Department of Social Research
University of Helsinki
Helsinki

SOCIAL DETERMINANTS OF MORTALITY FROM CHILDHOOD TO EARLY ADULTHOOD

Hanna Remes

ACADEMIC DISSERTATION

To be presented, with the permission of the Faculty of Social Sciences of the University of Helsinki, for public examination in Auditorium XIII, University main building, on 7 June 2012, at 12 noon.

Helsinki 2012

Publications of the Department of Social Research 2012:9
Sociology

Cover: Jere Kasanen

Distribution and Sales:
Unigrafia Bookstore
http://kirjakauppa.unigrafia.fi/
books@unigrafia.fi
PL 4 (Vuorikatu 3 A) 00014 Helsingin yliopisto

ISSN-L 1798-9140
ISSN 1798-9132 (Online)
ISSN 1798-9140 (Print)
ISBN 978-952-10-7645-9 (Print)
ISBN 978-952-10-7646-6 (Online)

Unigrafia, Helsinki 2012

ABSTRACT

Social gradients in health, wherein each successive level of social position enjoys better health and lower mortality, have been observed in various health indicators within different societies. Social inequalities in infant and adult mortality are well documented, but previous findings on children, adolescents and young adults are less complete and less consistent. Death at a young age is increasingly rare in developed countries. Nevertheless, research on mortality can still provide valuable insights into health inequalities in that social differentials in ultimate health outcomes reflect differentials in many other acute and chronic health conditions that are more difficult to capture.

The purpose of this study was to examine the social determinants of mortality at a young age. The findings are based on several measures of parental social background, and among older adolescents and young adults also on measures reflecting their own social position and current living arrangements. Extensive individual-level register data was obtained from Statistics Finland. Combining longitudinal population census and employment data from the period 1970–2007 with data on mortality and causes of death, the study data covered 80% of all deaths in 1990–2004/2007. Social differentials in mortality in the age range 1–29 years were assessed in both absolute and relative terms, by calculating mortality rates and estimating Cox proportional hazards models.

Mortality in childhood among both boys and girls was clearly associated with family type and parental socioeconomic factors. There were no differences in mortality between children in cohabiting-parent families and children of married parents, but children in single-parent families carried an excess risk. Both parental education and household income showed clear mortality gradients, with higher mortality among children of parents with lower levels of education and who earned less. The relationship between single parenthood and child mortality was, in fact, largely attributable to the associated low parental education and income.

Mortality in late adolescence and early adulthood was higher among young men and women living in single- or cohabiting-parent families, as single parents themselves, alone, or with others than among those living in the parental home with married parents. Living independently with a partner was associated with lower mortality, especially among people in their late 20s. Following adjustment for childhood and current factors, the strongest excess mortality in early adulthood occurred among the less-highly educated and the non-employed. Leaving the parental home at a young age also remained an independent risk factor for premature death. The associations between parental social background and mortality were distinct but smaller,

and were largely mediated by the current factors and age at leaving the parental home.

Among children, social inequalities in mortality were strongest in early childhood, between the ages of one and four years, somewhat smaller between five and nine years, and with the exception of a weak association between mortality and parental education, non-existent at 10–14 years. Moreover, the associations between mortality and the current living arrangements and the main activity differed by age in late adolescence and early adulthood. The convergence of social differentials in mortality in late childhood, and their re-emergence in late adolescence related to changes in the most common causes of death during these life phases. Influenced by various factors, different causes of death are more or less likely to associate with social factors. Social differentials in mortality stemmed mostly from external causes, but deaths from diseases contributed to mortality differentials between the ages of one to four, and in early adulthood. Targeting support to high-risk groups in early childhood and in the transition to adulthood could prove to be effective in reducing health inequalities and preventing social exclusion not only among the young but also later in life.

CONTENTS

Abstract 3

Contents 5

List of original publications 7

1 Introduction 8

2 Mortality at a young age 11

2.1 The Finnish context 12

2.2 Social determinants of mortality among the young 17

2.2.1 Explaining social patterns in mortality 17

2.2.2 Previous findings on mortality differentials at young ages 23

2.2.3 Methodological issues 28

3 The aims of the study 30

4 Data and methods 32

4.1 Data sources and the study population 32

4.2 Operational definitions of the measures 33

4.2.1 Mortality 33

4.2.2 Socio-demographic measures 34

4.3 Statistical methods 37

4.4 Ethical considerations 38

5 Results 39

5.1 Parental social background and mortality in childhood 39

5.2 Parental social background and personal social position – mortality in late adolescence and early adulthood 43

5.3 Age-patterning of social differentials in mortality 47

6 Discussion 52

6.1 The main findings and their interpretation 52

6.1.1 Family type and living arrangements 52

6.1.2 Socioeconomic factors 56

6.1.3 The presence and strength of mortality inequalities across the early life course 60

6.2 Methodological considerations 63

7 Conclusions 66

Acknowledgements 67

References 69

LIST OF ORIGINAL PUBLICATIONS

This thesis is based on the following publications:

I Remes, H., Martikainen, P. & Valkonen, T. 2010. Mortality inequalities by parental education among children and young adults in Finland 1990–2004. *Journal of Epidemiology and Community Health*, 64(2):130–135.

II Remes, H., Martikainen, P. & Valkonen, T. 2011. The effects of family type on child mortality. *The European Journal of Public Health*, 21(6): 688–693. doi: 10.1093/eurpub/ckq159

III Remes, H. & Martikainen, P. 2012. Living arrangements and external causes of deaths in early adulthood. *Journal of Adolescent Health* 50(2):164–171. doi: 10.1016/j.jadohealth.2011.05.018

IV Remes, H. & Martikainen, P. Social determinants of mortality after leaving the parental home – childhood and current factors. Submitted.

The publications are referred to in the text by their Roman numerals.

1 INTRODUCTION

Children are born into different types of families with varying socioeconomic backgrounds, and the early social environment has the potential to affect their future lives considerably, for better or worse. Studying the mechanisms behind the persisting influence of childhood health and social background into adulthood is a well-established field of research that enhances understanding of adult health inequalities (Kuh, Ben-Shlomo, Lynch, Hallqvist, & Power, 2003; Galobardes, Lynch, & Davey Smith, 2004). However, the focus of this study is on the social determinants of mortality during childhood, adolescence and early adulthood. These life stages can be considered critical periods of life with long-term impacts on later life, but just like the elderly, children and young people form a distinct population group in a society. Obviously, children grow up to be adults, nevertheless, comprehending the current living conditions and life chances of children and young people is important as such (Östberg, 1996).

Socioeconomic inequalities in child mortality have been observed in both developed and developing countries, although most of the research concerning children has come from advanced economies, the UK and Sweden in particular (Östberg, 1996; UNICEF, 2001; Petrou, Kupek, Hockley, & Goldacre, 2006; Kim, Son, Kawachi, & Oh, 2009). On a general level, the association between a lower parental social background and higher child mortality is well-established, especially with regard to external causes of death (Laflamme, Hasselberg, & Burrows, 2010). Complicated by the use of varying measures and classifications of social position among children, as well as methodological issues and the limited availability of suitable data, international and time-period comparisons of mortality inequalities at young ages are still to this day rare (Shaw, Blakely, Atkinson, & Crampton, 2005; Edwards, Roberts, Green, & Lutchmun, 2006).

Unmarried parenthood has become increasingly common in recent decades due to the rising rates of cohabitation, union dissolution and non-marital childbearing. These on-going changes in family life have raised concerns about the effects of family structure on the health of children (Brown, 2010). The number of cohabiting and single-parent families has grown across Europe and the US, notwithstanding the wide diversity between countries (Kiernan, 2004; Sobotka & Toulemon, 2008). In Finland, the proportion of children aged 0–17 years living with cohabiting parents grew from 9 to 18%, and with a single parent from 14 to 20% between 1990 and 2005 (Statistics Finland, 2006). Excess mortality among children of single parents has been documented in previous research. However, many studies focus on the long-term effects of single parenthood on later adult outcomes, and evidence of an association between single parenthood and mortality during childhood remains limited (Judge & Benzeval, 1993;

Östberg, 1997; Sauvola et al., 2001; Blakely, Atkinson, Kiro, Blaiklock, & D'Souza, 2003; Weitoft, Hjern, Haglund, & Rosén, 2003). Parental cohabitation has also been linked with child health disadvantage, but so far the evidence on specific health outcomes and physical health among children is fragmental (Carr & Springer, 2010; Schmeer, 2011).

As they grow older, children gradually attain a degree of social and financial independence from their parents. Compared to the mid-twentieth century, however, the transition to adulthood in advanced economies has become increasingly protracted and complex (Corijn & Klijzing, 2001; Furstenberg, 2010). Leaving the parental home occurs relatively early in Northern Europe today, and living alone or with peers before entry into a union, cohabitation, or unmarried parenthood have become normative living arrangements (Billari & Liefbroer, 2010). The pronounced associations between living arrangements and health in the adult population suggest that these structural changes in the transition to adulthood may have significant health consequences among the young (Joutsenniemi, Martelin, Martikainen, Pirkola, & Koskinen, 2006; Koskinen, Joutsenniemi, Martelin, & Martikainen, 2007).

Earlier life course studies have concluded that social position in adulthood affects adult health differentials over the effects of preceding childhood living conditions (Galobardes, Lynch, & Davey Smith, 2008; Pensola & Valkonen, 2002). Parental social background has nonetheless an important role in the transition to adulthood, which is manifested in the intergenerational transmission of social position and family behaviour (Sørensen, 2006; Erola, 2009; Rijken & Liefbroer, 2009). The prolongation and increasing complexity of the transition to adulthood may increase young people's reliance on family resources in the process of gaining independence and assuming adult roles, which has the potential to deepen the divide between those from advantaged and disadvantaged backgrounds (Swartz & Bengtson O'Brien, 2009; Furstenberg, 2010).

Overall, research on social inequalities in health has struggled to grasp the transitional period between childhood and adulthood, and older adolescents and young adults tend to be omitted on the grounds of not yet having established their position in a society. Parental social background is known to affect health and mortality in adolescence and early adulthood, but not much is known about the combined effects of parental background and factors reflecting the young people's own social position during this transitional period (Pensola & Valkonen, 2000; Kestilä et al., 2006; Saarela & Finnäs, 2008).

