Kaisla Joutsenniemi

Living arrangements and health

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Department of Health and Functional Capacity,
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and
Department of Public Health
University of Helsinki, Finland

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LIVING ARRANGEMENTS AND HEALTH

ACADEMIC DISSERTATION

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ABSTRACT

In line with major demographic changes in other Northern European and North American countries and Australia, being nonmarried is becoming increasingly common in Finland, and the proportion of cohabiters and of persons living alone has grown in recent decades. Official marital status no longer reflects an individual's living arrangement, as single, divorced and widowed persons may live alone, with a partner, with children, with parents, with siblings, or with unrelated persons. Thus, more than official marital status, living arrangements may be a stronger discriminator of one's social bonds and health. The general purpose of this study was to deepen our current understanding of the magnitude, trends, and determinants of ill health by living arrangements in the Finnish working-age population. Distinct measures of different dimensions of poor health, as well as an array of associated factors, provided a comprehensive picture of health differences by living arrangements and helped to assess the role of other factors in the interpretation of these differences.

Mortality analyses were based on Finnish census records at the end of 1995 linked with cause-of-death registers for 1996–2000. The data included all persons aged 30 and over. Morbidity analyses were based on two comparable cross-sectional studies conducted twenty years apart (the Mini-Finland Survey in 1978–80 and the Health 2000 Survey in 2000–01). Both surveys were based on nationally representative samples of Finns aged 30 and over, and benefited from high participation rates.

With the exception of mortality analyses, this study focused on health differences among the working-age population (mortality in age groups 30–64 and 65 and over, self-rated health and mental health in the age group 30–64, and unhealthy alcohol use in the age group 30–54). Compared with all nonmarried groups, married men and women exhibited the best health in terms of mortality, self-rated health, mental health and unhealthy alcohol use. Cohabiters did not differ from married persons in terms of self-rated health or mental health, but did exhibit excess unhealthy alcohol use and high mortality, particularly from alcohol-related causes. Compared with the married, persons living alone or with someone other than a partner exhibited elevated mortality as well as excess poor mental health and unhealthy alcohol use. By all measures of

health, men and women living alone tended to be in the worst position. Over the past twenty years, SRH had improved least among single men and women and widowed women, and most among cohabiting women.

The association between living arrangements and health has many possible explanations. The health-related selection theory suggests that healthy people are more likely to enter and maintain a marriage or a consensual union than those who are unhealthy (direct selection) or that a variety of health-damaging behavioural and social factors increase the likelihood of ill health and the probability of remaining without a partner or becoming separated from one's partner (indirect selection). According to the social causation theory, marriage or cohabitation has a health-promoting effect, whereas living alone or with others than a partner has a detrimental effect on health. In this study, the role of other factors that are mainly assumed to reflect selection, appeared to be rather modest. Social support, which reflects social causation, contributed only modestly to differences in unhealthy alcohol use by living arrangements, but had a larger effect on differences in poor mental health. Socioeconomic factors and health-related behaviour, which reflect both selection and causation, appeared to play a more important role in the excess poor health of cohabiters and of persons living alone or with someone other than a partner, than of married persons.

Living arrangements were strongly connected to various dimensions of ill health. In particular, alcohol consumption appeared to be of great importance in the association between living arrangements and health. To the extent that the proportion of nonmarried persons continues to grow and their health does not improve at the same rate as that of married persons, the challenges that currently nonmarried persons pose to public health will likely increase.

Keywords: living arrangements, marital status, cohabitation, mortality, self-rated health, depressive disorder, anxiety disorder, psychological distress, heavy drinking, alcohol dependence

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TIIVISTELMÄ

Suomessa on tapahtunut selvä demografinen muutos viimeisten vuosikymmenien aikana, kuten muissakin Pohjois-Euroopan ja Pohjois-Amerikan maissa sekä Australiassa: Yhä pienempi osuus väestöstä elää avioliitossa, ja vastaavasti avoliitossa ja yksin asuvien osuudet ovat kasvaneet. Virallinen siviilisääty ei enää heijasta yksilön asumismuotoa, sillä naimattomat, eronneet ja lesket saattavat asua yksin tai avopuolison, lasten, vanhempien, sisarusten tai sukuun kuulumattomien henkilöiden kanssa. Niinpä asumismuoto saattaa virallista siviilisäätyä selkeämmin heijastaa ihmisten välisiä sosiaalisia siteitä ja terveyttä. Tämän tutkimuksen yleisenä tavoitteena oli lisätä tietämystä asumismuodon mukaisten terveyserojen suuruudesta, kehityssuunnista ja niitä määräävistä tekijöistä suomalaisessa työikäisessä väestössä. Huonon terveyden eri ulottuvuuksia heijastavat erilliset mittarit sekä laaja valikoima asumismuotoon ja terveyteen liittyviä tekijöitä muodostivat kokonaisvaltaisen kuvan asumismuodon mukaisista terveyseroista ja selvensivät muiden tekijöiden roolia näiden erojen tulkitsemisessa.

Kuolleisuusanalyysit perustuivat vuoden 1995 lopun suomalaisiin väestölaskenta-aineistoihin, jotka liitettiin kuolemansyyrekistereihin 1996–2000. Tutkimusväestö sisälsi kaikki 30 vuotta täyttäneet henkilöt. Sairastuvuusanalyysit perustuivat kahteen 20 vuoden välein toteutettuun vertailukelpoiseen poikkileikkaustutkimukseen (Terveys 2000 -tutkimus 2000–01, Mini-Suomi-terveystutkimus 1978–80). Molemmat tutkimukset edustivat Suomen 30 vuotta täyttänyttä väestöä, ja niissä oli korkeat osallistumisprosentit.

Kuolleisuusanalyysejä lukuun ottamatta tämä tutkimus keskittyi työikäisen väestön terveyseroihin: kuolleisuus ikäryhmissä 30–64 ja 65 vuotta täyttäneet, koettu terveys ja mielenterveys ikäryhmässä 30–64 sekä epäterveellinen alkoholinkäyttö ikäryhmässä 30–54. Muihin ryhmiin verrattuina avioliitossa elävät naiset ja miehet olivat parhaassa asemassa niin kuolleisuuden, koetun terveyden, mielenterveyden kuin epäterveellisen alkoholinkäytön suhteen. Avoliitossa elävien koettu terveys ja mielenterveys olivat samanlaisia kuin avioliitossa olevilla, mutta avoliitossa elävillä oli yleisemmin epäterveellistä alkoholinkäyttöä sekä korkea kuolleisuus erityisesti

alkoholista johtuviin syihin. Avioliitossa eläviin verrattuna yksin tai muiden kuin puolison kanssa asuvilla oli korkeampi kuolleisuus, huonompi mielenterveys sekä yleisemmin epäterveellistä alkoholinkäyttöä. Yksin elävät naiset ja miehet olivat kaikilla mittareilla tarkasteltuina huonoimmassa asemassa. Koettu terveys oli kohentunut 20 vuoden aikana vähiten naimattomien naisten ja miesten sekä naisleskien ryhmissä, ja eniten avoliitossa elävien naisten ryhmässä.

Asumismuodon ja terveyden välistä yhteyttä voidaan selittää monin eri tavoin. Terveyteen liittyvä valikoituminen viittaa siihen, että terveet henkilöt päätyvät avo- tai avioliittoon ja pysyvät siinä todennäköisemmin kuin ne, joilla on huonompi terveys (suora valikoituminen), ja toisaalta erilaiset sosiaaliset ja elintapoihin liittyvät tekijät altistavat ihmisiä huonolle terveydelle sekä lisäävät naimattomana pysymisen tai parisuhteen päättymisen todennäköisyyttä (epäsuora valikoituminen). Sosiaalinen kausaatio viittaa siihen, että avio- tai avoliitolla on terveyttä edistävä vaikutus, kun taas yksin tai muiden kuin puolison kanssa asumisella on epäedullinen vaikutus terveydelle. Tässä tutkimuksessa pääasiassa valikoitumista heijastavien tekijöiden rooli näytti olevan melko pieni. Kausaatiota heijastava sosiaalisen tuen puute ei juuri vaikuttanut asumismuotoryhmien välisiin eroihin epäterveellisessä alkoholinkäytössä, mutta mielenterveyseroihin sillä oli suurempi vaikutus. Sosioekonomisilla tekijöillä ja elintavoilla, jotka heijastavat sekä valikoitumista että kausaatiota, oli tärkeä merkitys avoliitossa elävien, sekä yksin tai muiden kuin puolison kanssa asuvien huonon terveyden kannalta.

Kaiken kaikkiaan asumismuodolla oli voimakas yhteys huonon terveyden eri ulottuvuuksiin. Erityisesti alkoholin kulutuksella näytti olevan suuri merkitys asumismuodon ja terveyden välisissä yhteyksissä. Mikäli avioliiton ulkopuolella asuvien määrä edelleen kasvaa ja heidän terveytensä kohenee tulevaisuudessakin hitaammin kuin avioliitossa elävien terveys, ei-avioliitossa eläviin ryhmiin liittyvät kansanterveydelliset haasteet todennäköisesti kasvavat.

Asiasanat: asumismuoto, siviilisääty, avoliitto, kuolleisuus, koettu terveys, masennushäiriö, ahdistuneisuushäiriö, psyykkinen pahoinvointi, runsas alkoholin käyttö, alkoholiriippuvuus

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ABBREVIATIONS

CI	Confidence interval
GHQ	General Health Questionnaire
CIDI	Composite International Diagnostic Interview
COR	Cumulative odds ratio
DSM	Diagnostic and Statistical Manual of Mental Disorders
ICD	International Classification of Diseases
N	Number
OR	Odds ratio
RR	Relative risk
SRH	Self-rated health

LIST OF ORIGINAL PUBLICATIONS

I. Koskinen S, Joutsenniemi K, Martelin T, Martikainen P. Mortality differences according to living arrangements. International Journal of Epidemiology, *in press*

II. Joutsenniemi K, Martelin T, Koskinen S, Martikainen P, Härkänen T, Luoto R, Aromaa A. Official marital status, cohabiting and self-rated health – time trends in Finland, 1978–2001. The European Journal of Public Health 16: 476–83, 2006.

III. Joutsenniemi K, Martelin T, Martikainen P, Pirkola S, Koskinen S. Living arrangements and mental health in Finland. Journal of Epidemiology and Community Health 60: 468–75, 2006.

IV. Joutsenniemi K, Martelin T, Kestilä L, Martikainen P, Pirkola S, Koskinen S. Living arrangements, heavy drinking and alcohol dependence. Alcohol and Alcoholism Advance Access published 16 March 2007 (doi: 10.1093/alcalc/agm011).

1 INTRODUCTION

Information on health disparities between population groups is needed in order to promote the population's health. In Finland and elsewhere, research and policy on health disparities has focused mainly on differences between genders, regions, and socioeconomic groups. In contrast, population groups determined by interaction with other persons in the private sphere – other major determinants of one's health – have been largely neglected.

Every contact and interaction with other people is known to be good for health. Marriage has proven particularly beneficial to health, as this is a highly intimate relationship that usually involves daily interaction and a strong commitment to another person. Ever since the classic works of the 19th century, researchers have been intrigued by the relationship between marital status, living arrangements and health. William Farr studied the relationship between marital status and longevity, and reported in 1858 that the married were in the most advantaged position (Farr 1858). Emile Durkheim emphasised the key role of close social bonds and of social control in the individual's well-being. Based on differences in suicide rates by marital status, Durkheim concluded in 1897 that marriage and parenthood provide a sense of meaning and purpose as well as a sense of mutual obligation and control (Durkheim 1951). After decades of rigorous research in widely different societies, we now have a good understanding of the health differences between marital status groups: the married tend to be in the most advantaged position, the divorced in the most disadvantaged position (Gove 1973; Hu and Goldman 1990; Joung 1996; Murphy et al. 1997; Grundy and Sloggett 2003; Lund et al. 2004; Martikainen et al. 2005; Manzoli et al. 2007).

Early prospective studies have found that mortality is higher in people with few social and community ties than in people with larger social networks (Berkman and Syme 1979; House et al. 1988). Another classic study found that depression is not only clearly less common among women with a husband or boyfriend than among women with no social ties, but also somewhat less common among those with a confiding relationship with someone else, such as a relative or friend (Brown and Harris 1978). Today there is broad consensus on the health-promoting effect of social support (Fuhrer and Stansfeld 2002; Wang et al. 2003; Everson-Rose and Lewis 2005), and there is increasing interest in the role of household members as a source of social support: in fact, their support may be more beneficial to health than the support provided by persons from outside of the household (Ross 1995). However, persons living in the same household do not necessarily receive equal levels of social support; living in a family may promote the health of spouses and children most, while other adult members may benefit less (Helsing et al. 1981). Nevertheless, even the presence of another person in the household does not satisfactorily explain the strong association

between marriage and health (Ross 1995). This could indicate that marital status and living arrangements may affect health separately (Joung et al. 1994).

Today, mortality differences by marital status are increasingly prominent and a major burden on public health in Finland. Since the late 1970s, relative mortality differences between married and nonmarried Finns have markedly increased (Koskinen et al. 1999; Martikainen et al. 2005). Similar trends have also been documented in other Western countries, and marital status-related differences in mortality even tend to exceed social inequalities in mortality (Prinz 1995; Valkonen 2001; Valkonen et al. 2004; Jaffe et al. 2007). At the end of the 20th century, about 15% of deaths in the Finnish population aged 30 or over would not have occurred had mortality rates for nonmarried persons been the same as for married persons (Martikainen et al. 2005), and in the working-age population, about one third of deaths would not have occurred (Koskinen et al. 1999). Despite the compelling evidence on mortality trends, few studies have assessed morbidity trends between marital status groups. In an examination of long-standing illnesses, small but statistically insignificant reductions were found in relative morbidity differences between marital status groups in Norway between the early 1970s and late 1980s (Elstad 1996). According to other studies from the UK and the Netherlands, the patterns of depressive symptoms and self-rated health between marital status groups have changed between the mid-70s and the mid-90s, but these studies failed to report whether the relative morbidity differences had increased or decreased (Bartley et al. 1999; Meertens et al. 2003).

While mortality differences have increased, marked demographic changes have also occurred in Finland in the past twenty years, including changes in the composition of families and households, in the distribution of marital status and in the living arrangements of individuals. An increase in the prevalence of consensual unions has largely contributed to the growing proportion of nonmarried persons, and the proportions of lone parents and persons living alone have also grown (Statistics Finland 2001; Nihtilä and Martikainen 2004). These changes, which some researchers say reflect the individualisation process (van de Kaa 1987; Beck and Beck-Gernsheim 1995), have also taken place in other Western countries. The greatest demographic changes have occurred in Scandinavian countries as well as in other Northern European countries, North American countries and Australia, with relatively modest changes in Southern European countries (Prinz 1995; De Jong Gierveld and van Tilburg 1999; Statistics Finland 2001; Kiernan 2002; Smock and Gupta 2002; Australian Bureau of Statistics 2005). As in Sweden and Norway, being currently married is no longer the Finnish norm (Martikainen et al. 2005; Miettinen 2005). All in all, with the exception of marriage, official marital status no longer reflects an individual's living arrangements, as single, divorced and widowed persons may live with a partner, with children, with parents, with siblings, or with unrelated persons. Thus, more than official marital

status, living arrangements may be a stronger discriminator of one's social bonds and health, as living arrangements determine the organisation of the household and reflect a person's daily interaction and exchange of social support. Despite the large body of literature on marital status and health, relatively little is known about the relationship between living arrangements and health.

Not living with children is thought to associate with relatively poor health, which may partially be due to health-related selection. On the one hand, severely ill individuals may be involuntarily or voluntarily childless. On the other hand, smoking and unhealthy alcohol use, which are more common among nonmarried, childless persons, are known risk factors for infertility in both genders (Emanuele and Emanuele 1998; Emanuele et al. 2002; Kelly-Weeder and O'Connor 2006; Rostad et al. 2006). Among those living with dependent children, the living arrangement is likely to affect health differently than would living only with adults. Regarding the age of co-resident children, younger children are more likely to provide social integration into society, whereas older children are more likely to be particularly dependent on family members (Rogers 1996), and may thus pose additional strain. In terms of health benefits, children are a source of immense joy and they provide parents with pride, prestige, and meaning to life. Children may also act as agents of social control and thus positively affect adults' health-related behaviour. In terms of negative effects, worries and fears are an integral part of living with children, as well as limited private time and financial resources (Umberson 1992; Elstad 1996).

All in all, the literature on the health effects of co-resident children is inconsistent. A comprehensive review concluded that living with children may actually be detrimental to an adult's well-being, but in the "best circumstances", where the family experiences few social or economic strains, co-resident children may actually improve the well-being of adults (Ross et al. 1990). Accordingly, persons in living arrangements other than the traditional two-parent family with dependent children, such as grandparents living with grandchildren or lone parents, may experience less optimal circumstances due to financial strain and limited social networks, among other possible factors. Accordingly, strong and consistent evidence indicates the relatively poor health of these living arrangement groups in different Western societies (Minkler et al. 1997; Minkler and Fuller-Thomson 1999; Khlat et al. 2000; Lahelma et al. 2002; Fritzell and Burström 2006).

Explanations for health differences by marital status can be classified into those referring to selection and those referring to causality (Gove 1973; Hu and Goldman 1990; Wyke and Ford 1992); such theories have also been applied in studies on the association between living arrangements and health (Mastekaasa 1994a; Ross 1995; Joung 1996; Murphy et al. 1997; Wu et al. 2003). Despite these rigorous attempts, the relative contribution of selection and causation has remained unclear. In the framework

provided by these theories, this study aims to broaden our current understanding of the magnitude, trends and determinants of health differences by living arrangements. The identification of potentially health-promoting and other factors underlying health differences would provide health policy with information for reducing health disparities between living arrangement groups and thus promoting the population's health. This study examined the associations between living arrangements and health from the late 1970s to the early 2000s at the national level, focusing mainly on working-age Finns.

2 REVIEW OF THE LITERATURE

2.1 Living arrangements and health

The association between living arrangements and health has been assessed by various dimensions and measures of the general condition of the body or mind as well as by various operationalisations of living arrangements. Since the 1970's (Kobrin and Hendershot 1977), the term living arrangements has often referred to whom people live with. Specific living arrangements include living with a partner, living alone, with parents, with children, or with unrelated persons, as defined in population reports of the U.S. Census Bureau (Fields and Lynne 2001). In this study, "living arrangements" is not equivalent to "living conditions" or "living environment". The term "single" is used throughout this study to refer to those who never married, whereas "nonmarried" refers to cohabiting, single, divorced, and widowed persons; "cohabiting" refers to nonmarried couples living together, "spouse" refers to a wife or husband, and the term "partner" refers to either a spouse or a cohabiting partner.

Health is a multi-dimensional concept, and this study focuses only on specific dimensions of health that are likely to differ between living arrangement groups: mortality, self-rated health, mental health and unhealthy alcohol use. Mortality is a relatively objective measure, and cause-specific mortality differences are likely to suggest which underlying factors may exist behind health differences between living arrangement groups. Mortality differences are not equivalent to morbidity differences, and therefore selected measures of morbidity broaden our understanding of health differences by living arrangements. This study assessed self-rated health (SRH), a measure of health obtained by asking study participants a single question such as "How would you describe your present health status?" with a pre-coded answering scale. Because SRH is a sum of all aspects of one's health perceptions and health, it provides a global picture of morbidity differences between marital status and living arrangement groups. Finally, differences in mental health and unhealthy alcohol use may arise from psychological factors, coping processes, and social control related to living arrangements. As mortality differences tend to be higher among men, morbidity analyses may provide new insight into health differences among women. Furthermore, poor mental health and unhealthy alcohol use may reflect gender-specific ways of coping with different circumstances in life. Together, these distinct measures provide a comprehensive picture of the health of men and women in different living arrangements.

The purpose of this section is to describe previous literature on the association between living arrangements and health. Possible explanations for the findings are reviewed in section 2.2.

Table 1. Symbols used in the summary of the literature (Tables 2–5).

Symbol	Explanation
++	statistically significant positive association (the living arrangement group has an elevated risk for mortality / morbidity)
+	weak positive association, not significant (e.g. relative risk / hazard ratio / odds ratio ≥1.2 or coefficient absolute value ≥0.2 or 20% difference in prevalence)
0	no association
–	weak negative association, not significant (e.g. relative risk / hazard ratio / odds ratio ≤0.8 or coefficient absolute value ≤0.2 or 20% difference in prevalence)
––	statistically significant negative association (the living arrangement group has a relatively low risk for mortality / morbidity)

2.1.1 Mortality

Consistent evidence from different Western societies indicate that mortality rates differ between marital status groups. Married persons tend to have lower mortality rates than do nonmarried persons, with stronger associations in men (Koskenvuo et al. 1979; Hu and Goldman 1990; Mendes de Leon et al. 1992; Ebrahim et al. 1995; Joung et al. 1996; Cheung 2000; Lund et al. 2004; Martikainen et al. 2005; Kaplan and Kronick 2006). From the 1950s to the early 1980s, the relative excess mortality of nonmarried persons, as compared with married persons, has increased in several Western countries (Hu and Goldman 1990; Valkonen 2001; Valkonen et al. 2004). The same trend has occurred in Finland, where the relative mortality differences between the married and the nonmarried have continued to increase since the late 1970s (Koskinen et al. 1999). This trend is evident in both genders in all age-groups between 30 and 89 and largely results from a faster decline in mortality among the married than among the nonmarried (Martikainen et al. 2005).

Specific causes of death contribute most to mortality differences between marital status groups. Generally, alcohol- and tobacco-related causes of death (e.g. cirrhosis of the liver with mention of alcohol, lung cancer) and violent deaths (e.g. suicide, poisoning, accidents) are most common among nonmarried persons, and particularly among nonmarried men (Gove et al. 1990; Joung et al. 1996; Kposowa 2000; Martikainen et al. 2005; Kaplan and Kronick 2006). Despite some consensus on cause-specific mortality by marital status, there is little evidence on cause-specific mortality by living arrangements. A Finnish study on working-age men, with mortality follow-up in 1976–80, reported higher likelihood of suicide in men living alone, in men living with someone other than a partner or child(ren), and in lone fathers, than in men living with a partner and child(ren), controlling for age, socio-economic factors, region of residence, and official marital status (Valkonen and Martelin 1988).

Table 2. Summary of studies that have assessed the association between living arrangements and mortality.

