2.7 among men and 4.9 vs. 2.5 among women), but, unfortunately, the data set does not enable us to draw conclusions on the direction of the causality between unemployment and alcohol-associated suicide. Nevertheless, Pirkola, Isometsä, Heikkinen and others (2000) found that of those suicide committers who were not alcohol abusers, the unemployed were more often intoxicated at the time of suicide than the employed.

The Suicides in Finland 1987 research project (Heikkinen, Aro & Lönnqvist 1993) found that those life courses that end up with suicide are burdened with negative life events. Mannila (1993) has written about “a vicious cycle of loss” meaning a situation where problems in life escalate from one sphere of life and forum of activity to another. Especially among men, the unemployed with health problems seem to live alone and have income and accommodation difficulties. The men’s background often includes low education and unstable employment. Frequently these problems are accompanied by excess alcohol use. It may thus be difficult or impossible to indentify the first adversity that these men face. However, several studies have found that there are excess interpersonal stressors among alcoholic suicides compared with other suicides (Pirkola, Isometsä, Heikkinen et al., 2000), depressive suicides (Heikkinen, Aro, Henriksson et al., 1994) or suicide victims with affective disorder (Murphy & Robins 1967). In addition, all of these studies have shown that recent life events preceding suicide among the male alcoholics more often included separations, divorces and family discord as well as disruption of affectional relationships. As a consequence of vulnerability associated with abuse, alcoholics might be less capable of handling stressful life events, and they probably are also more likely to be deficient in coping responses which might serve as protective factors.

Among females, adverse interpersonal events were equally common in both alcoholic and depressive suicide victims (Heikkinen, Aro, Henriksson et al., 1994), indicating that the process towards suicide may well differ between men and women. This is also suggested by Mannila (1993), who found that unemployed women with health problems who have difficulties in getting employed were much more likely to be married and have offspring – in fact, their labour market situation was often a consequence of family responsibilities. During the most recent years, however, the positive trend in suicide mortality has stopped among manual and long-term unemployed women, which may indicate that these socioeconomically deprived categories are changing into more selected groups regarding other characteristics as well.

7.1.3 Area effects on suicide were small

The *fourth* main finding in this study was that the effects of the social characteristics of areas on suicide mortality were small. As highlighted already in the 19th century by Durkheim (1952), the eminently individual act of suicide could actually result from, or at least be encouraged by, forces external to the individual, that is the characteristics of societies. This study's approach to the contribution of area characteristics to the mortality of individuals has led to suggestions for interventions to improve health by focusing on efforts to improve neighbourhoods in socially disadvantaged areas. Most often the effects of area-level socio-economic status or deprivation have been studied. While some multilevel analyses have found effects of area deprivation independent of individual-level variables, other studies suggest that area effects are modest or nonexistent after controlling for individual-level variables (Pickett & Pearl 2001). Previous multilevel evidence on the effects of area characteristics on suicide is rare and inconclusive.

These analyses showed that in Finland differences in suicide mortality between functional regions with different characteristics can be identified, and that the area-level variability found was larger for men than for women and for alcohol-associated suicides rather than non-alcohol-associated suicide. Relatively high suicide mortality was observed in areas with a high proportion of manual workers, a high unemployment rate, a low voting turnout and low family cohesion. On the other hand, income inequality of areas showed no effect on suicide, and median income of households was weakly associated. Our results on the effect of the unemployment rate on suicide risk are in agreement with a study conducted in Denmark, but unlike us, the Danes found that gross area income also associated with suicide (Agerbo, Sterne & Gunnell 2007). This discrepancy in results may result from a different definition of income (household income per consumption unit vs. gross income), as the magnitude of the association between income and mortality is, at least at the individual level, greatly dependent on the measure used, with individual taxable income showing the strongest association with mortality (Martikainen, Valkonen & Moustgaard 2009).