The presence and strength of the social determinants of health and mortality vary by age, and both constant and age-specific social gradients have been found in different health outcomes during childhood and adolescence (Pensola & Valkonen, 2000; West & Sweeting, 2004; Chen, Martin, & Matthews, 2006). Childhood, adolescence and early adulthood involve many developmental changes, and identifying any coincident

changes in the relationship between social position and health may provide clues to identifying the mechanisms that produce health inequalities (Chen, Matthews, & Boyce, 2002). For example, West (1997) suggests that the increasing influence of youth culture and peer groups might explain observations of relative equalisation in certain indicators of health during the transition from childhood to adolescence. A better understanding of the emergence and age-patterning of health differentials may also have important implications with regard to the optimal timing of efforts to reduce inequalities and improve health across the lifespan.

Despite the relatively low levels of mortality, and a continuous decline, there are still social inequalities in mortality among children and young people in developed countries. Evidence related to longer-term trends is inconsistent and the patterning of differentials in more specific age groups, and by sex and different causes of death, remains unclear. The aim of this study, which relies on longitudinal register-based data, is to provide comprehensive, up-to-date information on social inequalities in mortality among children, adolescents, and young adults in Finland in the 1990s and 2000s. The extensive register data with annual updates helps to overcome some of the difficulties in studying mortality among groups with low mortality levels, and the various individual and household-level indicators of social position and living arrangements allow close examination of the social factors associated with the inequalities.

2 MORTALITY AT A YOUNG AGE

Globally, infant and child mortality (the probability of dying by the age of one or five years, respectively) are leading indicators of the level of child health and overall development of nations. Currently, 99% of deaths among the under-fives occur in developing regions, Sub-Saharan Africa and Southern Asia in particular (UNICEF, WHO, World Bank, & UN Population Division, 2011). Likewise, among those aged between 10 and 24 years, only 3% of deaths in 2006 were in high-income countries, despite the 11% proportion of the population (Patton et al., 2009). Overall, mortality at a young age has declined substantially in recent decades, even in the least developed regions (UNICEF et al., 2011).

Viner et al. (2011) concluded from data based on 50 countries (from high to very low income) in the WHO mortality database that mortality among children aged 1–9 years and 10–14 years declined by 80–93% and 68–78%, respectively between 1955 and 2004. There was a somewhat smaller decline (41–61% in OECD countries) among young people aged 15–24 years. With the exception of Eastern Europe, all-cause mortality declined among young people during the whole period, although to a greater extent during the first half. Overall, the improvements were mainly due to the steep decline in mortality from communicable diseases. In contrast, the static or even rising rates of mortality from external causes among young men largely explained the diverging rates between younger children and both adolescents and young adults. In all OECD countries, external causes of death accounted for 36% of mortality among children in ages 1–9 years, and for over 70% among males and over 50% among females aged 10–24 years in 2000–04. Transport injuries were consistently the leading cause of death from external causes for children and young people, but there was an increase in violent deaths, particularly suicides among young men during the 50-year period. (Viner et al., 2011.)

Children and young people, especially the youngest children, have greatly benefited from the epidemiological transition, and child mortality in developed countries has reached very low levels. From a broader perspective, mortality is still only the tip of the iceberg of total health-related harm among the young, however – for each death there is a multiple number of non-fatal diseases and injuries, traumas and disabilities of varying degrees and duration (UNICEF, 2001). Moreover, an increasing proportion of mortality at a young age is attributable to external causes, and the burden of injuries is very unevenly distributed both between and within societies: the steepest social gradients tend to be in mortality from external causes (Peden, Oyebite, & Ozanne-Smith, 2008; Laflamme et al., 2010).

2.1 THE FINNISH CONTEXT

Current infant and child mortality rates in Finland are among the lowest in the world, but adolescents and young adults, particularly young men, fare less well (Koskinen & Martelin, 2007). The average number of deaths per annum in 2005–09 among infants and children aged 1–14 years were 163 and 118, respectively. The annual number of deaths among older adolescents and young adults were considerably higher (146 and 453 among 15–19 and 20–29 year-olds, respectively), but still relatively low compared to the older age groups. (Statistics Finland, 2012.) External causes account for a major proportion of deaths in the young groups, the proportion increasing by age from less than 40% among children aged 1–4 years to over 70% among the 15–29 year-olds (Statistics Finland, 2005). The gender difference is also more pronounced towards early adulthood: in 2005–09, 56% of the deaths occurred among males aged 1–14 years, and 75% among the 15–29 year-olds (Statistics Finland, 2012).

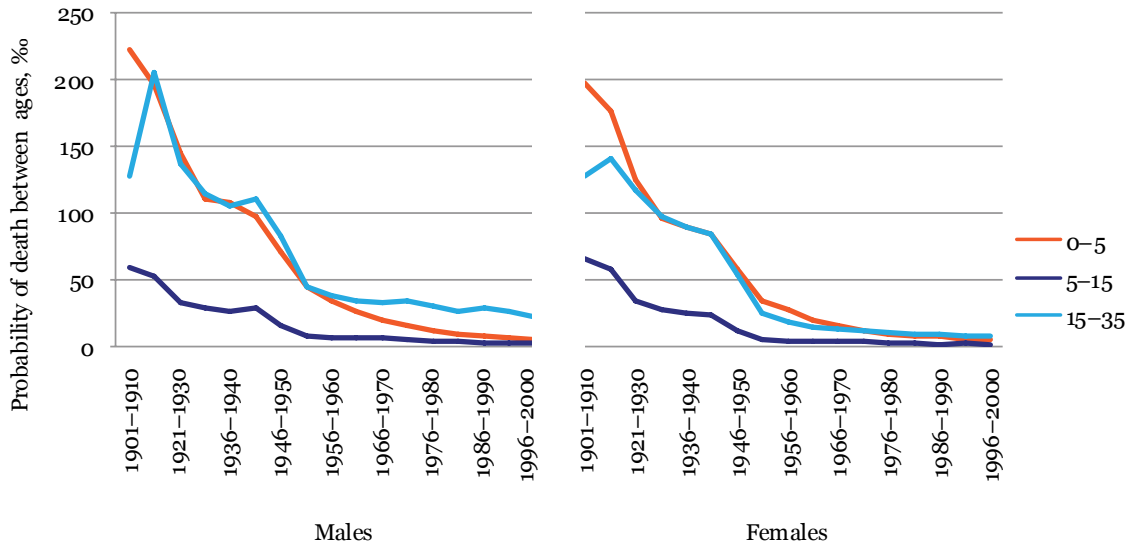

Figure 1 Probability of death (‰) between ages 0–5, 5–15, and 15–35 years, males and females, 1901–2000, Finland. Victims of war included in 1911–20, excluded in 1936–45.

Data source: Suomen väestö, Appendix table 10 (Official Statistics of Finland) (Koskinen, Martelin, et al., 2007)

Except for the war periods, mortality among the young has consistently declined in Finland (Figure 1). In particular, the steep drop in mortality among the under-fives during the first half of the last century contributed greatly to the rising life expectancy. As elsewhere, the declines in deaths from communicable diseases brought about the greatest change, and today this contributes very little to mortality at a young age. (Koskinen & Martelin, 2007.) Consequently, whereas the lowest mortality rates have quite

consistently been among those aged 5–15 years, the rate in early childhood has dropped below that in late adolescence and early adulthood (Figure 1).

Being increasingly rare, child mortality varies substantially from year to year, but there has been a clear and continuous decline in the overall trend in the past three decades (Figure 2). According to Rimpelä's report (1993) on mortality among 5–14 year-olds during 1981–1990, the decreasing trend in total mortality continued after the sharp drop in the 1970s until the early part of the 1980s, and almost for the whole decade with regard to external causes of death. Mortality among boys was almost twice as high as among girls, and the difference remained roughly the same during the 1980s. This gender gap in child mortality has narrowed somewhat during the last two decades (Figure 2), with the exception of infant mortality (Gissler, Rahkonen, Mortensen, et al., 2009), and the differentials between the age groups 1–4, 5–9, and 10–14 years have also converged (Figure 2).

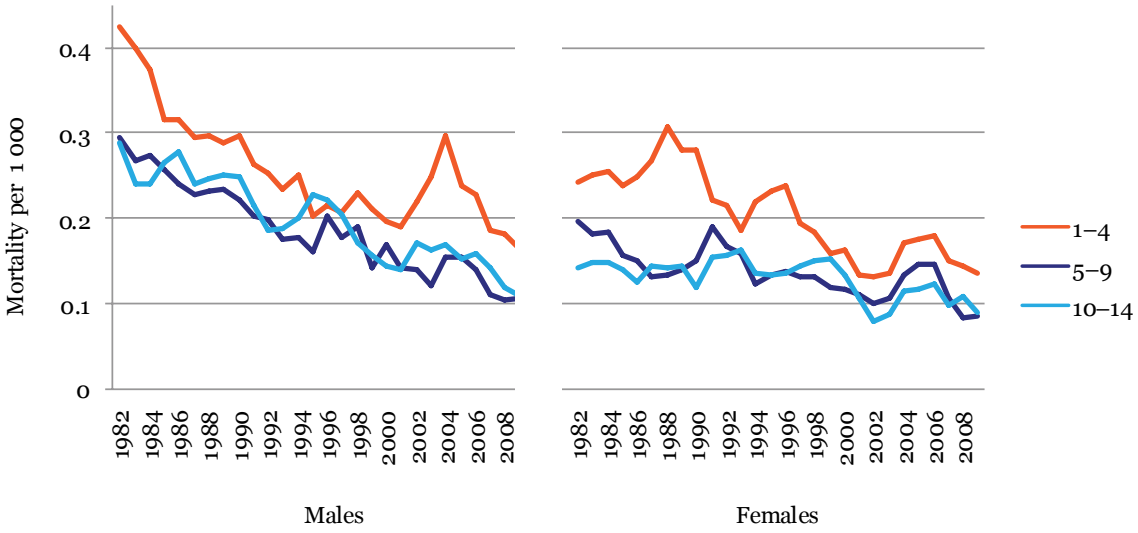

Figure 2 Mortality (per 1000) by year (three-year moving averages) and age at death (1–4, 5–9, and 10–14 years), males and females, 1982–2009, Finland.