Reference	Country / age group / gender / participants (N) / deaths	Age-adjusted results for all-cause mortality	
		MEN	WOMEN
[a] Helsing et al. (1981)	USA / >17 / W+M / N = 21 604 / 794 deaths		
Kotler and Wingard (1989)	USA / 35–64 / W+M / N = 3 700	Married with children 0 Previously married with children – (vs counterparts, no children)	Married with children, WO – Previously married + children, WO + Married with children, HW + Previously married + children, HW – (vs counterparts, no children)
Davis et al. (1992)	USA / 45–74 / W+M / N = 7 957 / 1 882 deaths	Living alone ++ (vs married)	Living alone + (elderly 0) (vs married)
		Living with others ++ (vs married)	Living with others ++ (elderly + / 0) (vs married)
Lillard and Waite (1995)	USA / >9 / W+M / N = 11 112 / 857 deaths		
Martikainen (1995)	Finland / 35–64 (during 1981–85) / W / N~3 750 000 person years / ~8 000 deaths		Not living with children: All cause ++ Circulatory diseases ++ Accidents and violence ++ (vs living with children)
Sorlie et al. (1995)	USA / > 24 / W+M / N = 530 507 / 54 304 deaths		
Rogers (1996)	USA / > 54 / W + M / N = 15 938 (115 376 person-years)		
Avlund et al. (1998)	Denmark / 70 / W + M / N = 734		
Lund et al. (2000)	Denmark / 70–95 / M+ W / N = 1 231 / 228 deaths	Living alone + (vs living with someone)	Living alone ++ (vs living with someone)
Ringbäck Weitoft et al. (2004)	Sweden / 29–54 / M / N = 682 919 / 18 314 deaths	Lone parent ++ Living only with a partner ++ Without partner/children ++ (vs couple parent)	

HW = housewife, M = men, W = women, WO = working

[a] Widowed population (includes persons remarried at follow-up)

Further adjustments
The mortality of widowed persons living alone was significantly higher than that of widowed persons living with someone. All results were adjusted for age at bereavement, change in marital status or residence after widowhood, residence, education, church attendance, smoking, animals and age first married.
Further adjustments for number of children, marital status, physical health, smoking, alcohol consumption, life satisfaction and contact with friends had no marked effect on health differences.
Further adjustments for chronic conditions or health behaviour variables (alcohol, smoking, BMI, activity) did not markedly reduce the association between living arrangements and mortality, whereas adjusting for socioeconomic factors (race, education, income, employment) reduced the relative hazard of mortality of those living alone or with someone than a spouse.
Living with an adult other than a spouse (vs not living with an adult) reduces the hazard of mortality for men and women. Living with children (vs not living with children) reduces the hazard of mortality only for men. All results adjusted for age, calendar time, race, subject's education, marital status, spouse's education, region, city size, and household income. Household income explained the beneficial effect of living with other adults for women.
There were no marked reductions in the mortality of women not living with children after further adjustment for age, marital status, economic activity, education, and occupational class; the excess mortality from accidents and violence remained most pronounced.
Persons living alone had higher mortality than did those living with someone, as adjusted for age and race. After further adjustment for age, race, employment status, income, education, and marital status, the only significant result was that the excess mortality of elderly women living with others was significantly higher than that of elderly women living alone.
Previously married persons living alone had significantly higher mortality than did married persons living only with a spouse. Single persons living alone did not significantly differ from married persons. All results were adjusted for age, marital status, gender, race, and education.
Among men, living alone associated strongly with elevated mortality, but among women the association was weaker and statistically nonsignificant. All results were adjusted for activities outside the home, social support for tasks, taking care of others or helping others with repairs, education, and functional ability.
After further adjustment for age, functional ability, and mental symptoms, relatively older persons who continued living alone (four-year follow-up) had higher mortality than did older persons who continued to live with someone (significant associations only among women).
Further adjustment for health selection variables (inpatient care for a variety of diagnoses) and socioeconomic factors (socioeconomic class, urbanisation, country of birth, social welfare benefit, unemployment benefit, housing situation) reduced the elevated mortality of all groups relative to the reference group by 6–35% and 20–63%, respectively. Together, these factors reduced the excess mortality by 24–65%, but the elevated mortality of persons other than couple parents remained significantly elevated.

Various American studies have assessed the all-cause mortality of persons living alone (Table 2). In the working-age and early old-age populations, persons living alone tend to have higher mortality than do those living with someone. This association has been reported among the widowed (Helsing et al. 1981), among the previously married (Rogers 1996), and among all working-age men and women (Davis et al. 1992; Sorlie et al. 1995). Single persons living alone have been reported to have no higher mortality than do their counterparts living with someone, but the original association may have disappeared after adjustment for marital status, gender, race and education (Rogers 1996). In short, there is convincing evidence from the working-age American population that living alone associates with high mortality (Table 2).

This association may, however, be less consistent among elderly persons, for whom living alone may actually reflect one's ability to take care of oneself and thus enjoy good health. Accordingly, elderly American women living with someone have been found to have higher mortality than those living alone, whereas elderly men living alone had elevated mortality (Sorlie et al. 1995). Similarly, compared with their married counterparts, elderly American women living alone or with others had no higher mortality than did their married counterparts, whereas among elderly men, both groups had higher mortality than did elderly married men (Davis et al. 1992). A Danish study supports these findings, as men, but not women living alone, had higher mortality than did those living with another person (Avlund et al. 1998). All in all, elderly women living alone or with someone other than a husband appear to be in no relatively disadvantaged position, whereas the reverse appears to be true for elderly men, although not all studies support this general finding (Lund et al. 2000) (Table 2).

With regard to persons living with someone other than a spouse, an American study found that men and women living with another adult (besides wife/husband) had somewhat lower mortality than those not living with an adult, although among women the association was largely accounted for by household income (Lillard and Waite 1995). In another American study, living with someone other than a spouse, more than being married, associated with high mortality among men aged 45 to 74, and among women aged 45 to 54 (Davis et al. 1992). The two American studies failed, however, to differentiate between cohabiting with a partner and living with other adults. A Swedish study reported that men living with neither a partner nor children (i.e. alone or with other adults) had higher mortality than did men living with both of the previous (Ringbäck Weitoft et al. 2004). These distinct studies on working-age populations provide some support for the notion that living with other adults appears to be more beneficial to health than living alone, but less beneficial than living with a wife or husband (Table 2).

With regard to living with children, Finnish women with children have been found to have lower mortality than women living without children. Regarding the number of children among married women, those living with two or more children had lower mortality than did those living with one child. In contrast, among nonmarried women those living with more than one child had higher mortality, and the excess mortality of nonmarried women living with more children was attributable mainly to mortality from accidents and violence and circulatory diseases (Martikainen 1995). Similar analyses of the number of children were performed in the United States, but only housewives, and not working women, living with over three children were found to have higher mortality than their counterparts living with fewer or no children. Regarding marital status, the mortality of married housewives with children was higher than that of their counterparts living without children, but no such association was found among nonmarried housewives or among working women (Kotler and Wingard 1989). In another American study, nonmarried women living with children were found to have higher mortality than their married counterparts (Lillard and Waite 1995). Regarding men in the United States, the presence of children was found not to affect their mortality (Kotler and Wingard 1989), whereas another American study reported that men living with dependent children had lower mortality than did men living without children, but adjusting for household income rendered the association insignificant (Lillard and Waite 1995). In short, living with children appears to associate with lower mortality among the married, whereas lone parents had higher mortality than did single persons. The association between the number of children and mortality appears to depend on the overall living arrangements and employment status of adults (Table 2).

2.1.2. Self-rated health

Self-rated health (SRH) is a widely used global measure of health, which mainly reflects somatic morbidity (Manderbacka 1998). Several studies have assessed the association between marital status and SRH, and the relative position of marital status groups appears to be similar to that reported in mortality; the married tend to have the best SRH, and the divorced tend to have the worst SRH, but the relative position of single and widowed persons is inconsistent. Furthermore, the greater health advantage of married men does not appear to apply to morbidity as clearly as for mortality (Wyke and Ford 1992; Joung et al. 1994; Ren 1997; Helmert and Shea 1998; Schoenborn 2004). Despite the large body of literature on SRH, little evidence is available on time trends in SRH differences between marital status or living arrangement groups. Annual surveys on health-related behaviour among the Finnish adult population provide some information on health trends by marital status. In 1978–80, divorced men reported worse SRH than did married men, whereas no remarkable differences by marital status occurred among women (Koskinen et al. 1981). In 2000, single men reported worse

SRH than did married and cohabiting men, and still no health differences occurred among women (Helakorpi et al. 2000). In Britain, the position of previously married unemployed women relative to that of never-married employed women worsened between 1984 and 1993 (Bartley et al. 1999). Regarding time trends among living arrangement groups, a British study reported that never-married unemployed lone mothers' poor SRH relative to that of never-married employed women without children worsened between 1984 and 1993 (Bartley et al. 1999). In Sweden, however, the SRH of lone mothers relative to that of couple mothers worsened between 1979 and 1998 (Fritzell and Burström 2006). Overall, SRH in Finland (Heistaro et al. 1996) and in other Western countries (Bartley et al. 1999) has improved over the past twenty years, but the SRH of specific groups living arrangements groups, such as lone parents, may not have improved at an equal pace.

Turning to cross-sectional studies on living arrangements (Table 3), a large American study found that cohabiting persons have somewhat worse SRH than do married persons (Schoenborn 2004), but a German study reported no such differences (Helmert and Shea 1998). The strongest evidence is provided by American and Dutch studies with statistically significant results, although their adjusted results may hide some original association. American cohabiters were found to have worse SRH than married persons (Ren 1997), and more specifically, previously divorced but currently cohabiting Dutch women were found to have worse SRH than married women, whereas no differences were found among Dutch men (Joung et al. 1995). Despite the differing study settings and poor comparability of previous findings, the literature provides some support for the notion that married persons enjoy a small health advantage over cohabiters (Table 3).

Regarding other living arrangements, adult persons living alone (Macran et al. 1996; Helmert and Shea 1998; Waite and Hughes 1999) or with their parents (Joung et al. 1994) appear to have worse SRH than do married persons. One American study found no difference in SRH between those living with an adult and those not living with an adult, but this study failed to differentiate between cohabiting with a partner and living with someone other than a partner (Anson 1989). Another American study with more differentiation found that the SRH of persons living with someone other than a partner or child(ren) is worse than that of persons living only with a partner (Waite and Hughes 1999). Disregarding the large body of literature on the SRH of lone parents described below, and some consistency on the poor SRH of persons living alone, few data are available on the SRH of persons living in other living arrangements (Table 3).

There is weak support for the notion that, compared to those living only with a partner, living with a partner and children may associate with better SRH (Macran et al. 1996; Waite and Hughes 1999), but other well-conducted studies have found no such association (Lahelma et al. 2002; Roos et al. 2005). With regard to lone parenthood,

an American study found lone parents to have worse SRH than those living only with a partner (Waite and Hughes 1999), whereas a British study found no such disadvantage for lone mothers (Macran et al. 1996). Compared with couple parents, compelling evidence from France (Khlat et al. 2000), Great Britain (Lahelma et al. 2002), Sweden (Fritzell and Burström 2006), and Finland (Lahelma et al. 2002; Roos et al. 2005), suggests that lone mothers have worse SRH than women living in two parent families, although in one study the excess morbidity of lone mothers in Sweden failed to reach statistical significance (Roos et al. 2005). All in all among couples, living with children does not appear to significantly associate with better or worse health. Lone mothers appear to have worse SRH than couple mothers, but it remains unknown whether the association also applies to men (Table 3).

2.1.3. Other indicators of physical morbidity

Morbidity differences by marital status and living arrangements have been reported according to several other somatic health indicators such as the prevalence of most common diseases and various functional limitations (Wyke and Ford 1992; Joung et al. 1994; Macran et al. 1996; Murphy et al. 1997; Lahelma et al. 2002; Aromaa and Koskinen 2004). Nonmarried persons tend to have higher levels of limiting chronic conditions (Wyke and Ford 1992) and poorer functional capacity (Aromaa and Koskinen 2004) than do married persons. Regarding findings on living arrangements, British women living alone have higher levels of disability (Macran et al. 1996), Canadian women living alone or with one or two parents have higher levels of chronic conditions (Denton et al. 2004), and American cohabiting men and women have poorer functional capacity and high levels of low back pain and headaches (Schoenborn 2004), than do married persons. Danish women over 60 years of age and Danish men over 50 years of age living without other adults were are greater risk for acute coronary syndrome than were those living with another adult (Nielsen et al. 2006). These results on different dimensions of somatic morbidity indirectly support the literature on SRH and mortality differences between living arrangement groups; living without other adults or with someone other than a spouse appears to associate with poor somatic health.

Table 3. Summary of studies that have assessed the association between living arrangements and self-rated health (SRH).

Reference	**Country / age group / gender / participants**	**Age-adjusted results (crude results mentioned separately)**	
		MEN	WOMEN
Anson (1989)	USA / 18–55 / W / N = 25 542		
Joung et al. (1994)	Netherlands / 15–74 / W+M / N = 18 973		
Joung et al. (1995)	Netherlands / 25–74 / W+M / N = 16 311		
Macran et al. (1996)	Great Britain / 18–59 / W / N = 2 353		
Ren (1997)	USA / 19+ / W+M / N = 12 274		
Helmert and Shea (1998)	Germany / 25–69 / W+M / N = 51 326	Cohabiting 0 Other nonmarried ++ (vs married) (Crude)	Cohabiting 0 Other nonmarried ++ (vs married) (Crude)
Waite and Hughes (1999)	USA / 51–61 / W+M / N = 9 424	Married/cohabiting with children – Living alone ++ Lone parent ++ Living with someone other than a partner / children ++ (vs living only with partner) (Crude)	
Khlat et al. (2000)	France / 30–49 / W / N = 1 476		Married / cohabiting 0 (vs no partner) Lone parent ++ (vs couple parent)
Lahelma et al. (2002)	Finland (FIN) & Great Britain (GB) / 20–49 / W / N = 7 152		Married / cohabiting, no children (0 FIN, 0 GB) Lone parent (++ GB, + FIN) (vs couple parent) (Crude)
Schoenborn (2004)	USA / 18+ / W+M / N = 127 545	Cohabiting + Widowed + Divorced/separated + Single 0 (vs married) (Crude)	Cohabiting + Widowed + Divorced / separated + Single + (vs married) (Crude)
Roos et al. (2005)	Finland (FIN) & Sweden (SWE) / 25–49 / W / N = 4 967		Married / cohabiting, no children (0 SWE, 0 FIN) Lone parent (++ FIN, 0 SWE) (vs couple parent)
Fritzell and Burström 2006	Sweden / 16–54 / W / N = 22 308		Lone parents ++ (vs couple parent)

M = men, W = women

Further adjustments
Those living with an adult did not differ from those not living with adults. The results were adjusted for age, education, family income, marital status, employment status, and parenthood.
Compared with married / cohabiting persons, living with parents did not associate with poor SRH.. Divorced persons had worse SRH, whereas single and widowed persons did not significantly differ from married persons. The results were adjusted for age, gender, education, urbanisation, religion, country of birth, and marital status / living arrangements.
Adjusted for age, gender, education, urbanisation, religion, and country of birth, the SRH of cohabiters was worse than that of married persons, but the difference did not reach statistical significance, whereas those living with someone other than a partner had significantly worse SRH than did married persons. Further adjustment for health behaviours (smoking, alcohol, leisure exercise, coffee, breakfast, body mass index) reduced the excess morbidity of all nonmarried groups by 22% for men and 31% for women, and smoking, alcohol and exercise caused the greatest changes.
Lone parents did not have better or worse SRH, married / cohabiting women with children had better SRH, and those living alone had worse SRH than did women living only with a partner. The results were adjusted for age, household income, employment status, and occupational class. Further adjustment for “disability” reduced the excess morbidity of those living alone.
Cohabiters and separated or divorced persons had worse SRH than did married persons, whereas single and widowed persons did not differ from married persons. The results were adjusted for age, gender, children, functional limitations, ethnicity, education, income, social support, type of area, and percentage of population in poverty.
Further adjustment for demographic factors (age, gender, race, ethnicity), household resources (e.g. education, income, home ownership) and household demands clearly reduced the original morbidity differences between the living arrangement groups, but the elevated morbidity of those not living only with a partner remained statistically significant.
Further adjustment for employment status, education and income narrowed the differences between the living arrangements groups, but the basic patterns in health differences by living arrangements remained unchanged.
After further adjustment for employment status and income, the risk of lone parents was not altered, but the risk of married / cohabiting women living without children increased in both countries.
After further adjustment for age, time period, country of birth, employment status, socioeconomic class, economic strain, and interaction terms, the results remained statistically significant. Economic strain explained 42% of the excess poor SRH of lone parents compared to that of couple parents.

2.1.4 Mental health

When referring to the literature, the term "poor mental health" comprises the whole range of measures from "mild" symptoms to the more "severe" disorders. The General Health Questionnaire (GHQ) is a popular self-report instrument for assessing one's current mental state (Goldberg and Hillier 1979). The GHQ includes questions on depression, anxiety, sleep disturbance and social functioning, and a total high score indicates greater psychological distress. The Composite International Diagnostic Interview (CIDI) is a fully structured mental health interview that assesses the presence of psychiatric disorders based on DSM-IV criteria (Wittchen and Pfister 1997). Differences in mental health by living arrangements have been assessed with these measures (Tables 4a and 4b) as well as with several others on depressive symptoms (Table 4c).

Numerous researchers have been intrigued by the mental health of cohabiters, which has been compared to that of married persons by means of various mental health measures, often with focus on different degrees of depression. Based on studies in Finland (Lindeman et al. 2000), Canada (Wu et al. 2003) and the United States (DeKlyen et al. 2006), major depressive episodes may be somewhat more prevalent among cohabiters, but the associations were weak and statistically insignificant. With regard to less severe measures of depression, well-conducted American studies found cohabiters to have significantly elevated levels of depressive symptoms independent of race, education, and socioeconomic factors (Kurdek and Kurdek 1991; Brown 2000). Other American studies found no differences in depressive symptoms between married persons and cohabiters of either gender. These results may be somewhat unreliable and under-powered, however, as one study had a participation rate of under 50% (Horwitz and White 1998) and the other included only 56 cohabiters (Ross 1995). A Finnish study with data from 1978–80 found that all cohabiters, and particularly cohabiting women, were more likely to report depressive symptoms than were married persons (Lehtinen et al. 1991) (Tables 4a–c).

Regarding psychological distress among cohabiters, the previously mentioned Finnish study also reported psychological distress to be more common among cohabiters than among married persons, and again, the association was stronger in women (Lehtinen et al. 1991). In the United States (Schoenborn 2004), Great Britain (Willitts et al. 2004) and Canada (Wu et al. 2003), cohabiting women appear to have higher levels of psychological distress than do married women. The same may be true for American and Canadian men, based on exceptionally large data sets (Wu et al. 2003; Schoenborn 2004), whereas British male cohabiters reported significantly less psychological distress than did their married counterparts (Willitts et al. 2004). Whether the different measures of psychological distress or other factors contribute to this differing finding remains unclear. In conclusion, the most convincing evidence

suggests that cohabiters do not clearly differ from married persons in terms of major depressive episodes, but cohabiters may have somewhat higher levels of depressive symptoms and psychological distress than do married persons, with more consistent evidence on women (Tables 4a–c).

Turning to living alone in the working-age population, one well-conducted Dutch study showed that those living alone have significantly higher levels of mood disorders than do married or cohabiting persons (Bijl et al. 1998), and studies from the United States, Canada and Sweden reported similar findings for depressive symptoms (Hughes and Gove 1981; Kurdek and Kurdek 1991; Hughes and Waite 2002). A Canadian study found no significant differences in psychological distress between those living alone and those living with a partner and children, but all reported results were adjusted for a wide range of socioeconomic and psychosocial factors and health-related behaviour, which may obscure any original association (Denton et al. 2004). British persons living alone appear to have higher levels of psychological distress than do those living with any adult (Harrison et al. 1999), and Finnish women living alone appear to have higher levels of depressive symptoms than do those living with someone (Aro et al. 2001). In a longitudinal international study that included elderly Finnish men, those continuously living alone did not exhibit elevated levels of depressive symptoms, whereas depressive symptoms were twice as common among those who had entered the state of living alone (i.e. mostly bereaved men) than among those living continuously with another person (van Gelder et al. 2006). In short, compelling evidence suggests that working-age and elderly persons living alone have poorer mental health than do those living with a partner and those living with other adults. However, as most well-conducted studies have assessed either a single gender or both genders together, it cannot be concluded whether the association applies to both genders (Tables 4a–c).

Disregarding research results on lone parents, those living with someone other than a partner have been largely neglected in the literature on mental health, particularly in studies on psychological distress. Swedish and Dutch studies have compared married or cohabiting persons to all those not living with a partner, and found that the latter groups are at considerably higher risk for mood disorders (De Graaf et al. 2002) and for hospitalisation for depression (Sundquist et al. 2004). Studies with more detailed classification of living arrangements have separated those living alone or lone parents or both from those living with adults other than a partner, and in the Netherlands, the latter group was found to have higher levels of mood disorders (Bijl et al. 1998) and in the United States, of depressive symptoms (Hughes and Gove 1981; Kurdek and Kurdek 1991; Hughes and Waite 2002), than did those living with a partner. All in all, the comparison of previous findings is difficult due to widely different classifications of living arrangements in addition to the wide range of mental health measures.

Table 4a. Summary of studies that have assessed the association between living arrangements and psychological distress[a].

Reference	Country / age group / gender / participants	Age-adjusted results (crude results mentioned separately)			
		MEN		WOMEN	
Lehtinen et al. (1991)	Finland / >29 / W + M / N = 7 217	Cohabiting + (vs married)		Cohabiting ++ (vs married)	
Harrison et al. (1999)	Great Britain / > 17 / W+M / N = 33 849	Living only with children ++ Living alone ++ (vs living with an adult)			
Hope et al. (1999)	Great Britain / 33 / W / N = 3 523			Lone parent ++ (vs couple mother)	
Gispert et al. (2003)	Spain / > 15 / W+M / N = 12 144				
[b] Wu et al. (2003)	Canada / 20–64 / W+M / N = 11 862	Cohabiting ++ (vs married)		Cohabiting ++ (vs married)	
[b] Denton et al. (2004)	Canada / > 19 / W+M / ~18 000				
[c] Schoenborn (2004)	USA / > 17 / W+M / N = 127 545	Cohabiting + (vs married)		Cohabiting + (vs married) (Crude)	
Pevalin and Ermisch (2004)	Great Britain / > 15 / W+M / N = 10 264				
Willitts et al. (2004)	Great Britain / 16–64 / W+M / N = 4 430	Cohabiting –– (vs married)	Cohabiting –– (vs married)	Cohabiting + (vs married)	Cohabiting + (vs married)
		First partnership	Partnership reformation	First partnership	Partnership reformation

M = men, W = women

[a] Studies using the General Health Questionnaire or other measures on psychological distress (the latter are marked separately)

[b] Items for psychological distress derived from the Composite International Diagnostic Interview

[c] Other measure for psychological distress

Further adjustments
Further adjustment for employment status, ethnic group, long-standing illness, housing tenure and social support reduced the morbidity of persons living only with children by ~20%, and of persons living alone by ~40%.
After further adjustment for psychological distress at age 23, financial and housing-based hardship score, employment status, social support, number of children, and age of youngest child, the results remained statistically significant, but the risk of lone parents declined by 73% (hardship score explained 65% of risk).
Compared to other living arrangements, lone parenthood associated with psychological distress among women aged 15–24, as adjusted by smoking, alcohol consumption, physical activity, sleep, physician contacts and visits, use of preventive care services, hospitalisation, marital status, education, employment status, chronic diseases, disability, and activity restriction. No associations were reported among relatively older women or among men in any age group.
After further adjustments for age, race, immigration status, urbanisation, health risk factors, psychological and social resources, socioeconomic status, and education, the differences in morbidity were no longer significant.
Among both genders, lone parents and those living alone did not significantly differ from those living with a partner and children. All results were adjusted for age, activity, education, income, occupation, social support, smoking, alcohol consumption, physical activity, weight, and psychosocial factors (i.e. seven sources of stress, self esteem, mastery, coherence, child/adulthood events, recent life events).
Longitudinal data: At follow-up, psychological distress increased the likelihood of exiting a cohabiting union, and reduced the likeliness of repartnering after a dissolved cohabiting union. Psychological distress did not affect the likelihood of repartnering after a previous marriage.