For non-alcohol-associated suicide among working-age Finns, most or all of the area differences can be accounted for by compositional differences of individuals between areas. For alcohol-associated suicide, more of the area differences remain unexplained after adjustment for individual-level factors, but other area variables attenuated mostly the remaining differences, and only voting turnout was statistically significantly associated

with increased suicide mortality among both men and women. We used the measure of voting turnout as an exemplar for civic participation, or more comprehensively understood, for social cohesion. The rationale for using voting turnout in municipal elections as a marker of social cohesion can be justified at least in two ways. First, as Kawachi and Berkman (2000) argue, social cohesion and social capital are by definition ecological characteristics, and hence need to be measured at the level of a collective. Second, voting turnout has been shown to associate with different aspects of social capital aggregated to area level, such as trust (Kawachi & Kennedy 1997). These, in turn, have been shown to associate with e.g., mortality (Kawachi, Kennedy, Lochner et al. 1997), but not consistently with mental health (De Silva, McKenzie, Harpham et al. 2005). Our analysis on alcohol-associated suicide mortality showed that whereas the effect of the size of voting turnout was highly comparable with the proportion of manual workers and the unemployment rate in age-adjusted models, the effect was not attenuated by adjustment for all individual- and area-level factors. This finding suggests that social cohesion, or civic participation, at the very least, has a moderate, but independent effect on the alcohol-associated suicide rates of the areas. Similar results in Finland on the effects of low social cohesion on mortality have been attained for accidents and violent causes of deaths in neighbourhood areas (Martikainen, Kauppinen & Valkonen 2003) and for alcohol-related mortality in functional regions (Blomgren, Martikainen, Mäkelä et al. 2004).

It is possible that the socio-economic structure of area affects suicide through behavioural cultures and psychosocial mechanisms. Those living in areas with a high level of unemployment possibly experience more hopelessness and loss of self-efficacy than people in better off areas, and this despair may be reflected in the suicidal behaviour and excess alcohol use of some of the residents in these areas.

We found no support for the interaction hypotheses: the effects of individual social class status on suicide mortality were mostly similar at all levels of area proportion of manual workers and unemployment rate, or showed inconsistent associations. The results regarding cross-level interaction were similar to the results also attained in other substudies, that both area effects and individual-level social class differences are larger for alcohol-associated suicides than for non-alcohol suicides and that these differences are more notable among men than among women. However, an important finding was that regardless of these differences, the effects of areas are similar for both manual and non-manual social class groups. This result showing lack of cross-level interaction is supported by negative or inconsistent evidence based on similar studies on suicide (Agerbo, Sterne & Gunnell 2007) and on total mortality (e.g. Sloggett & Joshi 1998).

7.2 Methodological considerations

7.2.1 *Determining a death as a suicide*

When suicides are considered, the reliability of reporting the cause of death and the possibility of misclassification of suicides as accidents remain a concern. However, international differences in the process of determining a death as a suicide have been estimated to cause less than 10% variation in suicide rates between countries (Öhberg &

Lönnqvist 1998). In Finland a coroner's investigation is conducted in all violent, accidental and sudden deaths, and almost all of these cases (97.9% in the age group 0–64 years in 1995) are subject to a medico-legal autopsy (Statistics Finland 1996). Furthermore, it is rare in Finland for fatal injuries to be undetermined – a possible “hidden” category of suicide deaths – in terms of whether they are intentional or unintentional: they constituted only 4.6% of all accidents and violence in the 25–64 age group in 1995 (Statistics Finland 1996), and it is unlikely that a large proportion of these were suicides. The decision on categorising a death as a suicide is made by the forensic examiner, and in the international perspective the suicide statistics are regarded as reliable in Finland (Karkola 1990; Lönnqvist, Louhivuori, Palonen et al. 1988).

From the point of view of this study, the issue is mainly of importance if there was social bias in reporting suicide on the death certificate. Socioeconomic differences in mortality in cases where intent is undetermined are, however, very similar to corresponding differences in suicide mortality (Substudy II). Suicide as a cause of death is probably not highly prone to stigmatisation and underreporting in Finnish death certification, which may stem from the fact that in Finland the death certificate is not a public document. Also, medico-legal autopsies are carried out by a small group of well-trained forensic pathologists (Mäkelä 1998), and, as mentioned above, their use is extensive. All this indicates a more congruent and harmonious interpretation and classification of suicide than in many other countries (Karkola 1990). Furthermore, some researchers have suggested possible underreporting of suicides in countries where optional life insurances are common (most insurance companies will not pay benefits in cases of suicide) (Mohler & Earls 2001). However, such factors are unlikely to have a significant effect on social differences in suicide, and, in any event, the prevalence of such insurances is very low in Finland (Kari, Kosonen & Kröger 2007).