Data source: Official Statistics of Finland

Using Finnish register data, Parkkari et al. (2000; 2003) examined the trends in fatal injuries between the ages of one and 14 years in 1971–2001. Although injuries were the leading cause of death during the whole period, the number and incidence of fatal injuries decreased dramatically in all age groups and in both sexes (from 20.1 to 2.8 per 100,000 among girls, and from 36.7 to 7.1 among boys). The reduction was essentially attributable to the decreasing number of unintentional injuries, among which the main causes of death were motor-vehicle injuries and drowning. The incidence of intentional fatal injuries (suicides and homicides), on the other hand, did not change markedly during that time. A study conducted by Mattila et al. (2005) drew largely similar conclusions on injury-related deaths among adolescents aged 10–19 years. The decline in the incidence of injury-related deaths

during the period 1971–2002 was greater in the younger age group (10–14 years), which is partly attributable to the fairly stable incidence of intentional deaths that were more common among the 15–19-year-olds.The over 50% overall decline in fatal injuries among adolescents was mainly attributable to a decline in fatal traffic accidents.

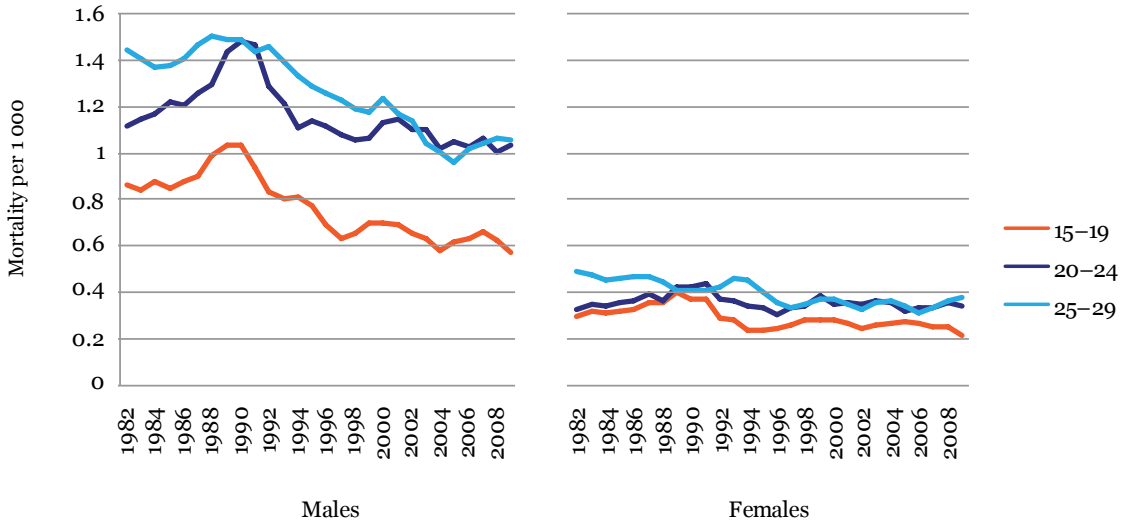

Figure 3 Mortality (per 1000) by year (three-year moving averages) and age at death (15–19, 20–24, and 25–29 years), males and females, 1982–2009, Finland.

Data source: Official Statistics of Finland

Mortality among adolescents and young adults is on a much higher level than among children. The excess peaks in late adolescence and early adulthood among men (Figure 3) are largely due to the high mortality from external causes (Koskinen & Martelin, 2007). A similarly pronounced gender difference has been observed in many other European countries since the 1950s (Vallin & Meslé, 2001). The general declining trend applies to adolescents and young adults too, although due to an increase in external causes mortality actually rose in the 1980s among both sexes in the 15–24 age group, and also among men aged 25–34 (Rimpelä, 1993). The decline in mortality from suicide among men aged 15–34 continued since the peak in 1990 until the first half of the 2000s, but that of transport-injury-related and alcohol-related mortality appeared to have stagnated (Statistics Finland, 2005). The overall decline in mortality among young adults has slowed down in recent years (Figure 3).

There are notable changes in the typical causes of death between early childhood and early adulthood. The most common causes in 1990–2007 among those aged between one and 14 years were transport-related injuries, congenital malformations and chromosomal abnormalities, malignant neoplasms and drowning (Figures 4 and 5: note the different scales for boys and girls). The proportion of external causes, particularly transport injuries,

increased by age, and was somewhat larger among boys than girls in all age groups.

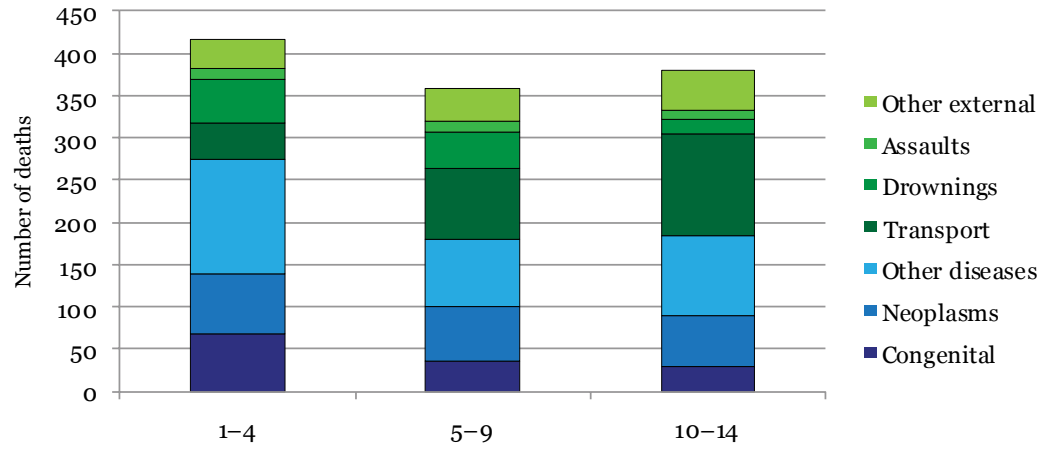

Figure 4 Main causes of death by age group, 1–14-year-old males, 1990–2007, Finland. Data source: un-weighted study data (approx. 80% of all deaths)

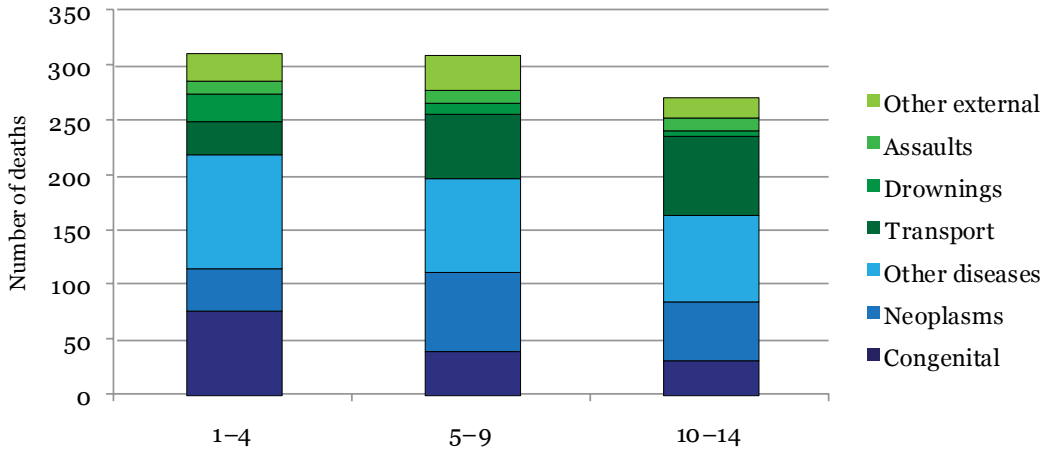

Figure 5 Main causes of death by age group, 1–14-year-old females, 1990–2007, Finland. Data source: un-weighted study data (approx. 80% of all deaths)

There is a clear increase in the level of mortality after the age of 14, and external causes become predominant (Figures 6 and 7: note the different scales for men and women). Suicide, the single largest cause of death, accounted for 38% of the deaths among men aged 15-29, and for 26% among women. Fatal transport injuries were relatively more common at younger ages, whereas suicide was more common among the older groups. Despite the dominance of external causes of death in late adolescence and early adulthood however, the proportion of disease-related deaths increased by age.

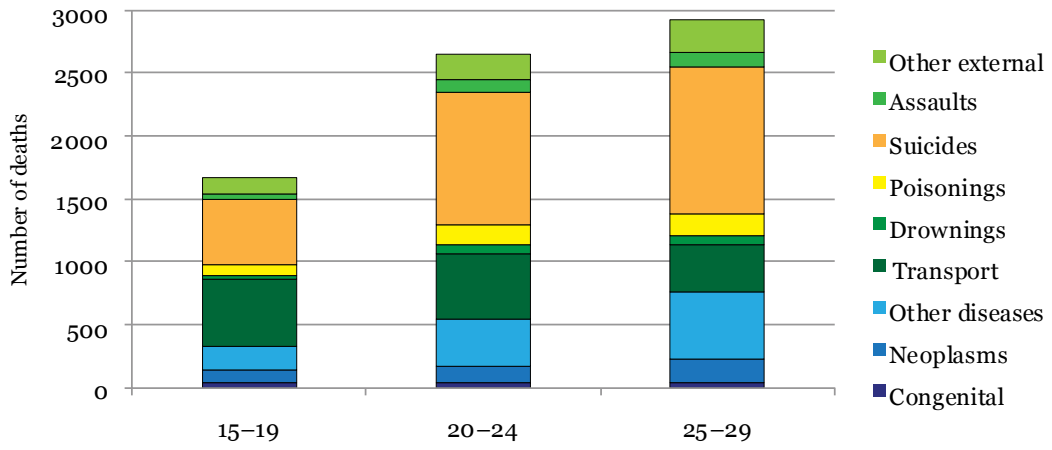

Figure 6 Main causes of death by age group, 15–29-year-old males, 1990–2007, Finland.
Data source: un-weighted study data (approx. 80% of all deaths)