Table 4b. Summary of studies that have assessed the association between living arrangements and mental health disorders according to the Composite International Diagnostic Interview (CIDI).

Reference	**Country / age group / gender / participants**	**Mental health disorder**	**Age-adjusted results (crude results mentioned separately)**	
			MEN	WOMEN
Bijl et al. (1998)	Netherlands / 18–64 / W+M / N = 7 076	Mood disorder	Living with parent(s) + Living alone ++ Lone parent ++ Living with other(s) ++ (Crude) (vs married / cohabiting with or without children)	
		Anxiety disorder	Living with parent(s) 0 Living alone ++ Lone parent ++ Living with other(s) 0 (vs married / cohabiting with or without children) (Crude)	
Lindeman et al. (2000)	Finland / 15–75 / W+M / N = 5 993	Major depressive episode	Cohabiting + (vs married)	Cohabiting 0 (vs married)
De Graaf et al. (2002)	Netherlands / 18–64 / W+M	Mood & anxiety disorder		
Cairney et al. (2003)	Canada / 15–54 / W / N = 2 956	Major depressive episode		Lone parent ++ (vs couple parent)
Wu et al. (2003)	Canada / 20–64 / W+M / N = 11 862	Major depressive episode	Cohabiting 0 (vs married)	Cohabiting + (vs married)
Klose and Jacobi (2004)	Germany / 18–65 / W+M / N = 4 181	Depressive disorder	Lone parent ++	Lone parent +
		Anxiety disorder	Lone parent +	Lone parent +
DeKlyen et al. (2006)	USA / parents of 1 to 1.5-year-old children / W+M / N = 7 540	Major depressive episode	Cohabiting + (vs married) (No age-adj)	Cohabiting + (vs married)
		Generalised anxiety disorder	Cohabiting + (vs married)	Cohabiting 0 (vs married)

M = men, W = women

Further adjustments
Persons living without a spouse / partner had elevated odds for mood disorders, but not for anxiety disorders, after adjustment for age, gender, education, urbanisation, employment status, somatic disorder, and adversities in childhood.
Adjustment for age, income, education, and age of children reduced lone parents' odds for depression by ~4%, whereas stress variables (recent life events, chronic strains and childhood adversities) and social support reduced the odds by 34% and 19%, respectively. Together, stress and social support reduce the odds by ~40%.
The excess morbidity of female cohabiters disappeared after further adjustment for age, race, immigration status, urbanisation, health risk factors, psychological and social resources, socioeconomic status, and education.
After adjustments for age, education, race / ethnicity, immigrant status, shared and nonshared children, and whether Medicaid paid for the child's birth, the excess morbidity of cohabiters no longer differed from that of married persons.

Table 4c. Summary of studies that have assessed the association between living arrangements and depressive symptoms[a].

Reference	Country / age group / gender / participants	Age-adjusted results	
		MEN	WOMEN
Hughes and Gove (1981)	USA / > 17 / W+M / N = 2 248		
Kurdek (1991)	USA / 19–65 / W+M / N = 6 573		
Lehtinen et al. (1991)	Finland / >29 / W + M / N = 7 217	Cohabiting + (vs married)	Cohabiting + (vs married)
Ross (1995)	USA / 18–90 / W+M / N = 2 031 (cohabiters N = 56)		
Brown (2000)	USA / W+M / N = 3 619		
Aro et al. (2001)	Finland / 48–50 / W / N = 1 851		Living alone ++ (vs living with others)
Hughes and Waite (2002)	USA / 51–61 / W+M / N = 8 485		
Kim and McKenry (2002)	USA / 19–75 / W+M / N = 5 991		
Sundquist et al. (2004)	Sweden / 25–64/ W+M / N = 4 437 491		
van Gelder et al. (2006)	Finland, Italy, Netherlands / 65–84 / M / N = 1 014	Staying living alone 0 Entering living alone ++ (vs living with others during follow-up period)	

M=men, W=women

[a] Measures for depressive symptoms include the Beck Depression Inventory (BDI), the Self-Rating Depression Scale (SDS), the Center for Epidemiological Studies Depression Scale (CES-D), the Symptom Checklist-90-Revised Depression Subscale (SCL-90-R), and other measures.

Further adjustments
Depression was least common among married persons, and most common among those living with someone other than a spouse, whereas those living alone had levels in between. All results were adjusted for age, gender, family income, education, and race.
Married persons reported depression less often than did cohabiters, who in turn reported depression less often than did those not living with another adult. All results were adjusted for age, income, race, education, and presence of children.
Cohabiters' health did not differ from that of married persons. All results were adjusted for age, gender, race, marital status, living with other adults / children, emotional support, income, and economic hardship.
The excess morbidity of cohabiters was significantly higher than that of the married after adjustment for age, gender, race, prior marital / cohabiting experience, education, earnings, children, housework, and union duration. After further adjustment for union instability, the excess morbidity of cohabiters no longer reached statistical significance.
In analyses adjusted for sociodemographic factors, health-related factors and social support factors, the variable "number of household members" was found to be statistically insignificant.
In a model that included chronic conditions and long-term disability, men and women living alone or with someone other than a partner as well as lone parents had significantly more depressive symptoms than did those living only with a partner. Further adjustments for age, race, ethnicity, education, employment status, income, family neighbourhood, and self-rated health reduced excess morbidity by 30–65%. The excess morbidity of lone mothers and of men living alone or with someone other than a partner remained significantly elevated.
Longitudinal data: Entering marriage associated with decreased depressive symptoms, whereas entering cohabitation had no association with depressive symptoms, as compared to living without a partner throughout the follow-up period. The results were adjusted for age, gender, education, number of children, depressive symptoms at baseline, role strain, social support, and self-esteem.
Longitudinal data: The risk for hospitalisation for depression was higher among those men and women living without a partner or cohabiting without children than among cohabiting persons living with children or among married persons. All results were adjusted for age, urbanisation, education, and immigrant status.

However, there is sufficient evidence to conclude that the mental health of those living with someone other than a partner is probably worse than that of married persons, but it is too early to speculate whether the association varies by gender or by severity of mental health symptoms (Tables 4a–c).

With regard to living with children, in Germany, depressive disorders were less common among working-age men with two or more children than among childless men, but no such association existed among women (Klose and Jacobi 2004); the German study failed, however, to assess parent's couple status. In the United States, in contrast, depressive symptoms were more common among those who cohabited with children than among those who cohabited without children, but the finding did not apply to married persons (Brown 2000). According to convincing evidence from Great Britain, Spain, Germany, Canada, the Netherlands and the United States, lone parenthood associates with psychological distress (Harrison et al. 1999; Hope et al. 1999; Gispert et al. 2003), depressive symptoms (Hughes and Waite 2002), and major depressive episodes and mood disorders (Bijl et al. 1998; Cairney et al. 2003). A Canadian study men and women over 19 years of age found psychological distress to be no more common among lone parents than among couple parents, but the study reported only results adjusted for a large number of variables (Denton et al. 2004). In short, the consistently reported association between lone motherhood and poor mental health also tends to apply to lone fathers (Tables 4a–c).

Few studies have assessed the association between living arrangements and anxiety disorders, but some data are available on the working-age population. Strong evidence is provided by a Dutch study, which found that those living alone and lone parents, but not those living with someone other than a partner, are at greater risk for anxiety disorders than are married persons (Bijl et al. 1998). Regarding weaker associations, generalised anxiety disorders may be more common among cohabiting men than among married men in the United States (DeKlyen et al. 2006), and any anxiety disorder may be more common among lone parents than among couple parents in Germany (Klose and Jacobi 2004). All in all, the evidence is insufficient to draw any general conclusions about the relationship between living arrangements and anxiety disorders (Tables 4a–c).

2.1.5 Unhealthy alcohol use

The range of unhealthy alcohol use extends from elevated levels and frequency of consumption to alcohol-related health problems, and finally to full-blown alcohol use disorders. When referring to the literature, the term "unhealthy alcohol use" comprises all categories that exceed light drinking, such as heavy drinking, alcohol-related health problems, alcohol abuse and alcohol dependence (Saitz 2005).

Numerous studies have compared the unhealthy alcohol use of cohabiters to that of married persons (Table 5). Although little is known about severe alcohol dependence, cross-sectional studies from the Netherlands (Joung et al. 1995), Australia (Fleming 1996), and Germany have reported positive associations between cohabitation and "severe" unhealthy alcohol use, as compared with the married, although no such association was reported among men in Germany (Helmert and Shea 1998). Regarding "milder" measures, excess heavy drinking has been reported among cohabiters from both Great Britain (Power et al. 1999) and the United States (Schoenborn 2004; Caetano et al. 2006; DeKlyen et al. 2006). Few studies were able to make adjustments for any factors beyond age. In two well-conducted American studies, cohabiters' propensity for heavy drinking remained significantly higher than that of their married counterparts independent of education and other socioeconomic factors (Caetano et al. 2006; DeKlyen et al. 2006). All in all, compelling evidence suggests that cohabiting men and women tend to have higher levels of different dimensions of unhealthy alcohol use than do married persons. Few studies have been able to assess plausible explanations for this association, and little evidence exists on Finnish cohabiters' unhealthy alcohol use (Table 5).

Those living alone have been shown to have higher levels of alcohol problems and alcohol consumption than married or nonmarried persons living with someone other than a spouse (Hughes and Gove 1981). A German study found no statistically significant difference in daily alcohol consumption between "single persons living alone" and married persons, but the study apparently failed to assess living alone in other marital status groups (Helmert and Shea 1998). In an international study that included elderly Finnish men, being an "alcohol consumer" was more common among those living alone than among those living with someone. However, because the measurement of alcohol consumption was not described in detail, the relevance of this finding remains uncertain (van Gelder et al. 2006). All in all, few studies have assessed the unhealthy alcohol consumption of persons living alone, although compelling evidence corroborates their higher likelihood for substance abuse than that of married persons (Bijl et al. 1998) (Table 5).

Table 5. Summary of studies that have assessed the association between living arrangements and unhealthy alcohol use.

Reference	Country / age group / gender / participants	Measure of unhealthy alcohol use	Age-adjusted results (crude results mentioned separately)	
			MEN	WOMEN
Hughes and Gove (1981)	USA / > 17 / W+M / N = 2 248	Alcohol problems & Number of drinks / month		
Joung et al. (1995)	Netherlands / 25–74 / W+M / N = 16 311	Very excessive alcohol consumption	Divorced / single & living with a partner + Not living with a partner + (vs married)	Divorced & living with a partner + Divorced / widowed & not living with a partner + (vs married)
Chilcoat and Breslau (1996)	USA / 21–30 / W+M / N = 979	Alcohol disorder symptoms & Alcohol dependence & Alcohol abuse		
Fleming (1996)	Australia / W / 17–94 / N = 3 958	Alcohol Use Disorders Identification Test		Cohabiting ++ (vs married)
Hajema and Knibbe (1998)	Netherlands / 16–69 / W+M / N = 1 327	Weekly consumption & Weekly frequency of heavy drinking	Entered marriage 0 Entered cohabitation 0 (vs living without a partner during follow-up period)	Entered marriage – – Entered cohabitation 0 (vs living without a partner during follow-up period)
Helmert and Shea (1998)	Germany / 25–69 / W+M / N = 51 326	(Almost) daily consumption	Cohabiting 0 Single, alone 0 (vs married)	Cohabiting ++ Single, alone 0 (vs married)
Power et al. (1999)	Great Britain / 23 / W+M /N = 12 537	Heavy alcohol consumption	Cohabiting + (vs married)	Cohabiting + (vs married)
Schoenborn (2004)	USA / >17 / W+M / N = 127 545	Heavier drinker	Cohabiting + (vs married)	Cohabiting + (vs married)
Sundquist and Frank (2004)	Sweden / 25–64 / W+M / N = 4 440 035	Hospital admission for alcohol abuse	Living without a partner or cohabiting without children ++ (vs cohabiting with children or married)	Living without a partner or cohabiting without children ++ (vs cohabiting with children or married)
Caetano et al. (2006)	USA / > 17 / W / N = 10 576	Heavier drinking		
Deklyen et al. (2006)	USA / parents of 1 to 1.5-year-old children / W+M / N = 7 540	Heavy drinking	Cohabiting ++ (vs married) (Crude)	Cohabiting ++ (vs married) (Crude)
Fryar et al. (2006)	USA / > 19 / W+M / N = 9 471	Heavier drinking	Cohabiting + (vs married)	Cohabiting + (vs married)
van Gelder et al. (2006)	Finland, Italy, Netherlands / 65–84 / M / N = 1 014	Alcohol consumer	Staying living alone ++ Entering living alone ++ (vs living with others during follow-up period)	

M = men, W = women

Further adjustments
Married persons had the lowest number of drinks per month as well as the lowest levels of alcohol problems, whereas those living alone had the highest levels and those living with someone other than a spouse had levels in between. The results were adjusted for age, gender, family income, education, and race.
More age-adjusted results: Women defined as "single & living with a partner", "single & not living with a partner" and "living with parents or others" had lower levels of alcohol consumption than did married women. Among men, those living with parents or others had high levels of alcohol consumption.
Longitudinal data: The incidence of alcohol disorder symptoms was significantly higher among those who were never parents throughout the follow-up period than among those who became parents for the first time. Similar results were reported for the incidence and persistence of alcohol dependence and alcohol abuse. The results were adjusted for age, gender, race, and education.
Longitudinal data: Other results adjusted for age, education, and drinking measures at t1 do not differentiate between marriage and cohabitation, but entering the role of a spouse / partner associated with decreased consumption among men aged 20 or over. Becoming a parent associated with decreased heavy drinking among both genders as compared to those who were not parents. (Decreased consumption was statistically nonsignificant)
Further adjustment for urbanisation, education, and immigrant status reduced the hazard for hospital admission among those living without a partner or cohabiting without children by ~16%, but their excess hazard for hospitalisation remained statistically significant.
Cohabiters had significantly higher odds for heavier drinking as compared with the married after adjustment for age, ethnicity, education, employment status, and income level.
Further adjustment for age, education, race / ethnicity, immigrant status, shared and nonshared children, and whether Medicaid paid for the child's birth had little effect on the excess heavy drinking of cohabiters.

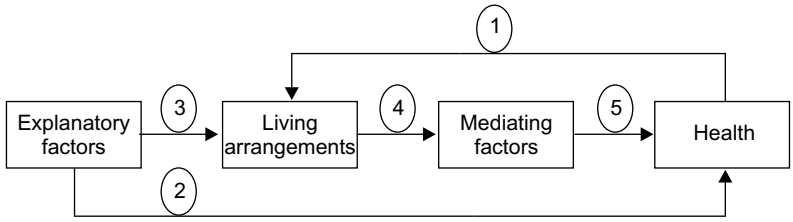
With regard to other living arrangements, a Swedish study reported that men and women living without a spouse or cohabiting without children had high rates of hospital admission for alcohol abuse (Sundquist and Frank 2004). A Dutch study assessed a living arrangement group that included mainly subjects living with their parents, and found that these men, but not women, had noticeably higher levels of excessive alcohol consumption than did married persons (Joung et al. 1995). In short, the unhealthy alcohol use of persons living with someone other than a partner remains largely unknown (Table 5).

With regard to living with children, the low propensity for heavy drinking among married persons may actually reflect the anticipation of parenthood, which has been reported to reduce drinking and smoking among Finnish men (Hyssälä et al. 1992). American and Dutch studies have shown that becoming a parent associates with reduced risk for developing "alcohol symptoms" (Chilcoat and Breslau 1996), reduced frequency of heavy drinking (Hajema and Knibbe 1998), and a lower likelihood of acquiring or maintaining an alcohol use disorder (Chilcoat and Breslau 1996) among both genders. In conclusion, convincing evidence from Finland and other countries suggests that parenthood associates with consequently reduced unhealthy alcohol use (Table 5).

2.2 Explanations for the association between living arrangements and health

The association between living arrangements and health can be explained in a variety of ways. According to the "direct" health-related selection theory (Arrow 1 in Figure 1), healthy people are more likely to enter and maintain a marriage or consensual union than those who are unhealthy, whereas less healthy persons are more likely to lose their partner and family and remain living alone or with someone other than their partner. According to "indirect" selection, various factors increase the likelihood of poor health (Arrow 2 in Figure 1) as well as the probability of remaining in a state of living alone or with someone other than a partner or becoming separated from a partner with whom one has married or cohabited (Arrow 3 in Figure 1). These factors precede both living arrangements and health, and therefore may partly explain the association between living arrangements and health ("explanatory factors", Figure 1). In accordance with the social causation theory (Arrows 4 and 5 in Figure 1), marriage or cohabitation may have a health-promoting or -protecting effect, whereas living alone or with someone other than a partner may have a detrimental effect on health. Living arrangements are not assumed to shape one's health as such but the effect is mediated by a number of factors ("mediating factors", Figure 1).

Figure 1. Schematic representation of the role of explanatory and mediating factors in the association between living arrangements and health.



Specific factors may, however, represent different roles in this scheme. For example, in this study the more "severe" dimensions of unhealthy alcohol use are outcome measures, and thus the association between alcohol use and living arrangements may reflect direct selection. When regarding other outcome measures, the "milder" dimensions of unhealthy alcohol use are possible explanatory or mediating factors. Also the role of socioeconomic factors may be either explanatory (leading to indirect selection) or mediating. For example, being unemployed and having financial difficulties may exacerbate marital problems and cause poor health. In this instance, socioeconomic factors lead to indirect selection. On the other hand, sharing the costs of daily living with a partner may alleviate financial difficulties, while divorce often worsens one's economical situation, which in turn may lead to health problems. Thus socioeconomic factors may operate as mediating factors

The following sections describe previous findings on the role of selection and causation in health differences between living arrangement groups as well as the evidence-based relative contribution of selection and causality. The literature is drawn mainly from Northern European and North American countries and Australia, as these Western countries have undergone fairly similar demographic changes. However, cultural differences between and within these countries limit the extent to which the following findings can be generalised.

2.2.1 Explanations based on health-related selection

Direct health-related selection

Direct selection may function either through a lower likelihood of marriage or q greater likelihood of marital breakdown among the unhealthy. Numerous studies support the notion that poor somatic and mental health, as well as alcohol-related health problems, discourage people from marrying (Mastekaasa 1992; Fu and Goldman 1996; Waldron et al. 1997; Prescott and Kendler 2001), although not all studies support these findings

(Gortmaker et al. 1993; Fu and Goldman 1996; Joung et al. 1998). Some researchers have suggested that selection may be limited to persons with the most serious health impairments (Gortmaker et al. 1993). Regarding cohabitation, some evidence indicates that cohabitation may be selective of persons with depressive symptoms (Horwitz and White 1998) and that psychological distress increases the likelihood of the breakdown of a cohabiting union (Pevalin and Ermisch 2004), whereas other well-conducted studies found no support for such selective effects (Brown 2000; Kim and McKenry 2002).

With regard to selection out of living with a partner, some evidence suggests that chronic conditions or physical impairments (Waldron et al. 1997; Joung et al. 1998), psychological distress (Simon 2002; Wade and Pevalin 2004), alcohol use disorders (Chilcoat and Breslau 1996), and other psychiatric disorders (Kessler et al. 1998; Overbeek et al. 2003) increase the likelihood of consequent divorce, and psychological distress has been shown to increase the likelihood of abandoning cohabitation (Pevalin and Ermisch 2004). However, other studies have found no support for selection out of marriage due to longstanding illnesses or poor self-rated health (Cheung 1998), psychological distress (Booth and Amato 1991) or alcohol problems (Horwitz et al. 1996). One must bear in mind that poor mental health may partially reflect underlying marital conflicts and stress prior to divorce, and consequently may not necessarily be the underlying factor causing the breakdown of the union in the first place (Simon 2002; Overbeek et al. 2003; Wade and Pevalin 2004).

The positive health effects of living with a partner or other persons may be offset by the fact that poor health sometimes requires living with someone. Therefore persons with poor health or detrimental health-related behaviour may benefit more from marriage, and thus may be more likely to (re)marry and less likely to exit marriage (Lillard and Panis 1996; Cheung and Sloggett 1998). Moreover, those least able to manage life on their own or with a partner, due to poor resources or poor health, may be selected into living with someone other than a partner (Lillard and Waite 1995).

In short, the literature on the role of direct health selection in choosing to live or to remain living without a partner is inconsistent, and the true direction of the association is difficult to ascertain even with rigorous analyses of longitudinal data. Although some data support direct selection, indirect selection may be even more important than direct health-related selection (Fu and Goldman 1996), especially among the younger population, where the prevalence of poor health is relatively small (Joung et al. 1998).

Indirect selection

Characteristics of social environment in childhood, such as parental adversities and family structure in childhood, as well as educational level, urbanisation (Statistics Finland 2005), and religious activity (Kääriäinen et al. 2003; Niemelä 2007), are likely to preceed living arrangements. These factors are also connected to mortality (Koskinen and Martelin 1994; Sorlie et al. 1995; Sauvola et al. 2001; Turrell et al. 2007), poor self-rated health (Anson 1989; Joung et al. 1995), poor mental health (Anda et al. 2002; Gispert et al. 2003; Breslau et al. 2004; Korkeila et al. 2005) and unhealthy alcohol use (Anda et al. 2002; Yang et al. 2007) on the one hand, and with marital status and living arrangements on the other. Thus, these factors may increase the risk for poor health and the probability of remaining unmarried or living alone, or becoming separated from one's partner and family, and may be regarded as reflecting indirect selection.