In this study, alcohol-associated suicides were defined as those suicide deaths that had alcohol intoxication as one of the contributory causes reported in the death certificate. This definition underlines the acute effects of alcohol. As an alternative, we could have examined alcohol causes as more widely understood as a contributory cause. This, however, would have emphasised the long-term effects of alcohol use. In Finland, compared to suicide victims with no alcohol misuse, those victims with misuse are more often manual workers or unemployed (Pirkola 1999), and hence the socioeconomic differences in alcohol-associated suicides defined this way would probably be larger than those found in the current study. Furthermore, especially alcohol dependence is strongly associated with increased suicide mortality risk (Pirkola, Suominen & Isometsä 2004), and, overall, this phenomena constitutes partly a different research question.

7.2.2 Data and methods

For this study, we had access to comprehensive population registration data that enabled us to establish to what extent education, occupation-based social class, income and employment status were associated with suicide. The data either were tabulated and covered the total population of Finnish adults of working age and included all suicides, or were based on a random sample of the population with a random oversample of 80% of deaths, assuring a large enough number of cases even when a single cause of death was

studied. Both contingency-based data and individual-level data have their strengths and weaknesses. While the statistical models are fast and easily calculated with tabulated data, researchers are compelled to decide the classification of variables, that is the cells in the tabulation, in advance. Individual-level data do not impose such limitations, but then again, because of the data protection regulations of Statistics Finland, on the individual-level only sample data are provided.

For the most part, the data included enough cases for statistical analyses even though the outcome measure used in this study was relatively rare. Nevertheless, among long-term unemployed women may the rather inconsistent results be due to the small number of suicides. The data also included several different indicators for socioeconomic position in the same database. The data had practically no loss of follow-up, and because the socioeconomic indicators were obtained from registers there was no self-report bias.

A conceivable disadvantage of the study design is that changes in socioeconomic status before baseline and between baseline and death or the end of follow-up are unknown. We first of all tried to deal with this potential source of bias by using information on social class from previous censuses in cases of economically inactive persons whose current occupation was not available. Furthermore, most indicators of socioeconomic status were rather stable over time. Education is an early-life socioeconomic indicator and is unlikely to change after early adulthood. Moreover, according to these census data, downward socioeconomic mobility is quite unusual in Finland: workers instead tend to move out of the workforce entirely. Income is the most probable indicator to reflect changes in labour force participation. In order to assess the possible bias related to long follow-up times in Substudies II and III, we carried out comparable analyses for a shorter follow-up period of 5 years (1991–1995). For non-alcohol-associated suicide, the models were remarkably similar irrespective of the follow-up length. When alcohol was a contributory cause, the RII in the fully adjusted model was larger for education, social class and income when the shorter follow-up time was used. Given these results, we believe that the longer follow-up time used in our study at least does not seriously bias or overestimate the socioeconomic differences in suicide.

In Substudies II, III and V socioeconomic indicators were measured in 1990. The cross-sectional nature of the exposure data did not enable us to ensure the causal order between the explanatory variables studied: it is possible, for example, that living arrangements have an effect on socioeconomic status, and marriage dissolution may lead to lower household income (Wickrama, Lorenz, Conger et al. 2006). However, this did not affect the interpretation of the results because adjusting for these factors, and in particular for living arrangements, in our multivariate models had relatively little impact on socioeconomic differences in suicide.

Probably the most important shortage in the data used in this study was the lack of information on mental health problems. This is not surprising, as this information is not easily and reliably available in the form that could be linked to register material. Partly, we tried to overcome this limitation in Substudy IV by using a study design that minimises selection on basis of, among others, illnesses. Nevertheless, mental illnesses and their association with socioeconomic differences in suicide pose an area needing further study (*see below*).