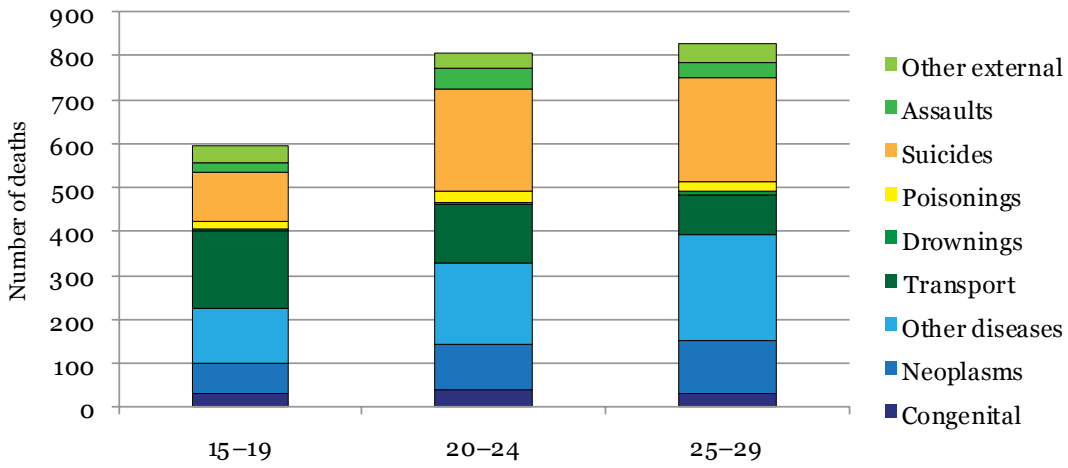

Figure 7 Main causes of death by age group, 15–29-year-old females, 1990–2007, Finland.
Data source: un-weighted study data (approx. 80% of all deaths)

Although deaths attributable to alcohol poisoning and alcohol-related diseases are quite rare among the young, alcohol plays an important role in mortality from external causes (Impinen, Lunetta, & Lounamaa, 2008). Previous research has revealed that recurring drunkenness in adolescence is associated with injury mortality and morbidity (Mattila et al., 2008; Pickett et al., 2002). According to the data used in this study, in approximately one third of all deaths from external causes among 17–29-year-olds, alcohol intoxication was registered as a contributing cause (Study III). Among the adult population alcohol-related mortality has been shown to contribute significantly to both social differentials in mortality and excess mortality

among men (Mäkelä, Valkonen, & Martelin, 1997; Martelin, Mäkelä, & Valkonen, 2004).

2.2 SOCIAL DETERMINANTS OF MORTALITY AMONG THE YOUNG

Differential experiences of environmental and material conditions, psychosocial support, and behavioural options make people more or less vulnerable to poor health. According to the Commission on Social Determinants of Health, established by WHO in 2005, these are the "conditions in which people are born, grow, live, work and age". In other words, social determinants of health and mortality broadly refer to the structural determinants and conditions of daily life – the living conditions and life chances of people in terms of their immediate living environment, access to education, health care, and social protection, and conditions of work and leisure that are shaped by families, communities, and national and global level structures and policies (Marmot, Friel, Bell, Houweling, & Taylor, 2008; Viner et al., 2012). From a life-course perspective on health inequalities, there is special emphasis on the early years of life: child development in physical, cognitive, social and emotional domains may have a strong influence on subsequent life chances and health through skills development, education, and occupational opportunities (Marmot et al., 2008). More recently, adolescence, a previously neglected life stage in research on health inequalities, is increasingly recognized as another key developmental stage (Due et al., 2011; Viner et al., 2012).

2.2.1 EXPLAINING SOCIAL PATTERNS IN MORTALITY

Social factors are known to associate with health and mortality, but explaining how, and under what circumstances, these factors produce their effects has turned out to be difficult (Adler & Stewart, 2010; Kawachi, Adler, & Dow, 2010). On the theoretical level, explanations are divided between those based on health selection, meaning that health affects social position, and social causation, meaning that social position affects health (Townsend & Davidson, 1982). However, the various theoretical models and conceptual frameworks based on selection, causation, and their modifications have been developed and empirically evaluated in order to assess health inequalities among adults.

Children are highly dependent on their parents or guardians during the early years of life. Although the living conditions that affect health and well-being may differ between children and adults (with regard to child care and school vs. work-related factors, for example), children are usually assigned the social position of their parents in studies on social inequalities. Alternative approaches among older children and adolescents include

studying the health effects of peer status and social relationships in the school context (Östberg, 2003; Karvonen, Vikat, & Rimpelä, 2005).

Social differentials in mortality among children and young people, as opposed to adults, are less likely to be caused by health selection, in other words the poor health of the child is less likely to be responsible for the lower educational attainment or lower occupational class of the parent (Östberg, 1996). On the other hand, studies from the US suggest that having an infant in poor health does increase the risk of parental separation, particularly among parents with a low socioeconomic status, and that children with disabilities are more likely to reside with a single parent (Reichman, Corman, & Noonan, 2003; Cohen & Petrescu Prahova, 2006). Evidence supporting child health as a cause of family instability remains limited in the case of less severe health problems (Bzostek & Beck, 2011). All in all, there may be effects related to selection, but the total number of children with severe health conditions is too small to fully explain the observed variation between parental social background and child health and mortality. In particular, it would appear that this type of selection is unlikely in deaths attributable to injuries (Östberg, 1996).

Parental health and health-compromising behaviours are perhaps more likely than child health to affect both parental social position and marital/cohabitation status, and the health of offspring (Ringbäck Weitoft, Burström, & Rosén, 2004; Propper, Rigg, & Burgess, 2007; Meadows, McLanahan, & Brooks-Gunn, 2008). In fact, there is evidence that higher mortality, worse health and health-compromising behaviours are more common among unmarried parents and those in a lower social position (Brown, 2000; Weitoft, Haglund, Hjern, & Rosén, 2002; Koskinen & Martelin, 2007; Umberson, Crosnoe, & Reczek, 2010). Less than good health or engagement in harmful health behaviours such as substance abuse may further affect parenting in many ways. For example, numerous studies document the negative effects of maternal depression on children's psychological functioning (Goodman, 2007). Empirical evidence supporting this type of association behind the differentials in children's mortality remains limited, however (Hjern & Bremberg, 2002; Weitoft et al., 2003).

The possible causal pathways between parental social position and child mortality are numerous. In her thesis on child mortality in Sweden in the 1980s and 1990s, Östberg (1996) divided the possible mediators between social class and child mortality into four categories: 1) the environment – physical and social, 2) resources – material and immaterial, 3) lifestyle and 4) life events. Further, Chen and colleagues (2002) propose a slightly different conceptual framework covering the potential mechanisms mediating the relationship between socioeconomic position and health in childhood and adolescence, which they classify as: 1) emotional/cognitive (hostility, depression, control, optimism, information processing), 2) social (family/peer relationships), 3) environmental (housing/neighbourhood characteristics, stressful events, child care, health care, school achievement),

4) behavioural (health habits, treatment compliance) and 5) biological (stress). The strength of these mediators is expected to change as children grow older and developmental changes occur. For example, compared to young children, older children and adolescents spend less time at home, which increases the importance of neighbourhood characteristics.

The contribution of genetic factors to social differentials in health is also well acknowledged, but so far the complex interactions between genes and the environment in this context are poorly understood (Adler & Stewart, 2010). The very complexity of such interactions nevertheless provides a strong counter-argument to claims that inherited vulnerability could fully explain the associations between parental social position and the health of their offspring (Chen et al., 2002; Wise, 2009).

The following description of the potential pathways and mechanisms between social position, social relationships, and mortality at young ages is loosely based on the categorisations given in Östberg (1996) and Chen et al. (2002), although largely omitting the psychological and biological processes that are beyond the scope of this study.

Social position and environmental factors

Social disadvantage may relate to both differential exposures and differential susceptibility to environmental hazards arising from residential conditions and neighbourhood characteristics (Bolte, Tamburlini, & Kohlhuber, 2010). Transport injuries contribute heavily to child and adolescent mortality, and the safety of the neighbourhood, especially in terms of traffic safety, and the means of transport used, is undoubtedly a significant mediating factor (Sonkin, Edwards, Roberts, & Green, 2006; Fleury, Peytavin, Alam, & Brenac, 2010).

Exposure to health hazards originating from the parents' work environment is probably of lesser importance to children's health in today's advanced economies. Rising housing standards have likewise diminished the risks associated with the physical environment at home, although the risk of injury may still differ significantly between housing arrangements, in particular during the first years of life. Characteristics of the built environment, outdoor and indoor air pollution (chemical agents, allergens and endotoxins) and noise have been associated with lower social positions in previous research, and in some cases linked further with child health disadvantage (Bolte et al., 2010; Vrijheid et al., 2010; Le Cann et al., 2011). However, the empirical evidence on environmental inequalities and their health effects among young people is so far scarce. Moreover, the somewhat mixed findings point to the complexity of the associations, and high variance in the effects by exposure type and context.

Economic resources play a fundamental role in shaping many aspects of life. Higher incomes may relate to healthier living environments and healthier lifestyles (Khanam, Nghiem, & Connelly, 2009). Children raised in

welfare societies are highly unlikely to suffer from absolute deprivation such as malnutrition or a lack of health care, but large differences still exist in the ability of families to provide their children with safe and healthy living conditions (UNICEF, 2007). The knowledge and skills acquired through education may play a significant role in this, and parental education is one of the strongest social determinants of child mortality in both developed and developing countries. Recent analyses of trends in child mortality between 1970 and 2009 in 175 countries attribute over 50% of the global decline in child deaths to increased educational attainment in women of reproductive age. In contrast, the contribution of economic growth is estimated at below 10%. Although making a minor contribution to the total number of averted deaths, the impact of the increasing level of education is also evident in Western Europe and other high-income regions (Gakidou, Cowling, Lozano, & Murray, 2010).