Divorce has been found to be more common among those Finns (Huurre et al. 2006), and lone parenthood to be more common among those Canadians (Cairney et al. 2003), who had experienced parental divorce or other adversities in childhood. In the United States, receiving welfare and not living with both parents in youth, as well as lower education levels, tend to associate with higher rates of cohabitation, as these factors may reflect differential abilities to marry (Bumpass and Sweet 1989; Brown 2004). On the other hand, high levels of parental education, which may reflect liberal attitudes, have been shown to associate with high rates of cohabitation prior to marriage (Bumpass and Sweet 1989), and yet another American study reported that those with high education levels have relatively low marriage rates (Fu and Goldman 1996). Furthermore, other studies found no support for the association between educational level and living arrangements (Hughes and Gove 1981; Wu and Balakrishnan 1995; Simon 2002). Finnish men with low education levels have been found less likely to be married than those with higher levels of education (Koskinen and Martelin 1994). Despite some contrasting findings, the evidence supports some degree of selection in terms of a less-advantaged social environment among cohabiters than among married persons.

Attitudes towards the acceptability of cohabitation are likely to be affected by other factors beyond parental education. Little religious activity or practicing a non-mainstream religion have been shown to predict a low likelihood of marriage (Wu and Balakrishnan 1995; Fu and Goldman 1996) and a relatively high likelihood of cohabitation (Manting 1996; Horwitz and White 1998), which also associates with having an urban background (Manting 1996). Although one American study showed no association between being Catholic and cohabiting prior to marriage (Bumpass and Sweet 1989), compelling evidence shows that factors related to religion and urbanisation associate with the likelihood to cohabit. Less is known about the association between religious activity and other living arrangements.

Other factors that may preceed both living arrangements and health include socioeconomic circumstances and health-related behaviour. For example, the stress and financial strain of unemployment may lead to poor health on the one hand (Dooley et al. 2000), and to marital problems on the other hand (Vinokur et al. 1996; Howe et al. 2004). Unemployment and low income have also been found to predict a lower likelihood to marry (Fu and Goldman 1996; Lichter et al. 2006). Furthermore, financial problems have been shown to be more common among those who enter cohabitation than among those who enter marriage (Horwitz and White 1998). Regarding health-related behaviour, excess alcohol consumption or heavy drinking, which predict an array of other health problems, have been found to associate with a lower likelihood to marry (Fu and Goldman 1996; Prescott and Kendler 2001). Heavy drinking may also predict a higher likelihood of losing one's partner (Cheung 1998), although another study found no propensity for selection out of marriage as a consequence of heavy drinking (Power et al. 1999). In addition to their role in indirect selection, socioeconomic circumstances and health-related behaviour are also mechanisms of social causation.

2.2.2 Explanations based on social causation

Living with a partner is believed to benefit health through social regulation and social integration into society as well as through the psychosocial and socioeconomic consequences of having a partner. These factors in turn affect morbidity and mortality both directly and through positive health-related behaviour. Not living with a partner is assumed to negatively affect health due to relatively lower levels of the previously mentioned health promoting factors as well as to the emotional stress and grief that results from transitioning to, and to some extent from remaining in, a state of living with someone other than a partner or of living alone (Bowling 1987; Anson 1989; Umberson 1992; Wyke and Ford 1992; Joung 1996; Martikainen and Valkonen 1996a).

Psychosocial factors

The terms "psychosocial factor" and "psychosocial determinant of health" have been used in reference to a wide range of variables from individual psychological and work-related factors to macro-level legal and welfare structures (Martikainen et al. 2002). This study focuses on intrapersonal psychosocial factors, such as social support, as they are likely to be more important determinants of health differences between living arrangement groups than, for example, work-related factors (Chandola et al. 2004). Lack of social support is a widely studied psychosocial factor that has been shown to predict mortality (Kotler and Wingard 1989; Avlund et al. 1998) and to associate with poor SRH (Ren 1997), high levels of psychological distress (Harrison et al. 1999; Wu et al. 2003), depressive symptoms (Romanov et al. 2003; Wu et al. 2003; Brown et

al. 2005), and alcohol dependence (Thundal et al. 1999). Social support and social control as well as grief and strain are psychosocial factors that may also be influenced by living arrangements; psychosocial factors are therefore likely to mediate the association between living arrangements and health.

The loss of a spouse through divorce or death is usually a source of major grief, stress and worry due to the role transition per se as much as to the loss of social and material support. Excess mortality has been shown to be highest shortly after bereavement (Kaprio et al. 1987; Martikainen and Valkonen 1996b), when grief is likely to be experienced most intensely, although a recent study did not fully support this general finding (Hart et al. 2007). A dissolved consensual union as well as entry into lone parenthood or into living alone may associate with similar grief, strain and worry.

Among other factors, social support comprises emotional and practical support and social contacts (Suurmeijer et al. 1995). A partner is one of the most important sources of emotional and practical support, and thus support is readily available to married and cohabiting persons with good relationship quality (Ross et al. 1990; Wyke and Ford 1992). The social support of marriage tends to benefit men more than women (Gerstel et al. 1985; Wyke and Ford 1992; Joung et al. 1997), whereas women may have a larger variety of sources of support (Fuhrer et al. 1999). Social contacts are another dimension of social support, and they also reflect social integration. The social networks of persons living with someone are expanded by contact with other persons living in the household, and thus are probably more socially integrated than those living alone. One study has reported that cohabiters are less likely than married persons to have neighbourhood friends (Brown et al. 2005), but cohabiters' general level of social integration into society is probably closer to that of married persons than to that of persons living without a partner.

Relationships may provide social control of health behaviour through the facilitation of health-promoting behaviour as well as through sanctions and physical interventions of detrimental health behaviour. Marriage appears to provide more social control for men, although the regulating agents among both genders are most often the partners. Children may also provide social control, particularly for women (Umberson 1987; Umberson 1992). With regard to the trend toward individualisation in the Western world (van de Kaa 1987; Beck and Beck-Gernsheim 1995), such forms of social control probably vary in time. According to a recent study, social control of drinking appears to differ among Finnish couples of various age groups (i.e. "old" couples tend to use stronger strategies, whereas "young" couples tend to use mild control strategies), and thus the forms of social control reflect the degree of individualisation in relationships (Suonpää 2005). Social control is not only health-enhancing, however, as social control in personal relationships associates with both a healthier lifestyle as well as with relatively high levels of psychological distress (Lewis and Rook 1999).

Socioeconomic factors

Poor socioeconomic circumstances, which are related to factors such as non-employment, financial situation and poverty, may affect health through various mechanisms such as health damaging behaviour, distress, control of one's life circumstances, or hormonal factors (Martikainen and Valkonen 1996c; Marmot 2002; Steptoe et al. 2002). Compelling evidence suggests that unemployment status, housing tenure, income level and social class associate with mortality (Sorlie et al. 1995; Pensola 2003), self-rated health (Anson 1989; Ren 1997), psychological distress (Harrison et al. 1999; Wu et al. 2003), mood and anxiety disorders (Brown and Harris 1978; Bijl et al. 1998; Klose and Jacobi 2004; Laaksonen et al. 2007), and alcohol dependence (Alonso et al. 2004). Although socioeconomic factors play a role in indirect selection, they are also likely to partially mediate the association between living arrangements and health, as living arrangements may affect socioeconomic circumstances. For example, breakdown of marriage or cohabitation or becoming a single parent may lead to lower household incomes (Wickrama et al. 2006), which in turn may lead to poor health.

Women tend to benefit more than men from the good financial situation marriage often provides (Gerstel et al. 1985; Wyke and Ford 1992; Joung et al. 1997). In contrast to men and women living alone, those living with someone, and particularly those living with a partner, are able to share housing expenses as well as the costs of other goods and services. Persons living with children or with elderly parents are in a less advantaged position, as the household income per consumption unit is probably smaller than in families with more than one income-earning adult. A Dutch study found that single, divorced, and widowed persons receive lower levels of household income and experience more financial difficulties than did married persons between 25 and 74 years of age; whereas cohabiters, in contrast, had relatively high levels of income (Joung et al. 1997). In contrast, American cohabiters over 50 years of age have been found to have lower levels of household income than married persons (Brown et al. 2005). The differing findings may be partially due to the age difference of the study populations, as among the relatively younger Dutch study population, cohabiting may have been a transitory phase before entering marriage.

Health-related behaviour

Through different levels of social support and social control, for example, living arrangements are likely to affect health-related behaviour, which may thus be regarded as a mediating factor between living arrangements and health. For example, more than remaining nonmarried, entering marriage has been shown to associate with decreased alcohol consumption (Hajema and Knibbe 1998), less heavy drinking (Power et al. 1999), less alcohol abuse (Simon 2002), and a lower likelihood to develop "alcohol

symptoms" (Chilcoat and Breslau 1996). Alcohol consumption may decrease even before the actual transition to marriage (Miller-Tutzauer et al. 1991). The transition from single to cohabiting, however, does not appear to reduce heavy drinking (Hajema and Knibbe 1998). Losing a partner has been shown to associate with subsequently elevated levels of heavy drinking and alcohol-related health problems (Chilcoat and Breslau 1996; Power et al. 1999; Simon 2002). Becoming a parent has also been shown to associate with decreases in unhealthy alcohol use (Chilcoat and Breslau 1996; Hajema and Knibbe 1998). As described previously, however, health-related behaviour, and particularly unhealthy alcohol use, also play a role in selection.

Other mainly cross-sectional studies have reported that those living with a partner generally tend to have better health-related behaviour than do those living without a partner. In Germany, the Netherlands and the United States, smoking tends to be more common among cohabiters than among married persons (Joung et al. 1995; Helmert and Shea 1998; Schoenborn 2004). Moreover, German women living alone appear to report current smoking more often than do married women or women in other living arrangements (Helmert and Shea 1998). The tendency of married persons to practice positive health-related behaviour is less consistent regarding physical activity. Research has shown physical activity to be more common among German cohabiting women (Helmert and Shea 1998), but less common among American cohabiting men and women (Schoenborn 2004) than among married persons. With regard to single persons living alone, women have been found to be more physically active, whereas men were found to be less physically active than married persons (Helmert and Shea 1998). One must bear in mind, however, that a spouse may sometimes have a negative effect on health-related behaviour (Homish and Leonard 2005; Leonard and Eiden 2007).

2.2.3 The relative contribution of selection and causation

A large body of literature has discussed the roles of selection and causation in mortality differences by living arrangements (Table 2). Some evidence from the United States indicates that adjustment for health behaviours (causation) had little effect (Kotler and Wingard 1989; Davis et al. 1992), whereas adjustment for education, race, urbanisation and immigration status (indirect selection), as well as for socioeconomic factors in adulthood, such as income, employment status and housing situation (causation), reduced the excess mortality of persons in more vulnerable living arrangements (Davis et al. 1992; Lillard and Waite 1995). A Finnish study reported small reductions in mortality differences between women living with and without children after adjustments for education and socioeconomic factors in adulthood (causation) (Martikainen 1995). In a recent American study, socioeconomic factors

in adulthood, together with other factors, reduced a marked proportion (20–63%) of the excess all-cause mortality of subgroups of men not living with a partner or children (causation), whereas prior health status (direct selection) reduced all-cause mortality by only 6–35% (Ringbäck Weitoft et al. 2004). Most previous studies have grouped socioeconomic factors in adulthood (causation) together with other social factors, such as urbanisation and education (indirect selection), making it difficult to distinguish the relative contribution of causation and selection based on these studies. However, in explaining mortality differences between living arrangement groups, socioeconomic factors in adulthood appear to play a more important role than do health-related behaviours, whereas little evidence exists on the role of psychosocial factors (Table 2).

In self-rated health (Table 3), long-standing illness (direct selection) may explain some of the excess morbidity of British women living alone, as compared to women living with a partner (Macran et al. 1996). A Dutch study found that after adjustment for education, urbanisation, and religion (indirect selection), further adjustment for health-related behaviour (causation) reduced the excess morbidity of nonmarried persons by 22–31%, as compared to that of married persons (Joung et al. 1995). According to other analyses of the same data, psychosocial factors (causation) explained most of the poor self-rated health (25–55%) reported by nonmarried men, whereas socioeconomic factors and health-related behaviour (causation) had smaller effects (Joung et al. 1997). Consistent evidence from the United States (Waite and Hughes 1999), Sweden (Fritzell and Burström 2006) and Finland (Lahelma et al. 2002) shows that adjustment for socioeconomic factors in adulthood (causation) reduces morbidity differences between living arrangement groups. As in mortality differences, little evidence exists on selection. Regarding causation, not only socioeconomic factors, but health-related behaviour and psychosocial factors in adulthood may also explain some of the morbidity differences between living arrangement groups (Table 3).

Direct health-related selection may play a larger role in mental health differences than in mortality or in physical health (Tables 4a–c). For example, psychiatric distress has been shown to increase the likelihood of the breakdown of a cohabiting union rather than of the transition into marriage (Pevalin and Ermisch 2004). Other studies, however, have shown that direct selection fails to explain differences in mental health between married and cohabiting individuals (Brown 2000; Kim and McKenry 2002). Even less is known about selection into other living arrangements, although persons with poor mental health may tend to live alone or with someone other than a partner due to selection processes. With regard to causation, adjustments for psychosocial and socioeconomic factors in adulthood have been shown to reduce the excess psychological distress of lone parents by up to 73% (Hope et al. 1999). All in all, support exists for the notion that urbanisation and education (indirect selection),

and particularly socioeconomic (causation) (Hope et al. 1999; Hughes and Waite 2002; Wu et al. 2003; DeKlyen et al. 2006) and psychosocial factors in adulthood (causation) (Hope et al. 1999; Brown 2000; Cairney et al. 2003; Wu et al. 2003), strongly contribute to mental health differences between living arrangement groups. Health behaviour (causation) is likely to be of less importance, although its role has rarely been assessed separately (Tables 4a–c).

Based on the literature on unhealthy alcohol use, support exists for both direct and indirect selection into living without a partner in the first place or due to a dissolved union (Chilcoat and Breslau 1996; Fu and Goldman 1996; Horwitz and White 1998; Prescott and Kendler 2001), but little is known about selection into living alone or with someone other than a partner. A Swedish study reported that adjustment for urbanisation, education and immigrant status (indirect selection) reduces the likelihood of hospitalisation for alcohol abuse among persons not living with a partner (Sundquist and Frank 2004) (Table 5). An American study reported little effect of factors such as education and immigration status (indirect selection) and receiving welfare (causation) on the excess drinking of cohabiters, as compared to that of married persons (DeKlyen et al. 2006). All in all, relatively few studies have assessed the role of causation in differences in unhealthy alcohol use by living arrangements (Table 5).

In short, the literature supports the notion of social causation, but a degree of selection may be operating simultaneously, particularly regarding differences in mental health and unhealthy alcohol use. Regarding different pathways of social causation, socioeconomic factors in adulthood appear to contribute more than do health-related behaviour and psychosocial factors, but this preliminary conclusion is biased because the previous literature has focused mainly on socioeconomic factors in adulthood. Furthermore, one must be careful in interpreting analyses of cross-sectional data, as selection or causation processes can only be hypothesised (Tables 2–5).

2.3 Framework of this study

This study assesses the relationship between living arrangements and health, and is based on theories regarding health-related selection and social causality. This study operationalises living arrangements by composing a crude ordinal scale indicator of the assumed quantity and quality of the social bonds of persons living in different living arrangements (Kobrin and Hendershot 1977; Hughes and Gove 1981; Anson 1989; Ross 1995).

Marriage is the reference group, or "cornerstone", used by most researchers interested in the relationship between living arrangements and health. Marriage is thought to reflect the most profound commitment to a significant other, and embodies unique

health-enhancing interaction between the husband or wife as well as overall social integration into society and increased social connections with other social groups, such as in-laws. Cohabitation resembles marriage, but does not bear all the characteristics of marriage. Thus, cohabiters are likely to experience some measure of emotional and practical support and to profit from economies of scale (Waite 1995; Joung 1996), but the level of attachment to a partner may be less intense among cohabiters (Axinn and Thornton 1992; Brines and Joyner 1999; Brown 2000). Cohabitations also tend to be shorter than marriages (Kurdek and Kurdek 1991; Haskey 2001), which prevents cohabiters from fully benefiting from the long-term protective effect of living with a partner (Lillard and Waite 1995). All in all, cohabitation may carry only some of the benefits of marriage (Waite 1995), and tends to be burdened by relationship instability (Ren 1997; Brown 2000). At the same time, marriages or consensual unions with poor relationship quality are likely to provide little emotional support; indeed, such living arrangements may be even more detrimental to health than not living with a partner (Salokangas et al. 1988; Ross 1995; Ren 1997; Brown 2000; Robles and Kiecolt-Glaser 2003; Uebelacker et al. 2006). Due to lack of data, however, this study makes no distinction between unions of high or poor relationship quality.

The presence of others in the household may partially compensate for the absence of a partner. Living with one's child(ren), parent(s), sibling(s) or friend(s), however, probably differs from living with a partner in terms of the quality of the social bonds between members of the household (Anson 1989; Ross 1995). In other words, the presence of any other person in the household may not provide the same health benefits as living with a partner (Helsing et al. 1981). Other persons may even adversely affect health due to excessive demands and lack of privacy (Hughes and Gove 1981). Finally, I assume that despite potential social networks outside the household, persons living alone are isolated from the most intimate, steady social relationships and related health-enhancing social and economic bonds (Kobrin and Hendershot 1977; Hughes and Gove 1981; Ross 1995).

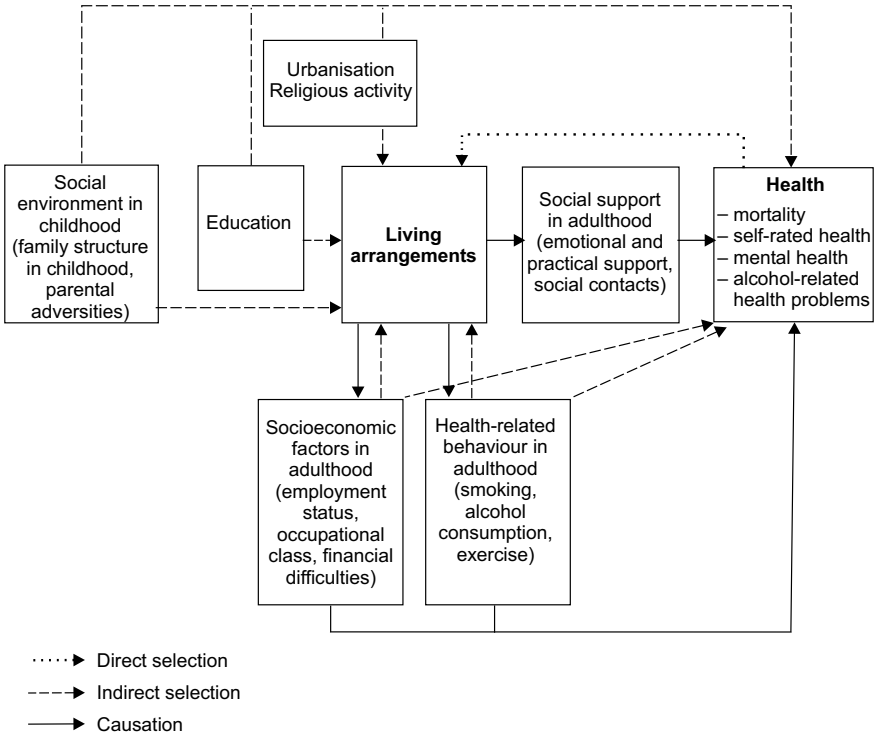
In the previous chapters I have described how gender, social environment in childhood and youth as well as socioeconomic circumstances, psychosocial factors, and health-related behaviour are connected to living arrangements and various dimensions of ill health. With regard to specific factors assessed in this study, I hypothesise that social environment in childhood (family structure in childhood and parental adversities) as well as educational level, urbanisation level and religious activity usually precede both living arrangements and health. Although this study measures current education, urbanisation and religious activity, these factors are probably determined earlier in the course of one's life. Educational level is usually achieved by the age of thirty, which is the minimum of the age range of this study. Moreover, one's place of residence is generally stable by the age of thirty; in the Finnish population, for example, the

propensity for intermunicipal migration declines rapidly after the age of 29 (Statistics Finland 2005). Furthermore, in Finland, religious activity is determined mainly by values rooted in one's family in childhood and youth (Kääriäinen et al. 2003; Niemelä 2007). Thus, social environment in childhood, educational level, urbanisation level and religious activity are assumed to reflect mainly indirect selection, and these factors may partially explain the association between living arrangements and health.

With regard to potential mechanisms of social causation, the level of perceived social support in adulthood (i.e. by the age of thirty) is likely to mediate the association between living arrangements and health. Socioeconomic factors in adulthood (occupational class, employment status and financial situation) as well as health-related behaviour in adulthood (smoking, alcohol consumption and exercise) may play corresponding mediating roles. However, these factors are known to affect both health and living arrangements and vice versa, and they also have a role in indirect selection (Power et al. 1999; Prescott and Kendler 2001; Howe et al. 2004; Lichter et al. 2006; Wickrama et al. 2006). Furthermore, the specific variables are heterogenous. For example, different pathways may lead to adopting the habit of smoking or excessive alcohol consumption as well as to avoiding or quitting adverse health-related behaviour. Therefore, socioeconomic factors and health-related behaviour reflect both selection and causation. Furthermore, gender may modify the association between living arrangements and health.

The simplified model (Figure 2), partially based on previous models of the relationship between marital status and health (Joung et al. 1997; Kiecolt-Glaser and Newton 2001), outlines the framework of this study and presents living arrangements, health and associated factors in this study as operationalised. Most of these associations are likely to be reciprocal to some extent, and these factors share many other connections between one another. Education, for example, is known to determine socioeconomic factors, and social environment in childhood partially determines health-related behaviour in adulthood (Kestila et al. 2006). For the sake of clarity, those connections which are not the focus of this study do not appear in this simplified model.

Figure 2. Simplified model of living arrangements, health and associated factors as operationalised in this study.



3 AIMS OF THE STUDY

Several researchers have assessed health differences by official marital status groups, and some evidence exists on the excess mortality of persons living alone, the poor self-rated health of lone parents and the poor mental health and excess unhealthy alcohol use of cohabiters. Less is known about the health of the working-age population in other living arrangements. The literature on morbidity trends and on cause-specific mortality and psychiatric disorders by living arrangements is particularly scarce. The overall aim of this study was to determine the magnitude and trends of health differences by living arrangements with regard to different dimensions of ill health. In addition, this study aims to assess the role of other factors to health differences by living arrangements. The numbers in brackets refer to the original articles (I–IV).