7.3 Implications for future research

This study has provided a systematic analysis of social differences and their social causes in suicide mortality in Finland especially during the most recent years when the suicide mortality rate has decreased. It has identified the most vulnerable sub-populations that would most probably benefit from suicide prevention programmes. In addition to working-age population, social class difference should be studied in the other age groups. However, as the socioeconomic indicators are not well established at very young ages and, on the other hand, they may have a different meaning among old-age pensioners, the most worthwhile choice of social status indicators and the most pertinent particular social circumstances and life course situations require deep conversance and more analyses. Some analyses in Substudy V already suggest that large social differences exist in suicide among those aged 65 and over, and that area characteristics might have an even larger impact on suicide in these age groups than among the younger.

In order to deepen our understanding of the strong and in many ways persistent socioeconomic and employment status differences in suicide mortality and the social causes and mechanisms behind these, more research among those of working age in specific fields is needed. For example, it has been suggested that unemployment could affect health in a manner similar to other stressful life events (Bartley 1994), with higher excess morbidity or mortality soon after the event and a weakening effect over time. High suicide mortality risk in the first weeks or months of unemployment could signify that becoming unemployed is a major stressful event and thus a short-term causal factor for suicide. As this study has shown that employment status differences are still important risk factors among both men and women, future research should include information on distinct periods of unemployment and the alterations between episodes of unemployment and employment.

Another field of research that could increase the understanding on causes behind social differences in suicide relates to mental health. The risk of mental illness differs between social status groups, and it would be most important to increase understanding of the extent of the influence it has on suicide. However, this research scenario is complicated by two reasons. Firstly, with a relatively rare outcome such as suicide, register data are a prerequisite but information on mental health problems is seldom available and systematically in a form that can be linked to register data. Secondly, measuring mental health or illness is not an easy task, but knowledge on psychiatric hospitalisation information and/or information on those being granted reimbursement for psychiatric pharmaceuticals could possibly contribute to such studies.

This study has shown that socioeconomic differences are even larger in alcohol-related than in non-alcohol-related suicides. This encourages the need to continue studying suicides according to their contributory causes of death. For some time per capita alcohol consumption has been strongly associated with the suicide mortality rate in Finland (Mäkelä 1996), but during the last decade suicide mortality rate has been decreasing despite an increase in alcohol consumption (Mäkelä, Mustonen & Huhtanen 2009) and despite the fact that all alcohol-related mortality has increased among those with low socioeconomic status (Herttua, Mäkelä & Martikainen 2008). Studying alcohol-related suicides trends by socioeconomic groups would, thereby, provide new understanding on this issue.

The decreasing suicide mortality rate in Finland suggests that at least to some extent suicide could potentially be an avoidable or preventable cause of death. Evaluations of policies or programmes associated with suicide mortality are important, and the continuation of earlier monitoring on trends and further research are thus much needed and arguably of great national interest.

7.4 Implications for social and public health policy

In Finland suicide mortality has diminished during the last decade and a half. This study has shown that the rates have decreased in most social status groups, although relative differences have, in fact, increased. Those socioeconomically deprived still have high excess suicide mortality.

Reducing health inequalities remains one of the salient goals in health policies in many countries. In Finland, the Ministry of Social Affairs and Health declared a new public health programme in 2001 (Terveys 2015). One of the main goals of this programme is to reduce inequality in health and welfare between population groups. The aim is to bring down educational- and occupation-based social class differences in mortality by a fifth by the year 2015. In addition, accidental mortality and deaths from violence among young adult men should be reduced by a third from the level that prevailed at the end of the 1990s. (Ministry of Social Affairs and Health 2001). Especially among working-age men, suicide mortality has diminished in all socioeconomic groups since the end of the 1990s, although possibly a turn in the decreasing trend has occurred in the very latest years that this study covered. Among women the trend has not been unequivocally positive. However, even if the target level of deaths from violent deaths is attainable, the goal to bring down relative mortality differences – at least in suicide – between socioeconomic groups is still a distant one.

As in Finland conscription is mandatory for all men, an example of a potentially effective intervention that could advance the attainment of the above-mentioned goals is that directed towards young men doing military service. The suicide prevention project that was implemented in 1992–1996 co-operated with the defence forces. In addition, those men who were discharged from conscription when reporting for service or before completing military service, were approached (Upanne, Hakanen & Rautava 1999). Since the results in the current study emphasise adolescence as a phase of life when at least some part of the social differences in suicide mortality emerges, the military remains a context for potentially productive intervention.