Public health care in Finland is built on the principle of universal access, and services related to children's health such as maternity services and health clinics are free of charge. Countrywide surveys have found no significant socioeconomic differences in children's usage of general-practitioner services in the five Nordic countries, although Finnish children of less highly educated parents and families on low incomes were less often seen by specialists (Virtanen, Berntsson, Lahelma, & Köhler, 2006; Halldorsson, Kunst, Kohler, & Mackenbach, 2002). The differences in children's health between neighbouring administrative areas identified in a study on regional variation in child health and the use of health services in Finland also suggest a degree of service-provision-induced variation. However, in the case of childhood mortality, the regional variations were attributable to maternal social class and biological confounders such as maternal age and parity (Gissler, Keskimäki, Teperi, Järvelin, & Hemminki, 2000).

Social relations and health behaviours

Providing their members with economic, social and psychological resources, families exert a powerful influence on health (Carr & Springer, 2010). Living alone or with someone other than a spouse has shown strong associations with excess mortality in the adult population (Koskinen, Joutsenniemi, et al., 2007). The increasing number of children living in single-parent, cohabiting-parent and reconstituted families has already prompted a significant amount of research on the effects of family structure and family disruption on the health of children (Brown, 2010). The overall conclusion from previous investigations is that single parenthood and other less traditional family forms seem to have negative, albeit often small effects on child health and well-being (Amato, 2001, 2005; Brown, 2004; Chapple, 2009; Låftman, 2009).

In their review of US-based evidence on the influence of family structure on children's health and well-being, Waldfogel et al. (2010) focus on five key pathways identified in previous research, namely parental time and economic resources, parental mental health, parental-relationship quality, parenting quality, and father involvement. Noting the inevitable role of the prior selection of different types of men and women into certain family roles, the authors found non-uniform associations depending on the outcome (child health, cognitive abilities or behavioural problems), and stressed the additional influence of family instability that often relates to non-traditional family structures. Family instability may lead to stressful life experiences for both parents and children, including residential mobility, the loss of social and economic resources, and parental conflict and depression (Bzostek & Beck, 2011).

Although more often considered in terms of health-promoting effects, social relationships may also be a source of strain with health-threatening consequences. The quality of parental care, family conflict, and, at the extreme, different forms of child maltreatment have been associated with mental and physical health outcomes in both childhood and adulthood (Repetti, Taylor, & Seeman, 2002; Gilbert et al., 2009; Greenfield, 2010). There is evidence that children with experience of substitute care, among whom many have been exposed to multiple risk factors starting from the intrauterine period (Sarkola, Kahila, Gissler, & Halmesmäki, 2007), suffer from strong excess mortality in adolescence and early adulthood, particularly with regard to suicidal deaths (Kalland, Pensola, Meriläinen, & Sinkkonen, 2001; Hjern, Vinnerljung, & Lindblad, 2004).

Health behaviours have been shown to play a major role in health and mortality inequalities among adults (Mackenbach et al., 2008). Factors such as diet, sleep and physical activity undoubtedly affect children's health and well-being, but health-compromising parental behaviours may be more significant with regard to mortality in childhood. Specifically, it has been found that maternal tobacco and alcohol use during pregnancy has consistent adverse effects on the health and survival of offspring (Autti-Rämö, 2000; Rogers, 2009). Research in Finland spanning the years 1987–2007 revealed that prenatal exposure to maternal smoking of more than 10 cigarettes a day increased the risk of mortality in childhood, adolescence and young adulthood (Ekblad, Gissler, Lehtonen, & Korkeila, 2010). This study did not adjust for socioeconomic factors, but smoking during pregnancy in Finland has been found to be significantly higher among young, single, and less highly educated mothers (Jaakkola, Jaakkola, Gissler & Jaakkola, 2001; Raatikainen, Huurinainen & Heinonen, 2007). Moreover, women in higher socioeconomic positions are more likely to stop smoking when they are pregnant (Gissler, Rahkonen, Arntzen, et al., 2009). Parental substance abuse may also contribute to childhood deaths attributable to accidents and violence.

The influence of peer groups is likely to become stronger during adolescence (Donovan, 2004), and personal engagement in risky behaviours, excessive alcohol use in particular, emerges as a strong predictive factor for injury mortality and morbidity (Pickett et al., 2002; Mattila et al., 2008). The use of tobacco products does not lead to death at young ages, but evidence from post-mortem examinations on young adults aged 15–34 in Finland suggests nicotine use is two-to-three times higher than among the living young population, and also carries strong associations with substance abuse and the use of psychotropic medication (Launiainen et al., 2011).

Age patterning in social differentials in mortality among the young

Studies focusing on specific age groups among the young have shown that the effects of social factors on mortality are not necessarily constant in presence or strength (West & Sweeting, 2004; Chen et al., 2006; Case, Lee & Paxson, 2008). Chen et al. (2002) propose three developmental models to describe changes in the association between social position and health outcomes during childhood and adolescence: 1) the childhood-adolescent-persistent model suggesting that the differences are established early in life and remain fairly constant, 2) the childhood-limited model positing that initially large differences gradually decrease and 3) the adolescent-emergent model positing just the opposite, in other words that modest initial differences increase with age. The fit of the models is likely to differ for different health outcomes, and in different cultures and/or periods of time. The childhood-limited model has perhaps attracted the most attention in research on health inequalities at young ages, possibly due to West's (1997) equalisation hypothesis. According to the hypothesis, the increasing influence of youth culture and peer groups may explain observations of relative equalisation in health by measures of parental social position during the child-youth transition.

From a life-course perspective, the social determinants of health are only expected to act differently at different stages of life (Wadsworth, 1997). During the intrauterine period and infancy, children are affected by factors such as the quality of medical care, nutrition and nurturing, parental smoking and substance use, whereas in childhood and adolescence factors such as housing conditions, environmental factors, schooling, the quality of parenting, family disruption and family conflict gain in prominence. The emphasis shifts again in the transition to adulthood to factors reflecting the children's own social position (educational attainment, employment), family formation and health behaviours. Social differentials in health may be weak during some periods of life, but re-emerge as developmental changes occur, or as the effects of factors that contribute to health inequalities accumulate across the life course (Wadsworth, 1997; Chen et al., 2002). For example, the association between social relationships and health behaviours are likely to evolve and change during the life course as both the relevant behaviours and

the most influential relationships differ between life periods. Parents largely define and control the lifestyle and health behaviours of young children, but in late childhood and adolescence the influence of peers, especially in the initiation of smoking and substance use, may become more important, followed by romantic partnerships in early adulthood (Umberson, Crosnoe, & Reczek, 2010).

Studies of specific causes of death suggest that differential associations between social position and living arrangements and total mortality by age group may also reflect changes in the overall prevalence and cause-composition of deaths. Influenced by various factors, and through multiple mechanisms, the different causes of death are more or less likely to carry a social gradient. Changes in mortality patterns are of particular relevance among the young: there are large differences between the age groups in the typical causes of death (see Figures 4–7, p. 15–16), which also reflect changing proximal risk factors as the living environment and social relationships evolve during the early life course. In Europe, for example, a sharp decrease in fatal home injuries among children aged five years and above is balanced with increases in road-traffic injuries (Sengoelge, Hasselberg, & Laflamme, 2011).

2.2.2 PREVIOUS FINDINGS ON MORTALITY DIFFERENTIALS AT YOUNG AGES

Although social inequalities in mortality among adults have been far more widely and thoroughly documented, differences in mortality at young ages have been observed in both developed and developing countries (Wagstaff, 2000; Blakely et al., 2003). In recent decades the research has focused strongly on injuries, the principal cause of death in high-income countries (Patton et al., 2009). Social differentials also appear to be most prominent with regard to external causes of death (Laflamme et al., 2010).

Östberg (1996) found systematic mortality differences across all social classes in Sweden during the period 1980–86. According to census-linked death registers, mortality among children of manual workers, self-employed persons and farmers was higher than among children of non-manual workers. In the manual-worker category, children of unskilled workers had higher mortality than children of skilled workers, and the highest death rate was among children with no parent in gainful employment. Compared to the non-manual group, the excess risks of mortality for the other social classes ranged from 39 to 91%. The class differences were wider in the case of mortality from external causes, but the association between class and total mortality from diseases was also statistically significant. The differences were present in every five-year age group within the age-span of one and 19 years, and for both sexes. The class effect was more pronounced among boys, however.

Further analyses focusing on the relative importance of social class compared to other structural dimensions (gender, family structure, immigrant status, and population density) revealed that only social class and gender were significant in the case of disease mortality. The greatest differences with regard to mortality from external causes were likewise attributable to gender and social class, but the risk was also higher among children of single parents and immigrant parents, and for those living in the least densely populated areas. These differentials also remained after mutual adjustment (Östberg, 1996). Blakely et al. (2003), in contrast, concluded in a 1991–94 follow-up of deaths among under-15-year-olds in New Zealand that the association between single-parent families and child mortality was totally attributable to the associated low socioeconomic position.

In England, Petrou et al. (2006) found a significant social-class gradient in mortality during the first 10 years of life in a cohort study of 117,212 children born in 1979–88 in Oxfordshire and West Berkshire. Deaths during the late neonatal period manifested the greatest differentials, but mortality differences among 1–10-year-olds were also statistically significant (the adjusted OR 1.13 [95% CI 1.02–1.26] for each decrement in the Registrar General's occupational social class category). The authors made an effort to adjust for numerous potentially confounding perinatal and maternal factors such as gestational age, maternal smoking and delivery complications, but the incorporation of the confounders in the regression models resulted in only a slight reduction in the gradient.

Siegler et al. (2010) found differing socioeconomic gradients by both cause of death and age group in their analysis of deaths from external causes between the ages of 28 days and 15 years in England and Wales in 2001–03. The highest gradients were in exposure to fire and hot substances, and pedestrian transport injuries, followed by accidental suffocation. Assault also carried a strong gradient, which was largely due to infant deaths, however. A study carried out in South Korea analysing deaths between the ages of one and nine years in 1996–2004 showed clear socioeconomic gradients by both maternal and paternal education, and the father's occupational class (Jung-Choi & Khang, 2011). External causes, transport injuries in particular, contributed most to the social differentials, whereas the contribution of cancers, the third largest cause of death after transport accidents and other injuries, was low. The relative contributions of different causes of death to mortality differentials seems to differ between countries, but the highest gradients are commonly found in external causes, whereas social differentials in cancer mortality are often small or non-existent in childhood (Shaw, Blakely, Crampton, & Atkinson, 2005; G. K. Singh & Kogan, 2007; Kim et al., 2009; Syse, Lyngstad, & Kravdal, 2012).