The specific aims of the study were:

1. To assess how living arrangements affect mortality, and to assess the contribution of factors related to education and other socioeconomic factors, as well as different causes of death, to these differences in the population aged 30 and over (I)

2. To study the relationship between self-rated health and official marital status and cohabitation, to quantify the change in these patterns of health from 1978–80 to 2000–01, and to quantify the extent to which these differences and their changes are due to changes in education, other socioeconomic factors and health-related behaviour in the working-age population (II)

3. To determine how psychological distress and psychiatric morbidity vary according to living arrangements, and to evaluate how social factors in childhood and youth, as well as socioeconomic, psychosocial, and behavioural factors in adulthood, contribute to differences in mental health according to living arrangements in the working-age population (III)

4. To determine how heavy drinking and alcohol dependence vary according to living arrangements, and to evaluate how social factors in childhood and youth, as well as socioeconomic and psychosocial factors in adulthood, contribute to differences in unhealthy alcohol use according to living arrangements in the working-age population (IV)

4 MATERIALS AND METHODS

This study used data from two cross-sectional health examination surveys and one population register data set linked to cause-of-death registers. Tables 6 and 7 summarise the characteristics of the data and the study populations. Table 8 summarises the variables used in substudies I–IV, which describe these variables and their classifications in detail.

Table 6. Characteristics of the data.

Name of data	Type of data	Target population	Period	Sample	Substudy
Mini-Finland Survey	Cross-sectional health survey	The whole Finnish population aged 30 or over	1978–1980	8 000 (3 637 men, 4 363 women)	II
Health 2000 Survey	Cross-sectional health survey	The whole Finnish population aged 30 or over	2000–01	8 028 (3 637 men, 4 391 women)	II, III, IV
Linked census data	Population register data linked to cause-of-death registers	The whole Finnish population aged 30 or over	Census records at the end of 1995, mortality follow-up 1996–2000	Total population	I

Table 7. Study populations in substudies I–IV.

Substudy	Data	Age range (years)	Participants	Participation rate
I	Linked census data	30 and over	15.7 million person-years, 210 139 deaths	> 99.5% of deaths were linked to a census record
II	Mini-Finland Survey Health 2000 Survey	30–64	N = 5 862 [a] (Mini-Finland Survey)	96%
			N = 5 405 [a] (Health 2000 Survey)	92%
III	Health 2000 Survey	30–64	N = 4 685 [a] (mental disorders)	80%
			N = 4 638 [a] (psychological distress)	79%
IV	Health 2000 Survey	30–54	N = 3 722 [a] (heavy drinking)	81%
			N = 3 573 [a] (alcohol dependence)	78%

[a] The number of subjects with data on living arrangements and the specific health measure in question

Table 8. Study variables in substudies I–IV.

Substudy	Living arrangement or marital status	Associated variables	Outcome
I	Married, cohabiting, living with someone other than a partner, living alone	Education, occupational class, employment status	Mortality
II	Married, cohabiting, single, divorced, widowed	Education, smoking, long-standing illness	Self-rated health
III	Married, cohabiting, living with someone other than a partner, living alone	Family structure in childhood, parental adversities, education, urbanisation, unemployment, having children, emotional help from others, practical help from others, social contacts, smoking, alcohol consumption, exercise	Any depressive disorder, any anxiety disorder, psychological distress
IV	Married, cohabiting, living with someone other than a partner, living alone	Social environment in childhood (family structure, serious conflicts within the family, financial problems, either parent's drinking problem, either parent's mental health problem), education, urbanisation, religious activity, main activity, financial difficulties, emotional and practical help from others, social contacts	Heavy drinking, alcohol dependence

General statistical methods for substudies I–IV

The analyses were performed with Stata statistical software 8.0 (StataCorp. 2003) and all analyses were conducted separately for men and women. Subjects with missing information on marital status, household size, or the outcome measure were excluded. Only variables associated with both living arrangements and health measures among either gender were included in the further analyses ($p < 0.1$). The statistical significance of the difference in the prevalences between the categories of the variables in question was based on the Wald test. Interactions between living arrangements and the other independent variables were examined by including one interaction term in the model at a time. The percentage change in the association between living arrangements and mortality or morbidity after adjusting for a specific variable was calculated as 100x [(OR(base model)–OR(base model+variable))/(OR(base model)–1)]. In analyses on mortality and self-rated health, ORs were substituted by RRs and CORs (Substudies I–IV, Appendix A).

Sections 4.1–4.3 present the description of the data and methods in connection with each outcome variable.

4.1 Analyses of mortality (Substudy I)

4.1.1 Data

The linked census data include a wide range of sociodemographic information and cause-specific mortality, and cover the total population of Finland: approximately five million persons (Valkonen and Martelin 1999; Martikainen et al. 2005). The data set combines successive Finnish quinquennial censuses from 1970 to 2000 and is linked to all deaths by cause in the period 1971–2000. Substudy I is based on the 1995 census and population records of men and women aged 30 or over linked to the records of all deaths during the period 1996–2000. The data set contains additional background information from the data files of the National Board of Taxation and the Social Insurance Institution of Finland. The linkage of the data set has been carried out by Statistics Finland by means of personal identification codes. Less than 0.5% of the deaths could not be linked to the census data. People living in non-private households (1.4% of all person years), persons with missing information on marital status, household size or household, as well as married persons not living together (altogether 1.3% of all person years), were excluded from the analyses in Substudy I; thus the final dataset includes 15.7 million person-years and 210 139 deaths.

4.1.2 Description of variables

Living arrangements and associated factors

In analyses of the census data, living arrangements were classified as married, cohabiting, living with someone other than a partner, and living alone. Living arrangements were identified based on information on official marital status, household size, and cohabitation as defined by Statistics Finland: "…two spouseless adults of different sex aged 18 and over and occupying the same dwelling on a permanent basis, provided their age difference is less than 16 years and they are not siblings" (Statistics Finland 2001). This definition does not cover same sex partners, whereas some persons who do meet these criteria do not live in a relationship. The analyses also used data on official marital status and on the number of co-resident children under the age of 18.

Educational level was based on the highest completed educational degree or certificate and included seven educational categories. Occupational class included eight social classes, and unemployed and retired persons were classified according to their previous occupation. For persons aged 30 to 64, their main activity was classified as follows:

economically active persons; retired persons, including persons on disability or old age pension; and others, including homemakers, students, other family members, and subjects whose source of income was unknown. Age was classified into five-year groups, and the oldest age group consisted of persons aged 90 or over.

Mortality

Information on cause of death was based on the Finnish versions of the ninth and tenth revisions of the International Classification of Diseases (ICD). Statistics Finland grouped some of the causes of death in order to provide a cruder classification of eight groups for men (ischaemic heart disease, other cardiovascular diseases, lung cancer, other cancer, alcohol-related causes, other accidents excluding alcohol poisonings, other diseases, and suicide) and nine groups for women (same as for men plus breast cancer). Causes of death that associated with alcohol included alcohol-induced diseases of the nervous system, myocardium and digestive system as well as alcohol-induced poisonings and foetal injuries (ICD10: F10, G312, G4051, G621, G721, I426, K292, K70, K860, K8600, O354, P043, X45) (Mäkelä 1998).

4.1.3 Statistical methods

In mortality analyses of the census data, the cell served as the unit of analyses. Age-adjusted prevalences were estimated by means of conventional direct standardisation. Poisson regression was used to calculate mortality differences between the living arrangement groups. The analyses were carried out separately for persons aged 30–64 and 65 or over. Age, education, occupational class and employment status were sequentially adjusted for in order to elaborate upon the additional effect on mortality of each new sociodemographic factor. The results appear as relative mortality rates (RR).

4.2 Analyses of self-rated health (Substudy II)

4.2.1 Data

The Mini-Finland Survey was a cross-sectional health interview and examination survey carried out in Finland in 1978–80 (Aromaa et al. 1989) (Substudy II). The information was obtained through carefully standardised interviews, questionnaires and measurements using, whenever feasible, well-established formulations derived from prior Finnish national surveys and from international surveys. The study began

with a health interview at the person's home or in the place where the subjects was under institutional care. Next, everyone was invited to participate in the initial phase of the health examination, which served as a screening phase for subsequent follow-up and in-depth examinations. The Social Insurance Institution's Mobile Clinic Unit conducted the health examination. Substudy II is based on information derived from these interviews and self-administered questionnaires.

The Health 2000 Survey was a cross-sectional health interview and examination survey carried out in Finland from fall 2000 to spring 2001 (Aromaa and Koskinen 2004). The survey data are based on information from interviews and questionnaires. In addition, subjects were invited to attend a comprehensive health examination, including a standardised, fully structured psychiatric interview. Nurses visited the homes of those subjects who did not attend field examinations. The aims of the Health 2000 Survey included determining changes in health since 1978–80. Therefore, special emphasis was given to choosing the same measurements as in the Mini-Finland Survey whenever feasible; therefore the two data sets provide a solid basis for analysis of time trends.

The Health 2000 Survey and the Mini-Finland Survey are based on stratified two-stage cluster samples representing the whole country. The participation rates of both surveys were high. Substudy II included over 90% of the samples in the age group 30–64 (Table 7).

4.2.2 Description of variables

Official marital status and cohabitation

Based on self-reported data, marital status and cohabitation was classified as married, cohabiting, single, divorced or separated, and widowed. In the Mini-Finland Survey, marital status was reported spontaneously, whereas in the Health 2000 Survey, the marital status categories were read aloud before answering.

Associated factors

Education was classified as basic (no matricular examination and, at most, a vocational course or on the job training), intermediate, or higher education (university qualification). Smoking represented health-related behaviour and was classified as never smoker, ex-regular-smoker, and current regular smoker. Data on current occasional smoking were available only for the Health 2000 Survey; subjects in this category were classified as ex-regular-smokers. Long-standing illness was inquired as follows: "Do you have any condition or long-standing illness that limits your work or functional ability? (Yes/No)." Age was treated as a continuous variable.

Self-rated health

Substudy II assessed trends in self-rated health, which is a simple yet powerful global measure of health (Manderbacka 1998; DeSalvo et al. 2006). In the surveys, the question was asked as follows: "I would next like to inquire about matters concerning your health and illnesses. Is your present state of health..." followed by a precoded answering scale: "good, rather good, moderate, rather poor, or poor?" The Mini-Finland Survey included an additional answering category: "cannot say"; those 28 subjects who had chosen this category were excluded from the analyses of the Mini-Finland Survey data.

4.2.3 Statistical methods

Age-adjusted prevalences were estimated by means of direct standardisation. The analyses were performed with the Survey procedures of Stata statistical software 8.0, which take into account the sample design. Taylor linearised variance estimation was used (StataCorp. 2003). Ordinal logistic regression was used in order to assess the whole range of self-rated health, rather than to determine a threshold for "poor health". Adjusted cumulative odds ratios (COR) with 95% confidence intervals (CI) were calculated, and the association between marital status, cohabitation and SRH was calculated separately for the two data sets. Education, smoking, and long-standing illness were sequentially adjusted for in order to elaborate upon each factor's additional effect on self-rated health. The two data sets were combined in order to test the statistical significance of changes in the marital status pattern of SRH.

4.3. Analyses of mental health and unhealthy alcohol use (Substudies III–IV)

4.3.1 Data

The analyses were based on the Health 2000 Survey, which section 4.2.1 describes in more detail. The thorough health examination included a fully structured psychiatric interview and a questionnaire on alcohol consumption. In the age groups 30–64 and 30–54, data on mental health and unhealthy alcohol use were available for 78–81% of the sample, the variation resulting from slightly different data available for each measure (Table 7). Data missing on mental health or unhealthy alcohol use is mostly due to the subjects' failure to attend the separate health examination.

4.3.2 Description of variables

Living arrangements

In analyses of the survey data, two variables served to identify living arrangements: self-reported marital status and household size. Living arrangements were classified as married, cohabiting, living with someone other than a partner, and living alone.

Associated factors

Factors related to social environment in childhood included family structure in childhood and parental adversities. Family structure in childhood was based on the question "When starting school (that is, when you were about seven years old), did you live…" followed by four answering categories. Subjects who reported having lived with one parent, with relatives, or in an institution, were classified as "not living with both parents". Parental adversities were based on the question: "When you think about your growth years – that is, before you were aged 16…?" followed by a list of 11 adversities. In substudy III, "parental adversity" was defined as reporting one or more adversity of the following adversities: parents' divorce, serious conflicts within the family, either parent's drinking problems, and either parent's mental problems. In substudy IV, reported adversities were classified into: long-term financial problems in childhood, either parent's mental health problem, either parent's drinking problem, and serious conflicts within the family.

Other social factors that were likely to preceed living arrangements included education and urbanisation (Substudies III–IV) as well as religious activity (Substudy IV). Education was classified as in substudy II. The level of urbanisation was classified as "urban" (=ten largest cities), "other urban or semi-urban", and "rural municipalities". Subjects who reported attending church or practicing other religious activities at least once a month were defined as engaging in "religious activity".

Socioeconomic factors in adulthood included main activity (Substudies III–IV) and financial difficulties (Substudy IV). In substudy III, the variable reflecting main activity was unemployment, which was defined as being currently unemployed or laid off. In substudy IV, main activity was classified as "full-time or part-time employed", "other" (i.e. student, retired, or taking care of the household or of family members), and "unemployed or laid off". Based on answers to the question "How would you describe the current balance between income and expenditure in your household?", financial difficulties were categorised as "no", "some", or "major difficulties".

Factors related to social support in adulthood included perceived emotional and practical help from others as well as social contacts. The availability of help from others was based on the questions "Who do you think really cares about you no matter

what happened to you?" and "From whom do you get practical help when needed?". Respondents could choose several of the following alternatives: spouse/partner, other relative, friend, fellow worker; neighbour, no one. In substudy III, the categories "two or more persons", "one person", and "no one" were constructed from the total score. In substudy IV, the answers were dichotomised into "two or more persons" and "no one or one person". Social contacts were classified as "rare" if subjects reported visits with family, friends or neighbours a few times a year or less.

Substudy III also assessed factors reflecting health-related behaviour in adulthood, including smoking, exercise and alcohol consumption. Smoking was classified as in substudy II. Data on exercise were based on the question "How much do you exercise and strain yourself physically in your leisure time?"; and subjects who chose the category reflecting the least amount of exercise were classified as practicing "no exercise". Alcohol consumption was recorded by inquiring separately about the consumption of beer, cider and long drinks in the past month. The total consumption was converted into grams of alcohol per week. One portion equalled 12 grams of alcohol. For men, we used the categories "no alcohol", "1–23 portions/week", and "24 or more portions per week", and for women, "no alcohol", "1–15 portions/week", and "16 or more portions per week".

In substudy III, subjects reporting one or more child were defined as having children.

Psychological distress

The General Health Questionnaire (GHQ) is a self-report questionnaire for assessing current mental state, and has proven to be a valid and reliable measure of psychological distress (Goldberg 1972; Goldberg et al. 1997; Martin 1999; Pevalin 2000). The original scale was designed to be a screening instrument and included questions on different dimensions of psychological distress, such as symptoms of depression, anxiety, sleep disturbance and social functioning. The original scale included 60 questions (Goldberg 1972), but several shorter versions have since been constructed (e.g. GHQ-12, GHQ-28 and GHQ-36) (Goldberg et al. 1997). The Health 2000 Survey includes the 12-item scale. The questions assess symptoms the subject may have experienced during the preceding weeks, and the four answering categories reflect possible changes in these symptoms: e.g. "better than usual", "as good as usual", "worse than usual", and "much worse than usual". The method is based on calculating the total score for the different items. The first two answering categories reflecting no change or a change to the better constitute zero points, and the last two categories indicating a worsening of the symptom constitute one point (Goldberg 1972). Thus, each separate item can be dichotomised in order to calculate the sum score. In GHQ-12, the sum score ranges from 0 to 12 points, with higher scores indicating greater distress. In the Health 2000 Survey, a minority of the subjects reported psychological distress regardless of the

threshold value (Aromaa and Koskinen 2004). Thus, in substudy III, the caseness threshold is between three and four GHQ points.

Any depressive disorder, any anxiety disorder, and alcohol dependence

The Composite International Diagnostic Interview (CIDI) is a widely used, fully structured psychiatric interview (Wittchen and Pfister 1997) that enables the assessment of the prevalence of DSM-IV mental disorders (American Psychiatric Association 1994). The CIDI has been found to have good reliability and validity (Wittchen et al. 1998; Pirkola et al. 2005b). The CIDI assesses psychiatric morbidity in different time frames, but this study included mental disorders only from the previous 12 months. In addition, the DSM-IV diagnoses were grouped in such a way as to obtain a cruder classification. "Any depressive disorder" comprised major depressive disorder and dysthymia, and "any anxiety disorder" comprised panic disorder, social phobia, agoraphobia and generalised anxiety disorder. The two groups overlapped, so that subjects with both diagnoses were included in both groups (Substudy III). Those diagnosed with alcohol dependence included both those with pure alcohol dependence as well as those with alcohol dependence and any other psychiatric diagnosis (Substudy IV).

When referring to results from this study, the term "poor mental health' includes the three outcome variables "psychological distress", "any depressive disorder" and "any anxiety disorder".

Heavy drinking

Alcohol consumption was recorded by asking separately about the past month's consumption of beer, cider and long drinks (in the Finnish context, a "long drink" refers to a specific ready-mixed mild gin-flavoured alcoholic beverage, wine, and spirits). The total consumption was converted into grams of alcohol per week. Based on the Finnish Current Care Guideline for the treatment of alcohol abuse, heavy drinking was classified as 280 or more (men) and 140 or more (women) grams of alcohol per week (Working group appointed by the Finnish Society of Addiction Medicine 2006).

When referring to results from this study, the term "unhealthy alcohol use" includes the two alcohol-related outcome variables "heavy drinking" and "alcohol dependence".

4.3.3 Statistical methods

The analyses were performed with the survey procedures of Stata statistical software 8.0 (StataCorp. 2003). Age-adjusted prevalences were estimated by means of the

predictive margins approach (Graubard and Korn 1999). Logistic regression models were the main statistical methods used to analyse the morbidity differences between the living arrangement groups. Adjusted odds ratios (OR) with 95% confidence intervals (CI) were calculated, and the potential explaining or mediating variables were adjusted for first separately or in sets in a presumed causal order. Finally, all variables were simultaneously included in a logistic regression model.

5 RESULTS

5.1. Distribution of living arrangements in the working-age population

At the turn of the 20th century, about two thirds of Finnish working-age men and women were married, and slightly more than 10% were cohabiting. About 10% lived with someone other than a partner, and slightly more than 10% lived alone. The small variation in the prevalences of living arrangements in substudies I–IV is due to differing definitions of living arrangements in census data and survey data (Table 9). About two thirds of married persons, and about two fifths of cohabiters lived with children at least part time. Among persons living with someone other than a partner, living with children was much more common among women than among men (Substudy I, Table 1; Substudy IV, Table 1). The proportions of cohabiting, single and divorced persons increased substantially between the two decades, and the proportions of married men and women and widowed women correspondingly decreased (Table 9; Substudy 2, Table 2).

5.2. Mortality (Substudy I)

In the working-age population, living arrangements associated strongly with all-cause mortality (Figure 3; Substudy I, Table 2). Compared to their married counterparts, cohabiting men and women had excess mortality of about 70%. Those men living with someone other than a partner and those living alone had three-fold higher mortality than that of married men. Among women, the mortality of the corresponding groups was only slightly higher than that of cohabiters. In all living arrangement groups among both genders, those with no children had higher excess mortality than that of those living with two or more children (Substudy I, Figure 1). In the elderly population, the relative mortality differences were smaller than among the working-age population. Other living arrangement groups had only 15–40% higher mortality than did married persons (Substudy I, Table 2). Regarding mortality differences by official marital status, mortality was lower among widowed persons than among single or divorced persons, when adjusted for education, occupational class and employment status. Divorced men tended to have the highest mortality, whereas the mortalities of divorced and of single women differed little (Substudy I, Figure 2).

In alcohol-related causes of death, as compared to all other causes, the relative mortality of non-married groups was highest, except among older women living alone or with someone other than a partner. Alcohol-related causes were followed by “other accidents” among men and working-age women, and by lung cancer in women. All other non-cancer causes of death showed greater relative differences between living arrangements among working-age women than did all-cause mortality.

Correspondingly, greater relative differences among working-age men were observed only for alcohol-related causes, "other diseases" and **"**other accidents". Working-age women, as well as older men and women living alone, had high mortality from suicide (Substudy 1, Table 3).

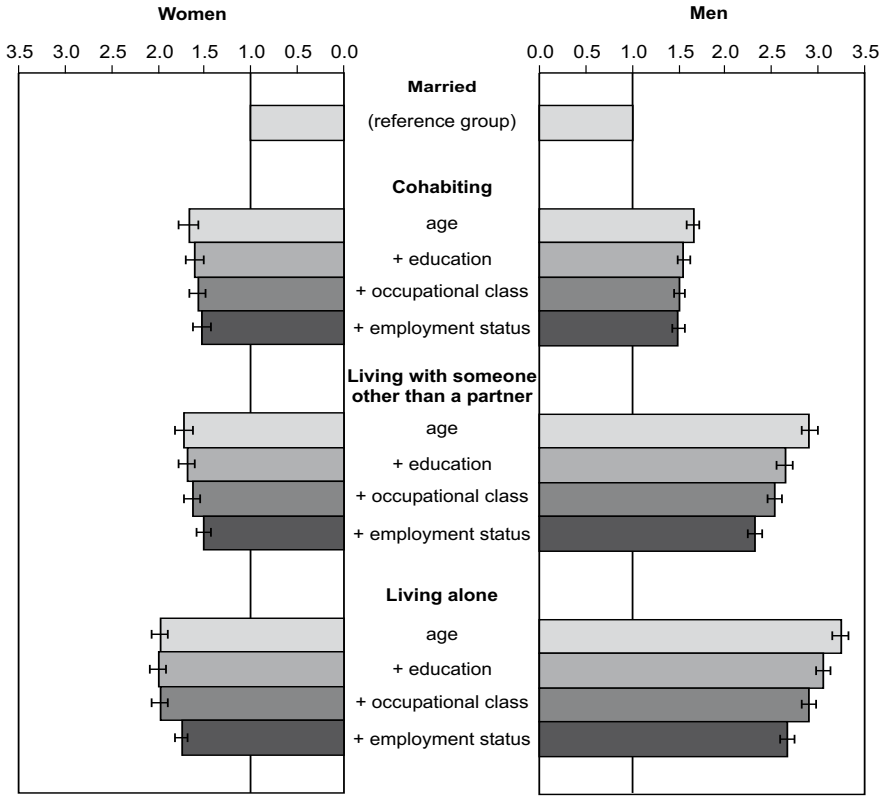
The adjustment for socioeconomic factors reduced the excess all-cause mortality of the nonmarried groups by 21–31% in the working-age population, and by only 7–14% in the elderly population (Figure 3; Substudy I, Table 2). There were no differences in the capacity of different socioeconomic factors to explain or mediate mortality differences by living arrangements.