In this study, long-term unemployment was strongly associated with suicide. Labour market actions should thus try to hold and reintegrate workers into jobs. Among women even short episodes of re-employment among the long-term unemployed have had a positive effect in decreasing depression (Virtanen, Liukkonen, Vahtera et al. 2003), possibly as a result of increase in social connectedness, which, in turn, could have an effect on suicide mortality. However, no similar result of decreased depression was found among men. The financial compensation in this scheme to re-employ long-term unemployed job seekers does not correspond to one's salary, which may be a reason why among men it does not counter the financial stress related to long-term unemployment.

An important conclusion of this study is that socioeconomic differences are even larger in suicides where alcohol intoxication is a contributory cause of death. This may result from two different mechanisms which are likely to be strongly intertwined. The first one stems from alcohol misuse. Health behaviour including alcohol drinking patterns is probably strongly determined at younger ages. During the more mature years, life problems can escalate from one sphere of life and forum of activity to another, a phenomenon called “a vicious cycle of loss” (Mannila 1993). Especially among men, low socioeconomic status coincides with health problems, accommodation difficulties and living alone, and frequently these problems are accompanied by excess alcohol use.

Secondly, it has been suggested that the use of alcohol prior to suicide could be interpreted as a way of overcoming the natural restraints against committing suicide. Mukamal, Kawachi, Miller and others (2007) found that the risk of death from suicide tends to be associated primarily with quantity of alcohol consumed per drinking day, not with drinking frequency or overall alcohol consumption. Alcohol, especially in large quantities, may propel suicidal ideations into action, increase aggressiveness, and inhibit or constrict coping strategies that might otherwise forestall the act of suicide. By impairing judgment, alcohol may lower the threshold to committing suicide, especially as suicide intent is often an ambivalent and not even a persistent state (Öhberg 1998). Previous studies have indicated that those who committed impulsive suicide have fewer completed school years and a smaller number of working years, and have much lower personal income (Zouk, Tousignant, Seguin et al. 2006). Furthermore, suicide among the highly educated is very seldom a consequence of the impulsivity associated with alcohol, especially among women (Chaudron & Caine 2004). Alcohol also tends to be associated with less predictable and impulsive instances, and when accompanied by lethal methods, these impulses are likely to result in a fatal outcome (Öhberg 1998). Furthermore, alcohol intoxication contributes to the suicides of those who are already alcohol abusers, and these individuals, in turn, are much more often manual workers or unemployed than those of higher social status (Pirkola 1999). On the grounds of these results, it is thus highly conceivable that alcohol use is to some extent behind social differences in suicide. Alcohol prevention programmes could thus have an effect on suicide mortality.

8 CONCLUSION

The essential target of suicide research is to discover the predominant risk factors and thus means for suicide prevention. This study has provided new scientific evidence on the level, structure, trends and causes of social determinants in suicide mortality. In conclusion, low social class proved to be an important determinant of suicide risk among both men and women.

Results in this study suggest that education, occupation-based social class and employment status have causal effects on suicide risk. Among the long-term unemployed these effects, especially among men, may partly derive from low income. On the other hand, the strong independent effect of education on alcohol-associated suicide indicates that the roots of socioeconomic differences are probably established in youth or early adulthood when educational qualifications are obtained and health-behavioural patterns set. Also high relative suicide mortality among the unemployed during times of economic boom suggests that selective processes may be responsible for some of the employment status differences in suicide. Thus to some extent selection into low education and unemployment are also involved in explanations for excess suicide mortality among the socially deprived. The results also suggest that health policy and suicide prevention actions might benefit most on focusing on people rather than on places alone.

Another important conclusion of this study is that socioeconomic differences are even larger in suicides where alcohol intoxication is a contributory cause of death. It is thus conceivable that alcohol use is to some extent behind social differences in suicide. In addition to those with low education, manual workers and the unemployed, young people, whose health-related behaviour is still to be adopted, would most probably benefit from suicide prevention programmes. In conclusion, suicide does occur across the social strata, but more in some walks of life than in others.

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