Swedish large-scale cohort follow-ups have provided rich information on mortality among the young. Weitoft et al. (2003) showed in a population-based cohort follow-up (1991–99) that children of single parents in Sweden had increased risks of both morbidity and mortality (among females only in

the case of suicide) even when a wide range of demographic, socioeconomic, and health-related factors were controlled for. Consistently with other studies linking single parenthood and a low socioeconomic position, a lack of household resources was the main explanation for the increased risk among children of single parents. In contrast, only a small part of the excess risk could be attributed to parental addiction and mental illness, both of which were more frequent in single parents than among parents with a partner.

Having conducted a cross-sectional register study on young people under 20 years of age living in Sweden in 1990–94, Engström et al. (2002) observed a relatively low injury incidence (both fatal and non-fatal) and negligible social differences among the under-fives, and significant socioeconomic differences in all the older age groups: the highest absolute differences in traffic injuries were among 15–19-year-olds, and the highest relative differences in intentional injuries among 10–14-year-olds. Hjern and Bremberg (2002) followed all children below 15 years of age and residing in Sweden in 1985 between 1991 and 1995. Controlling for gender, year of birth and urban/rural residency they found that parent-related social determinants explained 19% of all injury deaths (1,474 deaths in total). Notably, there was wide variability in parental social determinants for different causes of death: parental characteristics did not have an effect on suicide rates, but they did explain 58% of homicides and 47% of motor traffic injuries. Socioeconomic position was the single most influential parental determinant. The family situation (single- or two-parent household, a recent divorce or the recent death of a parent) explained 11% of suicides and 18% of homicides, but the remaining determinants - maternal country of birth and parental risk factors (a parent imprisoned, or hospitalised for substance abuse or mental illness) - did not seem to affect mortality. In Denmark on the other hand, in a study focusing specifically on suicides in 1981–97, parental factors such as suicide or early death, hospital-treated mental illness, unemployment, a low income, a low educational level and divorce were associated with an increased risk of suicide among 10–22-year-olds (Agerbo, Nordentoft, & Mortensen, 2002). The effect of parental socioeconomic background decreased clearly following adjustment for a family history of mental illness and suicide.

Relatively few studies have examined time trends in mortality differentials among young people. Roberts et al. (1998) found that in England and Wales in 1981, the injury death rate for the lowest-class children (0–15 years) was 3.5 times that of those in the highest-class. Moreover, the gap grew even wider between 1981 and 1991 because of the differential decline in death rates. The social gradients widened for both unintentional and intentional injuries, and were specifically strong for fire deaths, homicides and injuries of undetermined intent. According to a more recent British study (Edwards et al., 2006) based on mortality data classified according to social class and census-based estimates of the population at risk, child death rates from injury and poisoning in the age-span of 0–15 years

had fallen in England and Wales during the previous 20 years, but the inequalities remained. Because of changes in the socioeconomic classification, direct comparison of the social gradient over time was not possible, but in 2001–2003 the injury death rate of children with parents in routine occupations was still more than double that of children with parents in higher managerial or professional positions, and there appeared to have been no mortality decline at all among children with no parent in paid employment.

Shaw et al. (2005) analysed trends in mortality inequalities among children aged 1–14 against the background of rapid social and economic restructuring that took place in New Zealand between 1981 and 1999. Relative poverty among households with children increased in the 1980s, but decreased somewhat in the 1990s, and during the whole period the educational level increased and fewer children had parents in the lower occupational classes, yet at the same time the number of children with unemployed parents increased. The results of this census-based study indicated declining mortality rates in all socioeconomic classes, but there were still inequalities regardless of the measure of social position used. The relative differences by income increased slightly, but there was no clear trend in differences according to maternal education or parental occupational class: this finding underlines the importance of measuring multiple dimensions of social class simultaneously.

Widening inequalities by area-based socioeconomic measures were evidenced among 1–14-year-old US children in 1950–1993 (G. K. Singh & Kogan, 2007), and among 0–24-year-old males in Australia between 1985–1987 and 1995–1997, whereas the differentials decreased among females (Turrell & Mathers, 2001). According to Bremberg's (2003) Swedish study, no significant changes in mortality inequalities by income occurred among 0–19-year-olds in different areas of Stockholm County between 1988 and 1995. In Québec, on the other hand, although the precision of the estimates was low, absolute and relative socio-economic inequalities in morbidity and mortality declined for most causes and age groups between 1990 and 2005 (Barry, Auger, & Burrows, 2011).

In sum, the evidence on time trends in mortality inequalities among children and young people is inconsistent: previous studies report widening, but also stable or diminishing differentials over time, although some of the discrepancies undoubtedly arise from the use of varying measures and classifications of social position and family background.

A study conducted in Finland reported mortality differentials by paternal occupation-based social class among boys aged 5–14 years in the 1970s and 1980s (Rimpelä, 1993): in 1986–1990, the probability of dying between the ages of five and 14 was significantly higher for farmers' (0.38%) and workers' (0.26%) sons than for white-collar employees' sons (0.20%). The variation was mainly attributable to differences in the rate of accidental deaths. Among girls, the already small social-class differences at the beginning of the 1980s

almost disappeared during the decade. Mortality differences according to the father's level of education also declined among boys and girls, and were no longer of major significance at the end of the 1980s. No differences according to family structure were found for girls, but boys living in single-parent families had a slightly elevated mortality rate attributable to both diseases and external causes.

Among 15–19-year-olds the sons of farmers and workers had slightly higher-than-average mortality in 1986–1990. With reference to the children's own occupational class, mortality among men aged 20–24 was 1.5 times higher, and more than double among the 25–29-year-olds, for workers compared to upper-white-collar employees. Among women there were similar differences only in the older age group (25–29), whereas among the 20–29-year-olds the achieved level of education was even more strongly associated with mortality than occupational class. The probability of dying was more than five-fold among men and four-fold among women with basic education compared to the more highly educated. Both diseases and external causes of death contributed to the educational differentials. (Rimpelä, 1993.)

Gissler et al. (1998) studied social-class differences in mortality and morbidity in a seven-year follow-up of the 1987 Finnish birth cohort (N=59,865 live births). A significant social gradient was found for almost all morbidity measures, but not for mortality. However, the absence of mortality differentials in this study could have been due to the rather short follow-up period, which included only a small number of deaths (7.4 per 1000).

In their study covering 1987–95, Pensola and Valkonen (2000) found no systematic gradient in all-cause mortality by parental class among 5–14 year-old females or 10–14-year-old males. In the case of external causes of death, however, females with a manual class background had excess mortality compared with children of upper non-manual class at ages 10–19 years, and males at ages 5–9 and 15–19 years. A social gradient in all-cause mortality also appeared among females aged 15–19 and 25-29 years, and males aged 15–29 years. The strongest mortality differences by parental social class were in alcohol-related causes of death among males.

Having adjusted for several measures of health behaviour in their register follow-up of survey respondents in 1979–2001, Mattila et al. (2005; 2008) concluded that not living with one's parents in adolescence, as well as the father's lower occupational class among men, predicted injury-related mortality between the ages of 14 and 41. Other significant risk factors in the fully adjusted models included recurring drunkenness, smoking (only among females) and poor school performance in adolescence.

Saarela and Finnäs (2008) studied cause-specific mortality among 15–30-year-olds in 1970–2004 with a specific focus on differentials between Finnish and Swedish (6%) speakers in Finland. The register data comprised a 50% sample of Swedish speakers and 5% of Finnish speakers. Finding strong regional language-group differentials in suicides and none in other external causes, and stronger differentials by parental socioeconomic position in

other external causes than suicide among men, the authors suggest genetic predisposal as a possible explanation. The mortality patterns were less consistent among young women, however. Besides parental socioeconomic position, other risk factors in the fully adjusted models included a single-parent background, having no siblings and not living in owner-occupied housing in childhood.

It appears from these studies that differences in child mortality relating to socioeconomic background and family structure persisted in Finland at least up to the 1990s, and among young adults to the beginning of the 2000s. The fact that the differentials appear to be largely restricted to external causes of death is nonetheless significant given that such causes account for a major proportion of mortality among the young. An additional cause of concern is that the incidence of intentional deaths (suicides and assaults) did not decline during this time, and remained fairly stable among children and adolescents (Mattila, 2005; Parkkari et al., 2003). International evidence also confirms the existence of social differentials in mortality at young ages, but given the various study designs and methodological differences, the presence and strength of the reported associations vary significantly between the studies.

2.2.3 METHODOLOGICAL ISSUES

Analysing the social determinants of mortality at young ages is prone to methodological difficulties arising from the relatively small number of deaths in younger age groups in developed countries. On the statistical level the limited numbers result in wide confidence intervals in the mortality measures, and often preclude not only the conducting of more detailed analyses by smaller population subgroups, narrower age groups or time periods and different causes of death, but also closer examination of the interplay of several background variables. All of these could provide valuable information that would enhance understanding of the underlying mechanisms that ultimately produce the differences.

The most commonly used empirical measures of social position for children are parental education, occupation-based social class, and income (Galobardes, Shaw, Lawlor, Lynch, & Davey Smith, 2006). Housing, home or car ownership and received welfare benefits have also been used as measures of a family's material resources (Galobardes, Shaw, Lawlor, Davey Smith, & Lynch, 2006). Other family-related dimensions of children's living conditions used in research on health inequalities include family structure, number of siblings and specific parental characteristics such as age or health status (Blakely et al., 2003; Hjern & Bremberg, 2002; Weitoft et al., 2002).

Given that the various measures of social position cannot be considered interchangeable options, and rather reflect more or less different aspects or dimensions of social position, it is to be expected that study results vary according to the measures used, not to mention the level - individual, family,

household or neighbourhood (Chen et al., 2002). Moreover, among children there is potential variation depending on the individuals from whom the measure is derived - mother, father or both parents (Buis, 2012) - with further possible differentiation between biological and custodial parents. The on-going changes in the typical family structure in contemporary societies (Sobotka & Toulemon, 2008) complicate the setting further, making the appropriate assigning of a social position to children far from self-evident. Furthermore, measures of socioeconomic position and living arrangements are not static over the life course. Employment-related factors and living arrangements are particularly prone to considerable change resulting from relatively common life-events such as unemployment and family instability.