Table 9. Prevalence (%) of marital status or living arrangements among working-age men and women in substudies I–IV.

Living arrangement / marital status	**Substudy I (age group 30–64)**	**Substudy II (age group 30–64)**		**Substudy III (age group 30–64)**	**Substudy IV (age group 30–54)**
Time period	[a] Follow-up 1996–2000	1978–80	2000–01	2000–01	2000–01
WOMEN					
Married	63	74	60	62	61
Cohabiting	11	2	13	13	15
Living with someone other than a partner	12			9	11
Living alone	13			16	14
Single		9	11		
Divorced		7	12		
Widowed		8	3		
N	6.044 million person-years	3042	2784	2460	1990
MEN					
Married	60	79	59	63	59
Cohabiting	13	3	14	14	16
Living with someone other than a partner	12			6	7
Living alone	15			17	18
Single		12	16		
Divorced		5	9		
Widowed		1	1		
N	6.025 million person years	2820	2621	2225	1850

[a]Living arrangement defined on 31 December 1995; percentage based on person-years at follow-up

Figure 3. Relative mortality by living arrangements in 1996–2000, adjusted for age and socioeconomic factors, men and women aged 30–64 years (RR with 95% CI).



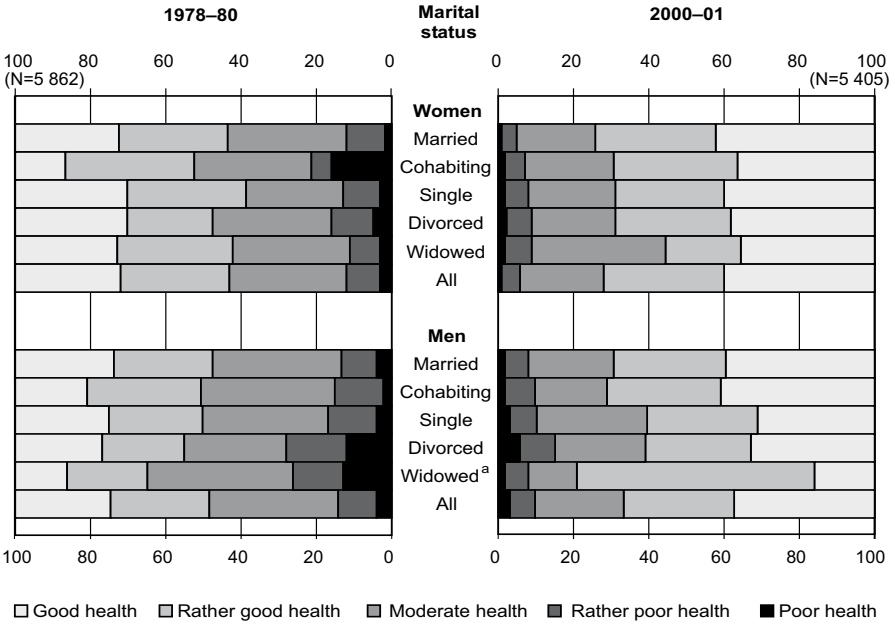
5.3. Self-rated health (Substudy II)

In 1978–80, as compared to married men, divorced men reported the worst SRH (COR 1.74, 95% CI 1.18–2.55), which was partly attributable to their lower level of education (Substudy II, Table 4). With no statistical significance, single and cohabiting men reported slightly higher morbidity, whereas widowed men reported somewhat lower morbidity than did married men. In 2000–01, all nonmarried men reported excess morbidity. The SRH of cohabiting and widowed men did not differ from that of married men, but single (COR 1.55, 95% CI 1.22–1.99) and divorced (COR 1.55, 95% CI 1.17–2.05) men had the worst health. The excess morbidity of single men was mostly attributable to their low level of education and common long-standing illnesses, and among divorced men, to their low level of education and common smoking habit (Substudy II, Table 4).

Among women in 1978–80, cohabiting and divorced persons had excess morbidity, whereas single and widowed persons had slightly lower morbidity than did married women (Substudy II, Table 5). Cohabiting women had the worst health (COR 1.85, 95% CI 1.29–2.63) and comprised the only nonmarried group that differed significantly from married persons even after adjustment for education, smoking and long-standing illnesses. In 2000–01, all nonmarried women reported excess morbidity, but only the excess morbidity of widowed women was statistically significant (COR 1.53, 95% CI 1.04–2.26). The excess morbidity of widowed women was mostly attributable to their long-standing illnesses and low level of education (Substudy 2, Table 5).

In general, the proportion of good and rather good SRH increased between 1978 and 2001 (Figure 4; Substudy II, Table 3). Based on analyses of the interaction between marital status and period, the changes in the marital status patterns in SRH were not statistically significant (p=0.231 for men, p=0.097 for women). However, the interaction analyses suggest that the relative improvement in SRH was not as large among single men and single or widowed women as among other marital status groups. On the other hand, the SRH of cohabiting women has improved relatively faster than among other women (Figure 4; Substudy II, Table 3).

Figure 4. Age-adjusted distribution (%) of self-rated health by marital status in 1978–80 and 2000–01; men and women aged 30–64 years.



[a] Age categories (30–34) and (35–39) were combined when adjusting for age

5.4 Mental health (Substudy III)

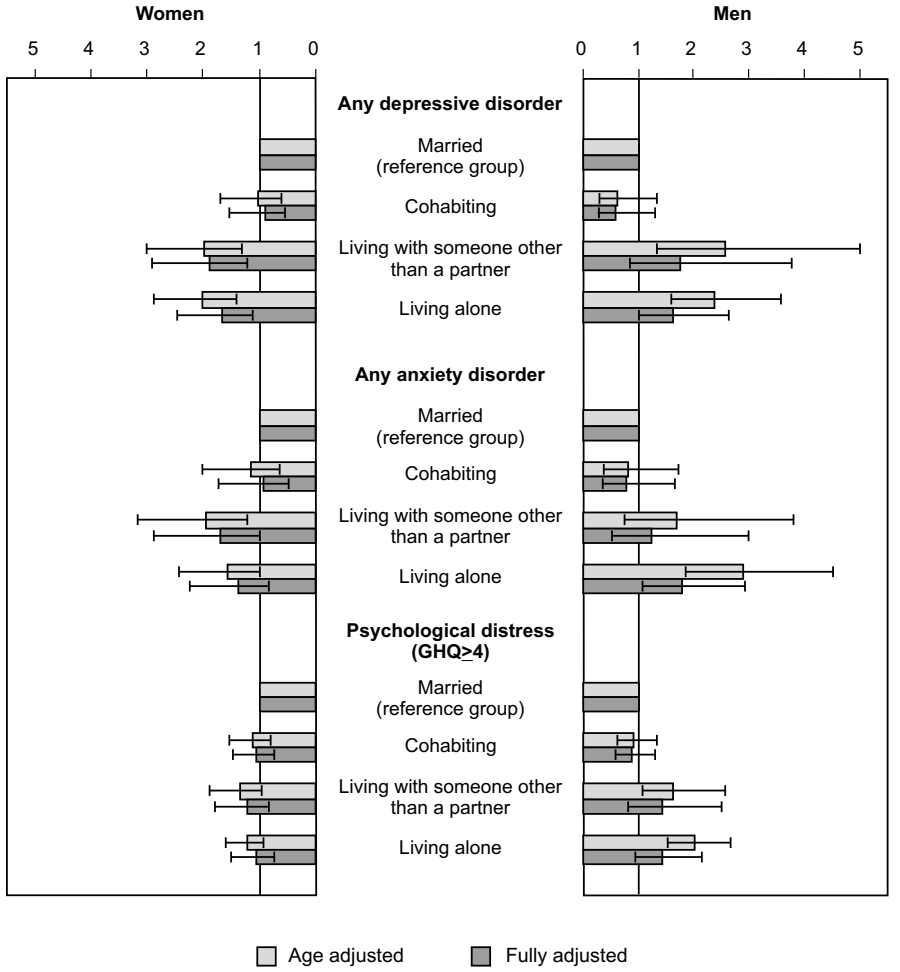
Mental health differed significantly by living arrangements. Those living alone or with someone other than a partner were approximately twice as likely as married persons to have any depressive disorder, any anxiety disorder, or psychological distress, with stronger associations in men (Figure 5; Substudy III, Tables 3–5). No significant differences in psychological distress were observed between women's living arrangement groups (Figure 5; Substudy III, Table 5). Cohabiters did not significantly differ from married persons in terms of any mental health measure (Figure 5; Substudy III, Tables 3–5).

Adjusting for social environment in childhood had little effect on excess morbidity from anxiety or depressive disorders, and adjustment for educational level had little effect on excess morbidity from anxiety disorders among persons living alone or with someone other than a partner. Adjusting for unemployment, however, reduced their excess morbidity from anxiety or depressive disorders by about 10–50%, adjusting for lack of social support by about 10–40%, and adjusting for heath-related behaviour by about 10–35%. Finally, adjusting for all variables reduced their excess morbidity by about 50–65% in men, and by about 10–35% in women (Substudy III, Tables 3–4). Regarding psychological distress among men living alone or with someone other than a partner, unemployment, lack of social support and excess alcohol consumption reduced their excess morbidity by about 20–30% each, and adjusting for all variables reduced excess morbidity by about 35–55% (Substudy III, Tables 5).

5.5 Unhealthy alcohol use (Substudy IV)

All nonmarried groups had higher odds for heavy drinking than did married persons, with stronger associations in men (Figure 6; Substudy IV, Table 3). Adjustment for urbanisation reduced the elevated odds for heavy drinking among nonmarried women by about 15–45%, and adjustment for religious activity reduced the odds of cohabiting women by 15%. Adjustment for main activity and financial difficulties reduced the relative odds of men living alone by about 15% and 5%, respectively. The factors adjusted for did not markedly differ from each other in their capacity to reduce the relative odds among men living with someone other than a partner (Substudy IV, Table 3).

Figure 5. Differences in the 12-month prevalence of any depressive disorder, any anxiety disorder and psychological distress in 2000–01, adjusted[a] for age, social environment in childhood and youth, socioeconomic factors, social support, and health-related behaviour; men and women aged 30–64 years (OR with 95% CI).



[a]Variables include: social environment in childhood (i.e. family structure in childhood; having a parental adversity score of one or more, parent's divorce, serious conflicts within the family, either parent's drinking problem, either parent's mental health problem), other social characteristics (i.e. education), socioeconomic factors (i.e. unemployment, having children), social support (i.e. emotional help from others, practical help from others, social contacts), and health-related behaviour (i.e. smoking, alcohol consumption).

Figure 6. Differences in the one-month prevalence of heavy drinking and the 12-month prevalence of alcohol dependence in 2000–01, adjusted[a] for age, social environment in childhood and youth, socioeconomic factors, and social support variables; men and women aged 30–54 years (OR with 95% CI).

[a]Variables include: social environment in childhood (i.e. family structure in childhood, serious conflicts within the family, either parent's drinking problem, financial problems in childhood), other social characteristics (i.e. education, urbanisation, religious activity), socioeconomic factors (i.e. main activity, financial difficulties), and social support variables (i.e. emotional help from others, social contacts).

Cohabiters and persons living alone were two to four times as likely to have alcohol dependence as were married persons, with only nonsignificant differences between persons living with someone other than a partner and married persons (Figure 6; Substudy IV, Table 4). Adjustments for factors connected to social environment in childhood and socioeconomic factors in adulthood reduced the excess morbidity of cohabiting women by about 10% each, but no such associations were found in cohabiting men. Among men and women living alone, adjustments for main activity and financial difficulties reduced their relative odds by about 5–30% each. Other marked reductions in persons living alone were found after adjustment for urbanisation and social support variables among women, and for either parent's drinking problem among men (Substudy IV, Table 4).

Living with children did not associate with heavy drinking among either gender (Substudy IV, Table 2), and no significant interaction existed between living arrangements and living with children. Regarding alcohol dependence, those women with no co-resident children were three times as likely to have alcohol dependence than women with co-resident children, but no such association was found in men (Substudy IV, Table 2). Those cohabiting men and women living without children had relatively higher odds for alcohol dependence than those living with children, whereas among men living with someone other than a partner, it was those living with children who were more likely to be alcohol dependent (Substudy IV, Figure 1).

5.6. Summary of the contribution of factors associated with living arrangements and health in substudies I–IV

The contributions of associated factors (i.e. percentage change in RR, COR or OR as described under Methods) have been calculated for eight variable groups for different outcome measures; the results appear in Appendix A.

Factors related to social environment in childhood were assessed in studies III and IV. All in all, they explained 7–15% of excess poor mental health and 2–22% of excess unhealthy alcohol use. No consistent differences existed in the explanatory contributions of these factors between genders or between living arrangement groups.

Regarding men's anxiety disorders, education explained 10–14% of nonmarried men's morbidity as compared to that of married men. Regarding mortality and SRH, education explained 0–60% of nonmarried persons' excess mortality and morbidity, with larger percentage reductions among men.

The largest explanatory effect (30–43%) of urbanisation level and religious activity was in heavy drinking among all nonmarried women as compared to that of married women. Regarding women's alcohol dependence or either measure of unhealthy alcohol use among men, the percentage reductions were only 1–14%.

All in all, the contribution of social environment in childhood, as well as education, urbanisation and religious activity, was modest.

Adjustments for social support in adulthood produced percentage reductions of up to 61% for excess poor mental health. The reductions in poor mental health were consistently larger among men living with someone other than a partner and among women living alone, than among married men and women. The reductions for excess unhealthy alcohol use among nonmarried persons were relatively small (3–15%).

Socioeconomic factors in adulthood (i.e. occupational class, employment status, and financial difficulties) were assessed in three original articles (I, III–IV), and adjustments for these factors produced large percentage reductions in nonmarried women's (3–29%) and men's (11–68%) excess mortality and morbidity (i.e. mental health and unhealthy alcohol use). Compared to the married, the largest reductions occurred among those living with someone other than a partner, followed by those living alone, and finally the smallest reductions occurred among cohabiters.

Health-related behaviour in adulthood explained 8–40% of nonmarried persons poor SRH and poor mental health as compared with that of married persons, with no marked gender differences. The largest reductions occurred in divorced men's and women's poor SRH in 2000–01 (33 and 40%), and in anxiety disorders of men living with someone other than a partner (33%) and of men living alone (34%).

Socioeconomic factors and health-related behaviour explained up to two thirds of the excess mortality and morbidity of the nonmarried groups.

Altogether, adjustments for factors included in studies I–IV reduced the excess morbidity and mortality of cohabiters to a lesser extent than among other nonmarried groups. Regarding differences between health measures, the percentage changes were smallest in mortality. In heavy drinking, the reductions were larger among women, and in depressive and anxiety disorders, the reductions were larger among men.

6 DISCUSSION

6.1 Main findings

6.1.1 Mortality

The *first* main finding was that living arrangements associated strongly with all-cause mortality, particularly in the working-age population, where the mortality of men living with someone other than a partner and of men living alone was two to three times as high as that of married men. The mortality in the corresponding groups of women was only slightly higher than that of cohabiters, who had excess mortality of about 70%. Alcohol-related causes of death showed the widest mortality differences between living arrangement groups. Adjusting for socioeconomic factors in adulthood reduced the excess all-cause mortality of the nonmarried groups by 21–31%, and therefore the excess mortality of the nonmarried groups appeared to be associated with factors other than socioeconomic ones. In comparison to other measures in this study as a whole, differences in alcohol-related mortality produced the largest health differences by living arrangements.

Regarding this study as a whole, the widest health differences by living arrangements were found in mortality from alcohol-related causes of death. Cause-specific mortality differences by marital status showed the widest differences in causes related to alcohol, accidents and violence, as well as to infectious diseases (Gove et al. 1990; Joung et al. 1996; Kposowa 2000; Martikainen et al. 2005; Kaplan and Kronick 2006). Alcohol-related causes of death in Finland between 1976 and 2000 have been found to contribute largely to increased mortality differences by marital status (Martikainen et al. 2005). However, few studies have assessed the contribution of different causes of death to mortality differences by living arrangements. In substudy I, alcohol-related causes were followed by accidents among men and working-age women, and by lung cancer in women. On the one hand, alcohol-related causes of death may reflect the selection of persons with severe alcohol-related health problems into not living with a spouse. On the other hand, high levels of alcohol-related causes of death may reflect causation in the nonmarried groups through mechanisms such as relatively lower levels of social control of health-related behaviour, as well as alcohol consumption as a means of alleviating stress. Lung cancer is likely to reflect similar effects of smoking among nonmarried women. Working-age cohabiting women's relatively high mortality from alcohol-related diseases and lung cancer is a new finding, which suggests that the health-promoting or -protecting effect of marriage does not fully apply to cohabitation, although selection may play a minor role. Among nonmarried men, "other accidents" and violence may reflect a risk-taking lifestyle as well as previously mentioned stress-related factors.

In a recent Swedish study, selection, in terms of prior hospitalisation for a variety of diagnoses, played a marked role in mortality from violent deaths, accidents and suicide among men not living with both a partner and children (Ringbäck Weitoft et al. 2004). Unfortunately, in this study no data were available on hospitalisation or other factors related to selection besides education. However, there were no differences in the capacity of different socioeconomic factors to explain or mediate mortality differences by living arrangements. Thus, the excess mortality of the nonmarried groups was probably associated with other factors such as the level of social support and health-related behaviour.

With regard to persons living alone, our findings are in agreement with those of several reports from the United States, which have reported that among the working-age population, persons living alone tend to have higher mortality than married persons and others living with someone (Helsing et al. 1981; Davis et al. 1992; Sorlie et al. 1995; Rogers 1996). However, the association may not to apply to elderly persons, among whom living alone may actually reflect relatively good health and the ability to manage on one's own. One Danish study of only 228 deaths does not support this general finding (Lund et al. 2000), but other American and Danish studies have reported that it is elderly women, rather than men, living alone who appear to enjoy equal or even better health than women living with someone (Davis et al. 1992; Sorlie et al. 1995; Avlund et al. 1998). This study found support for previous findings, as the mortality of elderly women living alone was close to that of married elderly women. However, the excess mortality of elderly men living alone was not particularly elevated either, although it was higher than that of their female counterparts. All in all, mortality differences between living arrangements were smaller among the elderly than among the middle aged.

Some previous studies have assessed dimensions of living arrangements other than merely living alone versus not, but these studies did not separate cohabiters from persons living with someone other than a spouse (Davis et al. 1992; Lillard and Waite 1995). Therefore, this study is among the first to report the excess mortality of cohabiters as compared to the married. Among working-age men and women, the excess mortality of cohabiters was largest in causes related to alcohol-related diseases and lung cancer. Furthermore, among women, the excess mortality due to these causes even exceeded the excess mortality of women living with someone other than a partner and of women living alone. Thus, detrimental health behaviour appears to play a large role in the excess mortality of working-age cohabiters.

Other studies support our finding that persons living with someone other than a partner have relatively higher mortality than do married persons, but lower mortality than do persons living alone (Davis et al. 1992; Lillard and Waite 1995; Ringbäck Weitoft et al. 2004). However, groups assessed by previous studies are even more heterogenous

than the one assessed in this study, as we separated cohabiters from persons living with other adults or children, and because this study had information on children. In this study, among persons living with someone other than a partner, those living with children under the age of 18 had lower mortality than did persons living with adults. Therefore adults living with elderly parents, siblings or unrelated persons appear to be in a particularly disadvantaged position.

The mortality differences in working-age men followed the assumed quantity and quality of the social bonds of persons in different living arrangements. In all separate causes of death, married men had the lowest mortality, followed by the elevated mortality of cohabiters, men living with someone other than a partner, and finally men living alone. Among working-age women, cohabiters had higher mortality than did other nonmarried groups in causes related to lung cancer and alcohol-related diseases. Compared to the working-age population, the association between living alone and health differs among elderly age groups. Thus, the scale indicator did not apply to working-age women or to elderly persons.

6.1.2 Self-rated health

The *second* main finding was that, although the proportion of good and rather good SRH increased, the changes in the marital status patterns in SRH between 1978 and 2001 were statistically nonsignificant. However, the relative improvement in SRH has not been as large among single men and single or widowed women as among other marital status groups, whereas the SRH of cohabiting women improved relatively faster than that of other women. In comparison to other health measures in this study as a whole, differences in SRH by official marital status and cohabiting were relatively small.

Over the past twenty years, the proportions of cohabiting, single and divorced persons have increased, whereas the proportions of married persons and widowed women in the working-age population have decreased. Thus cohabitation, divorce and remaining single are more common and more socially accepted in Finnish and in other Western societies today than they were twenty years ago (Ramsoy 1994; Manting 1996; Thornton and Young-DeMarco 2001). In contrast to the 1970s, when cohabitation was considered divergent behaviour or a protest against bourgeois marriage, today it is generally accepted as a positive, transitory state that often leads to marriage (Ramsoy 1994; Manting 1996; Thornton and Young-DeMarco 2001). Despite these major demographic changes and their potential implications for a population's health, relatively little is known about morbidity trends by marital status and living arrangements in Finland or other Western countries. Due to the lack of data on lone parenthood in this study, these results cannot be related to the literature on the health of lone parents (Bartley et al. 1999; Fritzell and Burström 2006). This study found that the

differences in SRH between marital status groups had not diminished. Accordingly, a previous study on long-standing illnesses reported small but statistically insignificant reductions in relative morbidity differences between marital status groups in Norway between the early 1970s and late 1980s (Elstad 1996).

Due to the scarcity of evidence on trends in SRH by living arrangements, results from this study are compared to morbidity trends assessed by other measures. A Dutch study found that between 1975 and 1996, single persons became progressively more likely to report depressive symptoms than married persons (Meertens et al. 2003). A Finnish study on mortality trends reported that between 1976 and 2000, mortality declined in all marital status groups, but least among single persons (Martikainen et al. 2005). An American study found that among the nonmarried groups, single persons had the highest mortality as compared to that of married persons (Kaplan and Kronick 2006). This study supports the notion of less improvement in the health of single persons than in that of married persons. The relatively worse health of single men in 2000–01 was partially explained by their low level of education and common long-standing illnesses, which may reflect selection into remaining single (Macran et al. 1996; Ringbäck Weitoft et al. 2004). Furthermore, marriage is still socially expected and valued in Finland and in other Western countries (Thornton and Young-DeMarco 2001; Cherlin and Cherlin 2004). Consequently, never-married single persons may be the group that is currently regarded as exceptional in society, in contrast to cohabiters who are likely to marry their partners, and to divorcees who once managed to enter marriage. Some researchers have suggested that single persons are most severely isolated, as they are likely to lack contact with children and other family members (Kaplan and Kronick 2006).