Finding the best approach to measuring the living conditions and life chances of adolescents, who are already becoming more or less distanced from the material resources and lifestyle of their parental home, is also somewhat problematic. Some adolescents and young adults may have income sources of their own, but on the basis of register data that do not show informal transfers of resources between parents and their children, the degree of independence is difficult to establish. On average, young adults in their late 20s have progressed much further in the transition to adulthood, but not all of them have completed their education, moved into full-time employment and established their own households (Corijn & Klijzing, 2001). A further measurement challenge is the increasingly dynamic nature of the transition to adulthood. The timing and order of transitional events such as completing education, entering full-time employment, leaving the parental home, forming a partnership and becoming a parent vary considerably nowadays, and repetitive events such as returning to the parental home and relationship breakdown and re-partnering are not uncommon (Goldscheider & Goldscheider, 1998; Corijn & Klijzing, 2001; Billari & Liefbroer, 2010).

Despite a wide consensus among researchers on the complex causal mechanisms driving the social differentials in mortality, there is no clear and well-grounded conceptual framework explaining the association between social factors and health at young ages. Conducting longitudinal, cohort-based studies starting from infancy, using several measures of social class and taking into account both age and time periods have been advocated in order to shed light on the mechanisms behind both childhood mortality differentials and the effect of childhood health on later health and mortality. (Goldman, 2001.)

3 THE AIMS OF THE STUDY

The objective of this study was to build up a comprehensive description of the social determinants of mortality among children, adolescents and young adults in Finland in the 1990s and 2000s. As mortality in infancy differs from the following years in many respects, the study was restricted to the population between one and 29 years of age. Multiple register-based measures of social position and living arrangements were used in order to explore the social determinants and to assess their associations with mortality in different age periods, and for different causes of death.

The specific aims were:

1) To examine the associations between parental social background (family type, parental education, household income) and mortality in childhood (Studies I and II)
2) To assess the simultaneous associations of parental social background and their offspring's own social position (education, main activity) and living arrangements with mortality in late adolescence and early adulthood (Studies III and IV)
3) To examine the emergence and patterning of social inequalities in mortality during different periods of childhood, adolescence and early adulthood (Studies I, II and III)

Figure 8 depicts the empirical framework. For empirical purposes, childhood in this study refers to the ages of 1–14 years, late adolescence to 15–19 or 17–19 years, and early adulthood to 20–29 years. Mortality in childhood is examined in relation to different family characteristics, whereas in late adolescence and early adulthood (17–29 years) the focus is expanded to include the young people's own social position and living arrangements, and to assess whether the effects of parental social background on mortality are direct or mediated through the timing of leaving the parental home, their own social position and their current living arrangements.

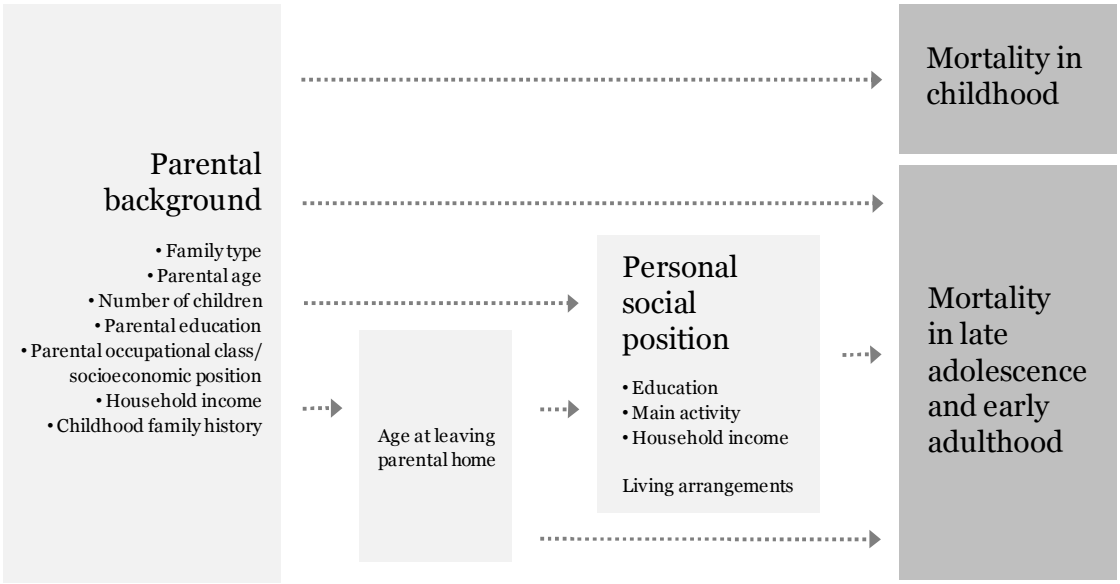

Figure 8 Social determinants of mortality in childhood and in late adolescence and early adulthood – the measures and associations examined in this study.

4 DATA AND METHODS

4.1 DATA SOURCES AND THE STUDY POPULATION

This study is based on extensive longitudinal register data maintained by Statistics Finland. Data on mortality and causes of death are linked with longitudinal population census and employment data by means of personal identification numbers. These data include individual- and household-level information about a person's education, employment and income, family and housing, and parental characteristics for children living in the same household as their parents. Most of the data have been produced annually since 1987, and before that information is available for the census years 1970, 1975, 1980 and 1985.

The study data is based on a representative 11% sample of the population residing in Finland during at least one of the years 1987–2003/2007. Because of data-protection regulations, Statistics Finland provides only crude data on the total population. Therefore, in order to maintain statistical power in the mortality analyses, a random over-sample of the population that died during the period was added to the dataset. All in all, 80% of all deaths in the period were covered in the final study data. Sampling weights for individuals from the original and the additional sample were used in the analyses in order to account for the unequal sampling probability.

Table 1 The study populations in the different sub-studies

Study	Period	Birth cohorts	Age at death	Person-years[1]	Deaths[1]
I	1990–2004	1970–2003	1–24	2 414 699	5 953
II	1990–2004	1975–2003	1–14	1 454 643	1 780
III	1995–2004	1966–1987	17–29	901 055	3 253
IV	1990–2007	1972–1989	17–29	570 217	2 795

[1] Un-weighted total (as observed in the data)

Table 1 shows the study populations in the different sub-studies. Foreign-born individuals (<3%) were excluded because of incomplete data on parental background. The study periods were 1990–2004 for Studies I and II, 1995–2004 for Study III, and 1990–2007 for Study IV. Excluding infant mortality, this study focused on deaths that took place between the ages of one and 29. The age ranges included were 1–24 years in Study I, 1–14 years in Study II, and 17–29 years in Studies III and IV. Except for Study IV, the subjects entered the mortality follow-up either at the beginning of the study period, or later on when they reached the respective age (see Figure 9): in the case of Study IV it was after leaving the parental home. Given the focus on mortality during childhood and early adulthood, the subjects were censored

when reaching the respective age (15, 25 or 30 years), or when moving abroad, or at the end of the follow-up period in 2004 or 2007. Immigrants who settled in Finland during the follow-up period were not included in the analyses.

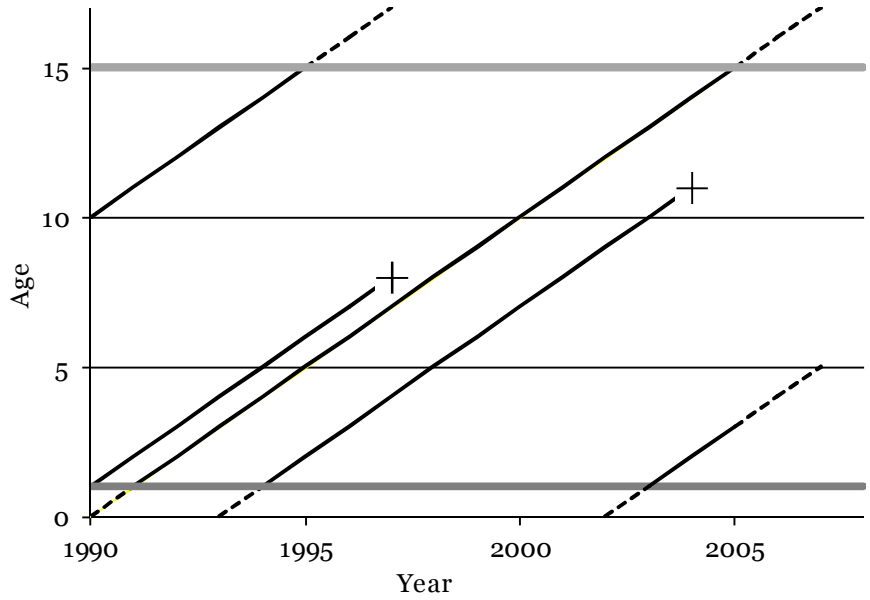

Figure 9 A simplified Lexis diagram on the mortality follow-up among children aged 1–14 years in 1990–2004 (Study II).

4.2 OPERATIONAL DEFINITIONS OF THE MEASURES

4.2.1 MORTALITY

The statistics cover the deaths in Finland or abroad of persons who were, at the time of death, residents in Finland. Determination of the cause of death is based on the medical or forensic evidence providing the grounds on which the physician issues a death certificate (Statistics Finland, 2005).

External causes of death (V01-X44, X46–Y89) and deaths due to diseases (A00–R99, X45) were identified according to the International Classification of Diseases 10. For additional analyses comparing alcohol- and non-alcohol-related deaths among young adults (Studies III and IV), alcohol-related deaths were separated from other deaths attributable to external causes on the basis of a medico-legal autopsy stating alcohol intoxication as a contributing factor (Mäkelä, 1998; Lahti & Vuori, 2002). In Study IV, alcohol-related deaths also comprised deaths caused by alcohol-attributable diseases and fatal alcohol poisoning.