According to Swedish census data, the mortality of cohabiting women, but not of men, declined between 1980 and 1985, and a slight increase in the mortality of both genders between 1985 and 1990 was probably due to a marriage peak resulting from a reform in 1990 in the pensions for widows (Prinz 1995). Although mortality is not equivalent to morbidity, this study found support for the previous study, as the self-rated health of cohabiting women, but not of men, improved more than did that of other groups between 1978 and 2001. Regarding this gender difference, women may be more exposed to social pressure than men are, and therefore a change in general attitudes may affect their health more strongly than men's. The modest contributions of education, smoking or long-standing illnesses made no difference to cohabiters' excess poor SRH among either gender in either time period. Nevertheless, cohabitation today is connected to a wider variety of advantages and disadvantages than in earlier times (Manting 1996). Although the marriage protection hypothesis may not be extended to cohabiting persons (Ren 1997), cohabitation clearly provides some measure of protection against poor health beyond that enjoyed by those not living with a partner.

Divorced persons remained the group that reported relatively poor health in both time periods. Despite being more common today, divorce probably remains a disappointment and a source of great grief and distress to individuals. A Dutch study found that between 1975 and 1996, divorced persons became progressively less likely than married persons to report depressive symptoms (Meertens et al. 2003), but the study found no improvement in the relative position of divorced persons. In this present study, low education and smoking contributed to the worse health of divorced men in 2000–01.

The proportion of widowed persons has decreased over the past twenty years, and the SRH of widowed women has improved more than that of other groups. Their improved educational status may also reflect more financial independence and thus less dramatic effects on health after the loss of a spouse. No definite conclusions can be drawn on the health of widowed men, as their number was very small among the working-age population.

6.1.3 Mental health

The *third* main finding was that living arrangement groups differed in terms of mental health. Those living alone or with someone other than a partner were approximately twice as likely as married persons to have any depressive or anxiety disorder. Similar associations were found in psychological distress among men, but there were no significant differences in psychological distress among women. Cohabiters did not differ from married persons in terms of any mental health measure. Adjustment for unemployment, lack of social support, and heavy drinking attenuated the excess morbidity of persons living alone and of those living with someone other than a partner by about 10–50% each. In relation to other measures in this study as a whole, there were relatively large differences in psychiatric morbidity by living arrangements, but somewhat smaller differences in psychological distress.

In line with the literature (Kurdek and Kurdek 1991; Bijl et al. 1998), men and women living alone had higher levels of psychiatric morbidity than did married persons. This present study broadens the previously reported general trend by including both genders in a single study while assessing men and women separately.

The finding that the prevalence of psychiatric disorders between cohabiters and married persons differed is supported by previous studies on the mental health of Finnish, Canadian and American cohabiters, which have found cohabiters to have modest excess morbidity as compared to that of married persons, but the majority of the associations have been weak and of no statistical significance (Lindeman et al. 2000; Wu et al. 2003; DeKlyen et al. 2006).

Some evidence suggests that cohabiters may exhibit more depressive symptoms than do married persons (Kurdek and Kurdek 1991; Brown 2000). These American studies assessed men and women together, and presented results adjusted for various factors; it is therefore it is difficult to compare their results to those of substudy III. Psychological distress has been found to be more common among female cohabiters than among married women, in the United States (Schoenborn 2004) and Great Britain (Willitts et al. 2004). The American study reported a similar but smaller association among men (Schoenborn 2004), whereas the British study found psychological distress to be relatively uncommon among cohabiting men (Willitts et al. 2004). A Finnish study from 1978–80 found that depressive symptoms and psychological distress were more common among cohabiting men, and particularly among cohabiting women, than among married men and women (Lehtinen et al. 1991). All in all, the literature supports the differing findings on men and women in this study. Regarding each mental health measure, cohabiting women had relatively worse health, and cohabiting men had relatively better health, than did their married counterparts, but these results were statistically nonsignificant. The gender difference may partially be due to union instability (Brown 2000), which may affect women more strongly than men.

Depressive and anxiety disorders were more common among men and women living with someone other than a partner, whereas psychological distress was more common only among corresponding men, than among married men and women. A multitude of previous studies that have demonstrated the relatively poor mental health of lone parents indirectly supports these findings (Bijl et al. 1998; Harrison et al. 1999; Cairney et al. 2003; Gispert et al. 2003). The group of women living with someone other than a partner consists mainly of lone mothers. Although their excess psychological distress did not quite reach statistical significance, such women may be in a more vulnerable position than married women and couple mothers. Among men, this group is can be assumed to consist of lone fathers and of adults living with their elderly parents. Some evidence suggests that adults living with adults other than a partner have high levels of depressive symptoms and mood disorders (Kurdek and Kurdek 1991; Bijl et al. 1998; Hughes and Waite 2002), but the level of psychological distress among these men has previously remained unknown. In the current Northern European context, adults seldom live with their elderly parents. Findings from substudy III suggest that these adult men may have poorer mental health than do married persons, and a Dutch study has reported that this living arrangement may not necessarily be advantageous to the elderly parents either (De Jong Gierveld and van Tilburg 1999), whereas this living arrangement does appear to benefit the well-being of elderly parents in the Mediterranean context (De Jong Gierveld and van Tilburg 1999; Zunzunegui et al. 2001).

Mental health differences by living arrangements appeared to be smaller in psychological distress, which reflects “minor” morbidity, and larger in psychiatric

disorders, which reflect more "serious" symptomology. Overall, previous studies of different determinants of mental health are difficult to compare to findings from substudy III, as the measures used for both the determinants and the mental health outcomes vary considerably. The heterogeneous literature on mental health differences by living arrangements has assessed primarily minor morbidity, and most studies on psychiatric disorders have reported morbidity differences with no statistical significance. Furthermore, few studies have assessed "minor" and "serious" morbidity in the same study. Thus, the literature provides no explanation for the larger differences in more serious morbidity found in this study. "Serious" psychiatric morbidity may discriminate living arrangements more effectively than does "minor" morbidity measured with a screening instrument. Furthermore, the finding may be connected to different time frames of the measurements, as this study assessed 12-month prevalences with the CIDI, and current psychological distress with the GHQ.

Due to culturally defined social expectations, the health effect of living in a certain living arrangement may be age-dependent. The level of psychological distress caused by transitions in marital status or living arrangements is likely to depend on whether the transition occurs at an "unusual" age, as living alone at the age of fourty or cohabiting at the age of sixty is less common and may thus cause more psychological distress (Mastekaasa 1994b; Martikainen and Valkonen 1996b).

In this study, social environment in childhood, as well as educational level, are mainly assumed to reflect selection. These factors contributed only modestly to the excess poor mental health of those living alone or with someone other than a partner, but other factors related to selection may not have been included in this study. Adjustments for a wide range of associated factors revealed that factors assumed to reflect either causation, such as lack of social support, or both causation and selection, such as unemployment and excess alcohol consumption, partially reduced the excess poor mental health of persons living alone or with someone other than a partner. However, these factors did not account for all of the differences by living arrangements; therefore, other unknown factors contribute to the excess morbidity of the nonmarried groups.

6.1.4 Unhealthy alcohol use

The *fourth* main finding of the study was that cohabiting and living alone associated with alcohol dependence and heavy drinking among both genders, and that living with someone other than a partner associated with heavy drinking. The highest odds for alcohol dependence occurred among those who cohabited without children and among those who lived alone. Adjusting for main activity and financial difficulties attenuated the odds for heavy drinking and alcohol dependence by about 5–30% each, and additionally, adjusting for urbanisation among women attenuated the odds for

heavy drinking by about 15–45%. In this present study as a whole, the widest health differences occurred in alcohol-related mortality, after which alcohol dependence by living arrangements differed the second most.

Although it is well-known that unhealthy alcohol use ranks among the world's major public health problems (Rehm et al. 2003), relatively few studies have assessed unhealthy alcohol use by living arrangements (Leonard and Eiden 2007). Men and women living alone had higher levels of both heavy drinking and alcohol dependence than did married persons. This finding is supported by scattered evidence on both genders from the United States (Hughes and Gove 1981), and on elderly men from Finland, Italy and the Netherlands (van Gelder et al. 2006). Persons living alone lack the social control other persons may receive from members of the household. Furthermore, unhealthy alcohol use and possible other detrimental health-related behaviour of persons living alone may cause people from outside the household to avoid them, and those living alone may themselves prefer to avoid persons who try to control their alcohol consumption (Umberson 1992). In short, persons living alone are likely to have limited social networks in the first place, and their excess unhealthy alcohol use may further increase their social isolation.

In support of previous findings on the excess unhealthy alcohol use of cohabiters (Fleming 1996; Power et al. 1999; DeKlyen et al. 2006; Fryar et al. 2006), both cohabiting men and women had significantly elevated levels of heavy drinking and alcohol dependence. Previous studies have lacked data on alcohol dependence; fortunately, this study provides new insight into the severity of unhealthy alcohol use among cohabiting men. The association between alcohol dependence and cohabiting women should be interpreted cautiously in a practical sense, as there were only 40 cases of alcohol dependence among women. With regard to factors contributing to little social control among other cohabiters, individuality and autonomy have been found to be more valued among cohabiting couples than among married couples in the United States (Brines and Joyner 1999). In Finland today, however, cohabitation before subsequently marrying is common, so most cohabiters are not likely to have values and ideologies that differ from those of married persons. Furthermore, because the proportion of divorces has grown in Finland, strong social control among both cohabiting and married couples may be "riskier" than before (Suonpää 2005). Nevertheless, some sort of change in lifestyle among cohabiters appears to be either a requisite for or a consequence of marriage. As cohabiters living with children had lower levels of alcohol dependence than did cohabiters living without children, anticipating or entering parenthood appears to be an additional source of social control (Hyssälä et al. 1992; Chilcoat and Breslau 1996; Power et al. 1999).

Turning to lone parenthood, men and women living with someone other than a partner had high odds for heavy drinking. However, as no statistically significant

interaction existed between living arrangements and living with children, whether lone parenthood or living with one's parents associates with heavy drinking remains unclear. Regarding alcohol dependence among men living with someone other than a partner, those living with children were more likely to be dependent on alcohol than were those living with other adults. Among women living with someone other than a partner and without children, no subjects exibited alcohol dependence. Although there is some consensus on the notion that those living with children have lower levels of unhealthy alcohol use, less is known about lone parenthood. Lone parents have been found to have elevated levels of substance use disorders (Bijl et al. 1998; Klose and Jacobi 2004; Afifi et al. 2006), but substudy IV provides only modest support for the notion of excess unhealthy alcohol use among lone parents. The relatively good health of Finnish lone mothers, as compared to that of lone mothers from many other Western countries, may be attributable to Finland's social policies and public childcare, which support women's employment (Lahelma et al. 2002).

Among the nonmarried groups of women, adjusting for urbanisation attenuated the odds for heavy drinking by about 15–45%, but no such reductions occurred in men. As a result of historical changes in the Finnish labour market, which promoted internal migration from agriculture in rural areas to manufacturing and services in urban areas, there is a surplus of women in urban areas (Kupiszewski et al. 2000). Substudy IV showed that living in urban areas was more common among women living alone or with someone other than a partner than among women living with a partner. The urban lifestyle may promote unhealthy alcohol use among women living without a partner via stressful life circumstances and little social support on the one hand (Sundquist and Frank 2004), and via a lack of social control and the availability of diverse entertainment and locations for drinking alcohol on the other hand. Although religion has rarely been assessed in studies of unhealthy alcohol use by living arrangements, religious activity has been shown to associate with high marriage rates, marital happiness and stability (Fu and Goldman 1996; Koenig 2001), as well as with low levels of unhealthy alcohol use (Koenig 2001). In this study, adjustment for religious activity reduced cohabiting women's odds for heavy drinking by 15%, but religious activity did not explain any excess unhealthy alcohol use among other nonmarried groups. Other factors that were mainly assumed to reflect selection, such as childhood social environment and education, contributed only modestly to the excess unhealthy alcohol use of nonmarried men and women.

In line with previous evidence on the associations between unemployment, unhealthy alcohol use and living alone (Bijl et al. 1998; Alonso et al. 2004; Schoenborn 2004), main activity and financial difficulties attenuated the odds for heavy drinking and alcohol dependence by about 5–30% each. Thus, these factors played a relatively large role in the excess unhealthy alcohol use of the nonmarried groups, particularly

among men. Main activity and financial difficulties, together with a lack of social support, may mediate the association between living arrangements and health, but other connections also exist between these factors. Some researchers have suggested that the alcohol problems of some cohabiting men may arise from their financial needs and consequent delayed marriages (Horwitz and White 1998). With regard to results from this present study, this notion found little support among men, but "some financial difficulties" were more common among cohabiting women than among married women.

6.1.5 Selection and causation

The *fifth* main finding was that the contribution of factors that were mainly assumed to reflect selection (i.e. social environment in childhood, education, urbanisation, and religious activity) was rather modest, but the results varied by gender. The contribution of social support, which is mainly thought to reflect causation, was also relatively small in unhealthy alcohol use, but larger in poor mental health. Socioeconomic factors and health-related behaviour, which reflect both selection and causation, appeared to play a more important role in the excess poor health of cohabiters and of persons living alone or with someone other than a partner than of married persons.

Little previous knowledge exists on the contribution of factors related to social environment in childhood, which explained about 5–20% of the excess poor mental health and unhealthy alcohol use of nonmarried men and women. Due to a lack of data, this study did not assess the contribution of social environment in childhood, or the roles of urbanisation and religious activity, to mortality differences. The largest explanatory effect (30–43%) of urbanisation level and religious activity was in the excess heavy drinking of nonmarried women, but the contribution of these factors was smaller among men. In contrast, education explained 0–60% of nonmarried persons' excess mortality and morbidity, with stronger effects among men. Education also explained 10–14% of nonmarried men's excess anxiety disorders as compared to those of married men, whereas no such association occurred among women. Previous studies have assessed mainly direct health-related selection, and reported that those with poor prior health status, disability, psychiatric distress and unhealthy alcohol use seem prone to living in more vulnerable living arrangements (Macran et al. 1996; Prescott and Kendler 2001; Pevalin and Ermisch 2004; Ringbäck Weitoft et al. 2004), although the results are inconsistent (Horwitz and White 1998; Brown 2000; Wu et al. 2003). Findings from this study suggest that gender differences may exist in the contribution of factors related to indirect selection, as urbanisation level and religious activity played a larger role among women, and education played a larger role among men, but the overall role of factors mainly assumed to reflect selection was rather modest.

The contribution of direct health-related selection to health differences cannot be estimated in detail on the basis of the census and survey data which provide no direct information on the subjects' health careers. In this study, persons living in institutions, a major part of persons most likely to be affected by direct health-related selection, were excluded from the analyses of linked census data. Furthermore, those with a serious illness from an early age are likely to live with someone other than a partner. Thus, the effects of direct health-related selection on the mortality differences between married persons, cohabiters and those living alone are likely to be small. Living with another person due to needs posed by poor health is not likely to play an important role among the working-age population assessed in this study, whereas direct health-related selection may be more important among the elderly, among whom only the healthiest are able to live alone.

Regarding causation, the level of social support appeared not only to mediate the association between living arrangements and health, but to be more important in mental health than in unhealthy alcohol use, in which adjustment for lack of social support produced only modest reductions of up to 15%. Little previous evidence exists on the role of social support and of other psychosocial factors in the unhealthy alcohol use of persons in more vulnerable living arrangements. The reductions in psychological distress and depressive and anxiety disorders were consistently greater among men living with someone other than a partner and among women living alone than among married men and women. In support of these findings, psychosocial factors, including social support, stress, and union instability, have been found to contribute markedly to the excess poor mental health of lone parents and cohabiters (Hope et al. 1999; Brown 2000; Cairney et al. 2003), but these factors have rarely been assessed in a comparable setting in studies of persons living alone.

Socioeconomic factors in adulthood (i.e. occupational class, employment status, and financial difficulties) were assessed as factors reflecting both selection and causation. Adjustments for these socioeconomic factors markedly reduced the excess mortality and morbidity of nonmarried men and women. There were no clear differences in the contribution of socioeconomic factors regarding different health measures. Compared to those of married persons, the largest reductions occurred among those living with someone other than a partner, followed by those living alone, and finally by cohabiters, with overall larger reductions among men (11–68%) than among women (3–29%). Most previous studies with even remotely comparable research frames have reported similar findings on the marked role of socioeconomic factors, and the strongest evidence focuses on differences in mortality and self-rated health (Davis et al. 1992; Lillard and Waite 1995; Lahelma et al. 2002; Ringbäck Weitoft et al. 2004; Fritzell and Burström 2006). Correspondingly, some evidence exists on mental health differences, but few previous studies have assessed the role of socioeconomic

factors in differences in unhealthy alcohol use (Wu et al. 2003; DeKlyen et al. 2006). Most previous studies have grouped socioeconomic factors in adulthood together with urbanisation and education, which this study assumes to reflect mainly health-related selection.

This study is unable to assess in detail the extent to which the different socioeconomic factors in adulthood reflect selection or causation. However, because adjustment for occupational class had little effect on mortality differences by living arrangements, its role in selection or causation is not of particular importance in this study. For the analyses of other health outcomes, this study measured current financial difficulties, which can be assumed to reflect mainly causation, although current financial difficulties may be partially based on one's socioeconomic circumstances preceding current living arrangements. Finally, whether employment status or living arrangements are determined first in one's life course remains unknown. Longitudinal studies with repeated measurements of these factors at short intervals would provide new insight into this interesting question. In conclusion, previous studies support the notion of a relatively large contribution of socioeconomic factors to differences in mortality and self-rated health, and this study increases our understanding of these factors in differences in poor mental health and in unhealthy alcohol use by living arrangements.

Health-related behaviour, including excess alcohol consumption and smoking, reduced nonmarried persons' poor SRH and poor mental health by up to 40% as compared to that of married persons, with no marked gender differences. The largest reductions of over 30% occurred in the poor SRH of divorced men and women in 2000–01, and in the anxiety disorders of men living alone or with someone other than a partner. Previously, the role of health behaviours has been found to be modest in terms of mortality differences by living arrangements (Kotler and Wingard 1989; Davis et al. 1992), but this study lacked data on health-related behaviour with regard to mortality. A Dutch study reported that together with material circumstances, health-related behaviour contributes less to differences in self-rated health than do psychosocial factors (Joung et al. 1997). This study broadens our current understanding of the role of health-related behaviour in the excess poor mental health of cohabiters, persons living with someone other than a partner and of persons living alone.

Overall, the assessed factors reflecting selection or causation or both contributed more to the excess morbidity and mortality of persons living alone than to the poor health of cohabiters, among whom other factors such as union instability may play a large role.

6.2. Methodological considerations and implications for future research

6.2.1 Data

This study focused on the working-age population aged 30 and over. On the one hand, this study did not assess younger age groups, as both the living arrangement and socioeconomic circumstances of younger persons are usually rather mobile. On the other hand, the association between living arrangements and health differs among older age groups of 65 and over among whom cohabitation is less common; moreover, living alone may actually reflect relatively good health. The health of the working-age population provides valuable information for future health policy, as the study population includes the large post-war generations, whose living arrangements and health will likely dominate major public health issues in the future. Future research on cause-specific mortality and morbidity and need-of-help trends between working-age living arrangement groups would provide valuable information for health policy.

The results can be generalised for the whole country, as all data sets were nationally representative, and Finland has a relatively homogenous population. Furthermore, the surveys had exceptionally high participation rates exceeding 90%, and the census data, which include all Finns at the end of 1995, are linked to over 99.5% of deaths between 1996 and 2000.

The mortality data provide new information on underlying causes of mortality differences by living arrangements. The linked census data are unique in that they include reliable census data on education and other socioeconomic factors with cause-specific death certificates, and cover the majority of the Finnish adult population. The follow-up was only five years, which reduces the likelihood of status transitions from one living arrangement to another during the follow-up period, a problem shared by all prospective studies. All in all, the linked census data are exceptionally well suited to mortality analysis.

Although the participation rates of the Mini-Finland and Health 2000 Surveys were exceptionally high (96% and 92% in the age group 30–64 in Substudy II), no information was available on the mental health or unhealthy alcohol use of 19–22% of the total sample (Substudies III and IV). Previous studies have reported the sociodemographic characteristics based on census data from Statistics Finland (Laiho and Nieminen 2004). The non-participation rate was highest among those living alone, as about one fifth of men and about one tenth of women living alone failed to participate in the study, due largely to refusal. Of adult men and women living with their parents, about one fourth failed to participate (Laiho and Nieminen 2004). Those who attended

only the health interview were more often single or widowed, had a lower level of education, and exhibited more symptoms of depression and psychological distress than did those who completed the CIDI interview (Pirkola et al. 2005b). Based on these data, non-participants, as well as those with missing data on the CIDI, likely included more persons living alone and more persons living with someone other than a partner, as well as more persons with poor self-rated health, poor mental health and unhealthy alcohol use. Therefore this study probably underestimates health differences by living arrangements. In addition, there is an item-specific lack of data, particularly in variables based on questionnaires.

Unfortunately, this study does not have precise information about the living arrangements of persons living with someone other than a partner. Based on available data on each subject's household size and the crude age structure of their households, 39% of men living with someone other than a partner lived in households with persons under 25 years of age (32% lived with persons under 18), who can be assumed to be their children. The corresponding proportions among women were 80% and 67%, respectively. Furthermore, 38% of men and 10% of women living with someone other than a partner lived with persons aged 65 or over, who can be assumed to be their parents. Thus, most of the women in this group appeared to be lone parents, while those living with their parents constituted a minority. About two fifths of men were lone parents and two fifths lived with their parents. Although it would have been interesting to assess these assumed subgroups separately, this study did not have enough subjects for meaningful analyses. Furthermore, no definite conclusions could be drawn about the more detailed nature of the living arrangements of subjects living with persons between the ages of 25 and 64. Future health surveys on adult populations should collect more detailed data on living arrangements, such as information on lone parenthood, living with one's parents, and living with someone other than a partner.

As the quality of the relationship in marriage or cohabitation was not assessed in the Health 2000 Survey, this study could not identify subjects in unions of poor relationship quality. Thus, this study only assessed the assumed average benefits of living with a partner, and fails to take into account the negative aspects of intimate relationships. Poor relationship quality is known to associate with poor self-rated health, poor mental health and high levels of stress, whereas supportive relationships associate with good health, better sleep, psychological well-being, and fewer physician visits (Ren 1997; Prigerson et al. 1999; Robles and Kiecolt-Glaser 2003; Uebelacker et al. 2006). The health differences reported in this study would probably be accentuated if relationship quality were accounted for, as subjects who lived in strained relationships probably exhibited worse health than did other married or cohabiting persons.

This study was not able to assess separately the health of same-sex couples. In the mortality analyses on census data, same-sex cohabiters were included in the group living

with someone other than a partner. In the surveys, no data were available on the gender of the subject's partner. Subjects living with same-sex partners were classified based on self-reported data, so most of them were probably included among cohabiters. The relationship between same-sex partners likely provide health advantages equivalent to those provided in heterosexual relationships. Some research has suggested that same-sex partners may lack institutional support for their relationships as well as support from family and friends, and therefore may be particularly important to each other. Regarding social control of health-related behaviour, same-sex partners have been reported to attempt to influence each others smoking, alcohol consumption, physical activity, diets, and HIV-related behaviours (Lewis et al. 2006). In conclusion, same-sex partners probably do not significantly differ from other married or cohabiting persons in this study.

Despite adjustments for an array of associated factors, marked health differences between the living arrangement groups remained. Thus, other unknown factors, such as those related to personality traits, current life events, social control, as well as genetic and other biological factors, are likely to underlie health differences by living arrangements. In particular, at the time of the analyses, the classification of social class and reliable information on income level were unavailable for the survey data. Thus, the importance of socioeconomic factors is likely underestimated in this study due to the absence of these factors in the analyses.

6.2.2 Methods

This study assessed a wide range of living arrangements rather than focused on a certain dimension such as cohabitation or lone parenthood. All results were analysed and presented separately for men and women. The social reality and health implications of being in a certain living arrangement are likely to differ substantially for men and women. Because several previous studies have failed to assess both genders separately, this study sheds some light on gender differences in health by living arrangements.

Due to the cross-sectional design of the surveys and to the cross-sectional measurement of explanatory factors in the mortality data, to draw any definite conclusions about the selection-causation issue is impossible, and any interpretations about the relative contributions of selection and causation should be made with extreme caution. As this study found that the contribution of factors reflecting mainly selection was modest, whereas the contribution of factors reflecting causation or both selection and causation was somewhat larger, it can cautiously be concluded that causation may play a larger role than selection in the interpretation of these findings. In future studies, the selection-causation issue should be assessed with longitudinal data using several dimensions of health and associated factors assessed simultaneously.

This study has increased our understanding of health differences between living arrangement groups, but more rigorous research is needed in order to discover more underlying mechanisms and to develop methods to prevent and to reduce these health differences. Furthermore, international comparative analyses with comparable data would increase our understanding of true patterns in health differences by living arrangements in opposition to differing results due to differences in data or methodology.

The measurement of health and associated factors

Census and mortality data used in substudy I are likely to be highly reliable. All in all, the association of living arrangements and mortality may be considered the most "objective" result of this study.

In addition to an array of variables associated with both living arrangements and different dimensions of health, the health surveys used in substudies II–IV include health measures which are widely used and accepted in the international context. This study used self-reported data on factors associated with living arrangements and health. Regarding questions on childhood adversities (Substudies III–IV), those with poor mental health may have been more likely to report negative events in order to explain their current state (Pirkola et al. 2005a). However, it is unlikely that answers on childhood adversities or other associated factors were biased according to the subject's marital status or living arrangement.

Self-rated health has been found to be a reliable (Martikainen et al. 1999) and valid measure of health, as it is a strong predictor of future health problems (Idler and Kasl 1995; Farmer and Ferraro 1997; Ried et al. 2006) and mortality (Kaplan and Camacho 1983; Idler et al. 2000; Burström and Fredlund 2001; DeSalvo et al. 2006) after controlling for known risk factors. Although SRH is a subjective estimate of a subject's health, it also has a biological basis (Goldman et al. 2003; Jylhä et al. 2006). More than the modest role of age, early life factors, sociodemographic factors, psychosocial factors and health behaviours, health status contributes most to SRH (Singh-Manoux et al. 2006). Furthermore, SRH correlates well with the subject's physician-reported health status (Aromaa et al. 1989), and principally reflects the respondent's physical health (Manderbacka 1998).

The GHQ remains the gold standard in measuring psychological distress. It is a valid and reliable measure (Goldberg 1972; Goldberg et al. 1997; Martin 1999; Pevalin 2000), and has been shown to predict future morbidity (Nicholson et al. 2005) and mortality (Robinson et al. 2004). As GHQ is designed to be a screening instrument, it does not differentiate between depression and anxiety (Fuhrer et al. 1999; Willitts et al. 2004). Thus, depressive and anxiety disorders, as well as alcohol dependence, were

assessed with the CIDI. This psychiatric interview has been found to be valid and reliable for large surveys, and has become the gold standard in measuring psychiatric disorders (Wittchen 1994; Wittchen et al. 1998). The widely used measure is fully structured and standardised, and in the Health 2000 Survey, 21 non-psychiatric health care professionals were carefully trained as CIDI interviewers (Pirkola et al. 2005b).

The consumption of alcohol was likely underestimated, as information about the amount of alcohol consumption was based on self-reports (Poikolainen 1985; Göransson and Hanson 1994). Nevertheless, self-reports distinguish between groups with different levels of alcohol consumption, as subjects reporting higher levels of alcohol consumption also displayed higher levels of biochemical markers of alcohol consumption (Carlsson et al. 2003). Reasons for underreporting may be failure to recall true amounts, shame or guilt. Thus, the findings reported in substudy IV may indeed underestimate the prevalence of heavy drinking. However, this possible underreporting probably accounts for a minor proportion of the observed differences in heavy drinking. In order to broaden the information based on pure alcohol consumption, this study also assessed alcohol dependence, which covers more dimensions of unhealthy alcohol use than pure excess consumption. Furthermore, alcohol dependence was assessed with the CIDI, which is not based on self-reporting.

This study included both "milder" measures of unhealthy alcohol use and poor mental health (heavy drinking and psychological distress), and more "serious" measures (depressive and anxiety disorders as well as alcohol dependence). Together with self-rated health and mortality, these measures on morbidity provide a global picture of health differences by living arrangements. This study did not, however, assess somatic health, functional capacity or need of help between living arrangement groups, which are important areas for future research. Furthermore, this study assessed only the most common mental health disorders, as no data were available on psychoses or personality disorders, which may have revealed even greater health differences by living arrangements.

The definition and measurement of cohabitation

The definition of cohabitation is a problem shared by all epidemiological studies. Some have stated that whatever the definition of legal cohabitation, there will always be unions that fall outside its criteria (Prinz 1995). Based on the analyses of the census data, 11% of women and 13% of men in the age group 30–64 years cohabited at the end of 1995 in Finland (Table 9). According to the definition used by Statistics Finland, these cohabiters include only couples with an age difference of less than 16 years (Statistics Finland 2001). Thus, cohabiters with an age difference of more than 15 years were included in the group "living with someone other than a partner" in substudy I, resulting in underestimation of the proportion of cohabiters. Furthermore,

the definition fails to cover same-sex partners. On the other hand, persons living together in an unromantic relationship, such as undertenants, were erroneously registered as cohabiters if their gender and age differences fell within the inclusion criteria. All in all, the Finnish census data slightly underestimated the prevalence of cohabiting as compared with subjects' self-reports (Statistics Finland 2001). In this study, census data at the end of 1995 indicate that the prevalence of working-age cohabiters (11% in women and 13% in men) corresponds to prevalences obtained from survey data for 2000–01 (13% in women and 14% in men) (Table 9). All in all, difficulty in registering the dwelling place of cohabiting subjects was not a plausible contributor to the underreporting, as is the case in other Western countries (Prinz 1995). Based on Finnish survey data (N = 10 000) from 2000, only 1.4% of subjects failed to be registered at the address where they actually lived (Statistics Finland 2001).

In the Mini-Finland Survey (1978–80), the prevalence of cohabiters was 2% among women and 3% among men in the age group 30–64 years. Based on higher prevalences reported by another survey conducted in 1978 by the Central Statistical Office of Finland (Aromaa et al. 1983), the proportion of cohabiters in the Mini-Finland Survey was expected to be about 4% in the working-age population. In the Mini-Finland Survey, marital status was reported spontaneously, whereas in the other survey, all nonmarried persons were asked whether they were cohabiting (Aromaa et al. 1983). There may have been some underreporting of cohabitation in the Mini-Finland Survey, as spontaneously reported marital status may favour one's official marital status rather than the rare, and at that time somewhat stigmatised, cohabitation. However, as the Mini-Finland Survey had a higher sample (N = 8 000 versus N = 1 300) and participation rate (96% versus 82%), the proportions reported in this study may be more reliable. The health of those who failed to report their true cohabiting status in 1978–80 remains unknown. In the Health 2000 Survey, the marital status categories were read aloud before answering, which may have reduced such bias. Furthermore, in Finnish society today, cohabitation has become a socially accepted institution. As expected, the prevalence of cohabiting based on the Health 2000 Survey (14% for men and 13% for women in the age group 30–64 years) corresponds to official estimates from Statistics Finland for the same age group at the end of 2000 (13% and 12%, respectively) (Statistics Finland 2001). All in all, whether the possible underestimation of the prevalence of cohabiting in the Mini-Finland Survey biased the estimates of change in SRH among cohabiters remains unclear.

6.3 Implications for health policy

If the role of health-related selection was more important than that of causation, the increase in the proportion of the nonmarried population would not enhance the total burden of poor health in the population, but rather would lead only to a change in the distribution of poor health. However, because the role of social causation may cautiously be assumed to be of somewhat greater importance, the growth of the proportion of currently nonmarried persons may subsequently increase the prevalence of poor health. Among the nonmarried population, the impact of the growing proportion of cohabiters remains unclear, as their relatively high probability of unhealthy alcohol use may compensate for their otherwise relatively good health.

Couples increasingly choose to exit an unsatisfactory union and regard cohabitation as trial marriage. Despite the individualisation process observed in Finland and in other Western countries, the significance of living with a partner has not declined. The importance of the institution of marriage may be even more important than in earlier times, since it may compensate for the diminished position of other institutions such as politics and religion (Beck and Beck-Gernsheim 1995). This study offers new insight into the health benefits of marriage versus other living arrangements, and thus provides another aspect to consider in health policy.

The reported health differences could be efficiently reduced by focusing health interventions on alcohol consumption, which plays a large role in the health of persons in more vulnerable living arrangement groups. Furthermore, health interventions should focus on the most vulnerable groups, such as persons living alone, childless cohabiters, adults living with elderly parents as well as lone parents of dependent children.

Cohabitation is not equivalent to marriage according to Finnish law, and the legal implications of cohabitation have not been adequately assessed. Today, loss of a partner may lead to unreasonable financial difficulties in cases where the deceased partner was the primary provider for housing and other expenses. By providing cohabiters with more financial security in case of loss of a spouse, national legislation could remarkably strengthen the position of this growing subgroup of the population. Another possibility could be to inform cohabiters of the legal implications of cohabitation, and to encourage them to make specific agreements on matters such as common and private possessions.

The relatively poor health of lone parents compared to that of couple parents may also affect the health of the next generation. Children of lone parents may already be in a more vulnerable position due to the mere absence of the other parent and possible lack of time for the children. The possible poor health of a lone parent may further increase a child's risk of growing up in a vulnerable social environment.

7 CONCLUSIONS

This study examined health differences by living arrangements in the Finnish working-age population based on census data linked to cause-of-death registers, as well as survey data from two time periods. Distinct measurements of different dimensions of poor health, as well as an array of associated variables, increased our current understanding of the magnitude and trends of morbidity and mortality differences by living arrangements, and of the contribution of associated factors as interpretations for these findings.

The results of this study show that living arrangements were strongly connected to various dimensions of poor health. Over the past twenty years, SRH has improved least among single men and women and widowed women, and most among cohabiting women. Regarding the relative position of each living arrangement today, married men and women enjoyed the best health as assessed by all measures of health. Cohabiters did not differ from the married in terms of self-rated health or mental health, but did exhibit excess unhealthy alcohol use and high mortality from alcohol-related causes, as well as excess mortality from "other causes". In alcohol-related mortality among working-age women, and in alcohol dependence among both genders, the excess poor health of cohabiters exceeded that of persons living with someone other than a partner. Persons living alone or with someone other than a partner had higher mortality, excess poor mental health and unhealthy alcohol use than did married persons, and those living alone tended to be in the worst position by every measure of health.

With regard to the magnitude of differences in different dimensions of health, the greatest health differences by living arrangements occurred in alcohol-related mortality and alcohol dependence, followed by all-cause mortality, depressive and anxiety disorders and heavy drinking, whereas modest differences occurred in self-rated health and psychological distress. All in all, alcohol consumption appeared to play a major role in the overall health and well-being of persons in more vulnerable living arrangements.

In this study, the role of factors mainly assumed to reflect selection appeared to be rather modest. Social support, which reflects social causation, contributed only modestly to differences in unhealthy alcohol use by living arrangements, but had a larger effect on differences in poor mental health. Socioeconomic factors and health-related behaviour, which reflect both selection and causation, appeared to play a more important role in the excess poor health of cohabiters and of persons living alone or with someone other than a partner than of married persons.

To the extent that the proportion of nonmarried persons continues to grow and their health does not improve at the same rate as that of married persons, the challenges nonmarried persons pose to public health are likely to increase. Thus, health interventions should focus on the most vulnerable groups, such as persons living alone, childless cohabiters, and adults living with elderly parents as well as lone parents of dependent children.

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Appendix A. The contribution of associated factors in substudies I–IV.

Dependent variable (age group)	Gender	Age–adjusted RR / COR / OR by living arrangement (Reference group: Married RR / COR / OR=1)	The percentage change in the association between living arrangements and mortality or morbidity after adjusting for a specific variable[a]								Fully adjusted RR / COR / OR by living arrangement (Reference group: Married RR / COR / OR=1)
			b	c	d	e	f	g	h		
			Social environment in childhood (%)	Education (%)	Religious activity and urbanisation (%)	Socio-economic factors (%)	Social support (%)	Health-related behaviour (%)	Long-standing disease (%)	All (%)	
Mortality (age group 30–64)	Women	Cohabiting RR=1.67 (1.57–1.77)		10		19				21	Cohabiting RR=1.53 (1.44–1.62)
		Living with other(s) RR=1.72 (1.63–1.81)		6		28				29	Living with other(s) RR=1.51 (1.43–1.59)
		Alone RR=1.98 (1.90–2.07)		0		24				23	Alone RR=1.75 (1.68–1.82)
	Men	Cohabiting RR=1.66 (1.59–1.72)		17		21				26	Cohabiting RR=1.49 (1.44–1.56)
		Living with other(s) RR=2.91 (2.82–3.00)		14		29				31	Living with other(s) RR=2.32 (2.24–2.39)
		Alone RR=3.24 (3.15–3.32)		8		25				25	Alone RR=2.67 (2.60–2.74)
Self-rated health 1978–80 (age group 30–64)	Women	Cohabiting COR=1.85 (1.29–2.63)		12				12	14	28	Cohabiting COR=1.61 (1.02–2.53)
		Single COR=0.84 (0.66–1.06)		no				no	no	no	Single COR=0.79 (0.61–1.04)
		Divorced COR=1.13 (0.84–1.53)		no				no	no	no	Divorced COR=1.01 (0.74–1.38)
		Widowed COR=0.84 (0.61–1.16)		no				no	no	no	Widowed COR=0.86 (0.62–1.19)
	Men	Cohabiting COR=1.16 (0.81–1.66)		no				no	no	no	Cohabiting COR=0.93 (0.62–1.41)
		Single COR=1.20 (0.95–1.51)		60				15	70	100	Single COR=0.94 (0.74–1.19)
		Divorced COR=1.74 (1.18–2.55)		24				12	+	31	Divorced COR=1.51 (1.02–2.4)
		Widowed COR=0.92 (0.45–1.89)		no				no	no	no	Widowed COR=0.65 (0.28–1.51)

Dependent variable (age group)	Gender	Age–adjusted RR / COR / OR by living arrangement (Reference group: Married RR / COR / OR=1)	The percentage change in the association between living arrangements and mortality or morbidity after adjusting for a specific variable [a]								Fully adjusted RR / COR / OR by living arrangement (Reference group: Married RR / COR / OR=1)
			b Social environment in childhood (%)	c Education (%)	d Religious activity and urbanisation (%)	e Socio-economic factors (%)	f Social support (%)	g Health-related behaviour (%)	h Long-standing disease (%)	All (%)	
Self-rated health 2000-01 (age group 30–64)	Women	Cohabiting COR=1.22 (0.99–1.50)		18				32	+	+	Cohabiting COR=1.26 (0.99–1.59)
		Single COR=1.19 (0.90–1.57)		no				no	no	no	Single COR=1.28 (0.95–1.72)
		Divorced COR=1.20 (0.94–1.53)		5				40	+	+	Divorced COR=1.24 (0.97–1.57)
		Widowed COR=1.53 (1.04–2.26)		21				8	51	68	Widowed COR=1.17 (0.78–1.74)
	Men	Cohabiting COR=1.08 (0.86–1.37)		no				no	no	no	Cohabiting COR=0.95 (0.75–1.21)
		Single COR=1.55 (1.22–1.99)		35				13	38	71	Single COR=1.16 (0.88–1.54)
		Divorced COR=1.55 (1.17–2.05)		24				33	13	53	Divorced COR=1.26 (0.93–1.70)
		Widowed COR=1.04 (0.53–2.06)		no				no	no	no	Widowed COR=0.82 (0.39–1.72)
Psychological distress (age group 30–64)	Women	Cohabiting RR=1.12 (0.81–1.54)	no			no	no	no		no	Cohabiting RR=1.05 (0.74–1.48)
		Living with other(s) RR=1.35(0.97–1.89)	+			14	29	+		37	Living with other(s) RR=1.22 (0.84–1.79)
		Alone RR=1.23 (0.93–1.61)	+			9	61	26		74	Alone RR=1.06 (0.75–1.50)
	Men	Cohabiting RR=0.90 (0.61–1.33)	no			no	no	no		no	Cohabiting RR=0.87 (0.57–1.31)
		Living with other(s) RR=1.64 (1.06–2.56)	+			28	27	20		33	Living with other(s) RR=1.43 (0.82–2.50)
		Alone RR=2.01 (1.52–2.67)	7			27	26	27		57	Alone RR=1.43 (0.94–2.16)
Depressive disorder (age group 30–64)	Women	Cohabiting RR= 1.02 (0.62–1.69)	no			no	no	no		no	Cohabiting RR=0.91 (0.53–1.54)
		Living with other(s) RR=1.99 (1.32–3.01)	+			7	11	+		10	Living with other(s) RR=1.89 (1.23–2.91)
		Alone RR=2.01 (1.40–2.89)	15			3	25	22		35	Alone RR=1.66 (1.12–2.45)
	Men	Cohabiting RR=0.62 (0.29–1.32)	no			no	no	no		no	Cohabiting RR=0.59 (0.27–1.29)
		Living with other(s) RR=2.58 (1.32–5.02)	+			13	42	20		52	Living with other(s) RR=1.76 (0.83–3.77)
		Alone RR=2.39 (1.60–3.57)	+			17	32	11		55	Alone RR=1.62 (1.01–2.62)

Dependent variable (age group)	Gender	Age–adjusted RR / COR / OR by living arrangement (Reference group: Married RR / COR / OR=1)	The percentage change in the association between living arrangements and mortality or morbidity after adjusting for a specific variable[a]								Fully adjusted RR / COR / OR by living arrangement (Reference group: Married RR / COR / OR=1)
			b	c	d	e	f	g	h		
			Social environment in childhood (%)	Education (%)	Religious activity and urbanisation (%)	Socio-economic factors (%)	Social support (%)	Health-related behaviour (%)	Long-standing disease (%)	All (%)	
Anxiety disorder (age group 30–64)	Women	Cohabiting RR=1.14 (0.64–2.02)	no	no		no	no	no		no	Cohabiting RR=0.92 (0.49–1.72)
		Living with other(s) RR=1.96 (1.21–3.18)	+	4		10	8	18		27	Living with other(s) RR=1.70 (1.00–2.89)
		Alone RR=1.56 (1.00–2.43)	+	0		5	39	27		34	Alone RR=1.37 (0.84–2.24)
	Men	Cohabiting RR=0.80 (0.37–1.71)	no	no		no	no	no		no	Cohabiting RR=0.77 (0.35–1.67)
		Living with other(s) RR=1.70 (0.76–3.81)	+	14		47	34	33		64	Living with other(s) RR=1.25 (0.52–2.98)
		Alone RR=2.89 (1.85–4.51)	+	10		33	21	34		58	Alone RR=1.79 (1.09–2.94)
Alcohol dependence (age group 30–54)	Women	Cohabiting RR=2.56 (1.10–5.94)	11		3	13	7			16	Cohabiting RR=2.31 (0.96–5.54)
		Living with other(s) RR=0.65 (0.15–2.90)	no		no	no	no			no	Living with other(s) RR=0.35 (0.07–1.89)
		Alone RR=4.43 (2.03–9.64)	6		14	29	15			52	Alone RR=2.63 (1.15–6.01)
	Men	Cohabiting RR=2.29 (1.44–3.64)	4		3	+	+			6	Cohabiting RR=2.21 (1.35–3.63)
		Living with other(s) RR=1.37 (0.66–2.88)	+		+	68	+			43	Living with other(s) RR=1.21 (0.55–2.63)
		Alone RR=3.66 (2.39–5.59)	11		+	39	3			42	Alone RR=2.55 (1.58–4.11)
Heavy drinking (age group 30–54)	Women	Cohabiting RR=1.54 (0.96–2.46)	0	0	30	7	0			26	Cohabiting RR=1.40 (0.85–2.29)
		Living with other(s) RR=1.62 (1.01–2.60)	+	2	32	29	6			66	Living with other(s) RR=1.21 (0.71–2.05)
		Alone RR=1.67 (1.07–2.63)	+	6	43	7	6			55	Alone RR=1.30 (0.81–2.08)
	Men	Cohabiting RR=1.71 (1.17–2.49)	+	3	10	+	+			1	Cohabiting RR=1.70 (1.14–2.56)
		Living with other(s) RR=1.93 (1.29–2.88)	22	2	1	31	8			8	Living with other(s) RR=1.54 (0.99–2.41)
		Alone RR=2.15 (1.55–3.00)	2	+	+	11	0			19	Alone RR=1.93 (1.32–2.81)

[a] 100x [(OR(base model)-OR(base model+variable))/(OR(base model)-1)] In analyses on mortality and self-rated health, ORs were substituted by RRs and CORs
[b] Variables include: family structure in childhood, parental adversity (i.e. serious conflicts within the family, financial problems in childhood, either parent's drinking problem)
[c] Variables include: educational level
[d] Variables include: religious activity, urbanisation
[e] Variables include: occupational class, employment status, financial difficulties
[f] Variables include: emotional help from others, practical help from others, social contacts
[g] Variables include: smoking, alcohol consumption
[h] Variables include: long-standing illness

empty cell = variable not included in the original article
no = no excess morbidity (age adjusted RR, COR, or OR < 1.2), and thus the percentage change is not presented
+ = adjustment for the variable in question increased the RR, COR, or OR