4.2.2 SOCIO-DEMOGRAPHIC MEASURES

The linkage between children and parents is based on shared permanent place of residence. In other words, children were matched with the adult or adults they lived with, regardless of the biological relationship. With a few exceptions, socio-demographic measures were used in the analyses as time-varying covariates that were updated at the end of each follow-up year. Any changes in household composition following parental separation, for example, thus showed in the respective covariates. Depending on the child's age, 1–2% of children could not be linked to their parents. Not living with parents was more common among the older children, and these individuals, most of whom were in institutional or substitute care, were excluded from the further analyses in Studies I, II and IV. The socio-demographic measures used and the respective classifications are listed below. Data-quality descriptions and further information on the data collection and classification are available at the Statistics Finland website: www.stat.fi.

Parental background

Parental education is based on the highest achieved educational qualification: those with a basic level of education have had up to nine years of schooling, those with secondary education 11 or 12 years, and those with higher education at least 13 years. In order to allow a common categorisation for single and two-parent families, the level of parental education was determined on the basis of the highest qualification in the household, in line with the dominance approach (Erikson, 1984; Buis, 2012). Parental education was used as a time-varying covariate in Studies I and II, and was measured at the age of 15 in Study IV.

Parental socioeconomic position (Study III) refers to the socioeconomic position of the household's reference person, usually the one with the highest personal income. A six-class version of Statistics Finland's classification of socioeconomic position was used: upper non-manual, lower non-manual, manual, farmer, entrepreneur, and other or unknown (including students, stay-at-home parents and other non-employed parents). Parental socioeconomic position was only measured in the census years (1975, 1980, 1985, 1990, 1995, or 2000), assessed on the value from the year when the child was between 10 and 14 years old.

Parental occupational class (Study IV) refers to the same six-class version of Statistics Finland's classification of socioeconomic position as described above. The mother's and the father's occupational class were included in the analyses as separate variables, and the measures were taken from the census year when the child was aged between 10 and 15 years.

Household income is based on data drawn from the Tax Administration database. Income subject to state taxation consists of wages and salaries, entrepreneurial income, and other income such as pensions, unemployment benefits and some of the other social security benefits. In order to allow comparison between households of different size and structure, household income was divided by the size of the consumption unit determined as the sum of the weights of its members in line with the modified OECD equivalence scale according to which the first adult aged 18 or over contributes 1.0, subsequent members over 13 years old 0.5, and children aged 0–13 years 0.3 (OECD, 2009). Total household income was divided into annual quintiles for the analyses. For Study III, in which the household could refer to either the parental home or the young people's own home, the quintile cut-off points were calculated separately for the following gender-specific age groups: 17–19, 20–24, and 25–29. Household income was used as a time-varying covariate in Studies II and III. It is referred to as *parental income* in Study IV, and was measured as a two-year average from the years when the child was aged 14 and 15.

Parental age at the child's birth (Study II) was classified as less than 25 years, 25–29, 30–34, or 35 years or more. The mother's or the stepmother's age was used in the first place, and the father's age for children living with a single-parent father.

The number of children (Study II) in the family was classified as 1, 2, 3, or 4 or more children under 18 years of age.

Family type (Study II) was classified as married two-parent families, cohabiting two-parent families and single-parent families. Two-parent families included both intact and reconstituted families. A non-married couple with no common child was considered a cohabiting two-parent family only if the two adult residents were of different genders and not siblings, over the age of 18, and their age difference was less than 16 years. Children in Finland can be registered in only one household, thus some of those with separated parents may have lived at different times with both of their parents.

Childhood family history (Study IV) was formed on the basis of changes in the child's living arrangements from birth until the age of 16. Data on the living arrangements of the under-17s was available from 5–17 measurement points (fewer measures for the older cohorts) for each individual. The different family histories were classified as follows: intact two-parent family, intact single-parent family, disrupted two-parent family, partnered single parent, multiple changes in family structure (two or more), and non-family or unknown living arrangements at least once before the age of 17.

Age at leaving the parental home (Study IV) was classified separately for men (17, 18, 19, 20, 21 or older) and women (17, 18, 19, 20 or older), given that women tend to leave home earlier than men. Those who left at the median age or later were grouped together, because after this point the age at leaving showed no significant effects on mortality. Children below the age of 17 who were not living with their parents (those in institutional or substitute care and the few 15- and 16-year-olds living independently) were grouped together with those who had left at the age of 17.

Personal social position and living arrangements

Education (Studies III and IV) was based on the highest qualification obtained, or current engagement in an educational track leading to an even higher qualification. Obtaining basic qualifications requires up to nine years of schooling, secondary education 11–12 years on average, and higher education at least 13 years. On-going education was determined on the basis of being registered as a student at an educational institute and/or receiving a state study grant.

Main activity refers to the main economic activity during the preceding year. It was classified in study III as employed, unemployed, student, pensioner and other (including stay-at-home parents and those in military/civil service). A slightly different classification was used in study IV: employed (including those in military/civil service), unemployed, student, child home care, and other (including pensioners). Many students appear among the employed because working part-time is very common, especially among students in higher education.

Living arrangements refer to the individuals' permanent place of residence, household size and composition, and marital status. In the case of young adults in Studies III and IV the categories included living with their own parents, married couples, cohabiting couples, single parents, living alone, living with others, and other or unknown. Young people living with their parents were further classified in Study III as those living in married two-parent families, cohabiting two-parent families, and one-parent families. In addition, among the 20–29-year-olds, married or cohabiting couples with children were separated from childless couples. Two unmarried people living together were defined as a cohabiting couple if they were of different genders and not siblings, aged over 18 years, and the age difference was less than 16 years. Same-sex couples could not be identified and appear in the 'living with others' category.

Control variable

In order to assess the degree of urbanisation in the home municipality the municipalities were classified as urban, semi-urban or rural according to the proportion of the population living in urban settlements or the size of the largest settlement (Nihtilä et al., 2008). This variable was included in the analyses of Studies I–III because rural areas tend to have higher rates of mortality, and living arrangements are also likely to be associated with the degree of urbanisation (Eberhardt & Pamuk, 2004). According to the study data, mortality was higher in rural municipalities, whereas single parents, for example, tended to live in urban municipalities.

4.3 STATISTICAL METHODS

The associations between childhood and current socio-demographic factors and mortality were estimated from mortality rates and Cox proportional hazards models (Cox, 1972). Hazard ratios (HR) of mortality were calculated with 95% confidence intervals, and multivariate Cox models were used to determine the relative effects of the different factors. Due to the over-sampling of the population that died during the study period, sampling weights were used in all the analyses to account for the unequal sampling probability. Analyses were conducted separately for males and females, different age groups, and different causes of death, and the groups were collapsed when appropriate. In analyses of specific causes of death, deaths from other causes were treated as censored observations. All the Cox models were adjusted for age (using attained age as the time scale of the follow-up) and the degree of urbanisation of the home municipality (except in Study IV). Stata 10 statistical software (Statacorp., 2007) was used for all the analyses.

Five-year age groups and five-year calendar-time periods were analysed separately in Study I, the focus being on the presence and strength of the association between parental education and mortality during different periods of childhood and young adulthood, and on changes in the association over time. Relative indices of inequality (RII) were used to summarise the associations: each of the original values of parental education was replaced by the midpoint of the cumulative proportion of the population with a higher level, and mortality was then regressed on parental education as a continuous variable (Mackenbach & Kunst, 1997). The RII values can be interpreted as the relative increase in mortality between those at the high and low ends of the education hierarchy.

In Study II, the mortality rates and hazard ratios were first calculated separately for each age group (1–4, 5–9, and 10–14 years) and each socio-demographic covariate. The main purpose was to understand the association between family characteristics and mortality in childhood, thus the initial model only included family type. Other family characteristics (parental age

and number of children in the family) were added next, and finally factors reflecting the family's socioeconomic position (first parental education and then household income). Parental occupational class was not included because the measure was available only for the census years. Given the clear gender difference in the level of mortality and a significant mortality decline during the 15-year follow-up, the analyses were stratified by gender as well as calendar time period (1990–2004 divided into three five-year periods).

The focus in Study III was on living arrangements and mortality from external causes in late adolescence and early adulthood. Parental socioeconomic position, and the young people's current main activity, household income, and level of education were each added to the model both one at a time and in sequential order in order to assess their effects on the association between current living arrangements and death. Typical living arrangements differed strongly among the age groups, thus young people aged 17–19, 20–24, and 25–29 years were analysed separately. Likewise, all the analyses were conducted separately for males and females.

In order to facilitate comparison between the effects of parental social background and their children's own social position in Study IV, the mortality follow-up started only after the young adults had left the parental home. Deaths between the ages of 17 and 29 were included. The first model included all childhood socio-demographic factors (family structure, parental education, occupational class, and income) simultaneously, and the second one showed these results adjusted for age at leaving home. Current living arrangements, level of education and main activity were then added to the previous model in sequential order to assess any changes in the associations.

4.4 ETHICAL CONSIDERATIONS

Data-protection guidelines and ethical regulations approved by the data-protection authorities, Statistics Finland and the University of Helsinki were strictly followed in the use and reporting of the data. The data linkage was performed at Statistics Finland, and any information enabling identification of individuals was removed. Statistics Finland's Ethics Committee granted access to the anonymized data (permission TK 53-601-06).

5 RESULTS

5.1 PARENTAL SOCIAL BACKGROUND AND MORTALITY IN CHILDHOOD

Despite the growing proportion of single-parent and cohabiting-parent families, over 70% of the person-years among 1–14-year-olds were spent in married two-parent families in 1990–2004 (Table 2). Reflecting the timing of family-life transitions and, to a degree, the variation in the different birth cohorts, cohabiting-parent families were more common among the younger children whereas living with a single parent was more common among the older ones (Table 2).

Table 2 Person-years and number of deaths by family characteristics among children in ages 1–4, 5–9, and 10–14 years, 1990–2004, Finland.

	Ages 1–4		Ages 5–9		Ages 10–14	
Family type	Person-years (%)	Deaths[1]	Person-years (%)	Deaths[1]	Person-years (%)	Deaths[1]
Married two-parent	71.3	403	74.4	400	74.9	421
Cohabiting two-parent	18.2	110	11.3	46	8.3	41
Single-parent	9.7	103	13.5	96	15.7	93
Missing	0.7	14	0.9	17	1.1	36
Parental age at birth						
Less than 25 years	17.4	118	19.1	125	23.1	109
25–29	34.1	205	35.7	181	36.4	218
30–34	30.6	164	28.9	139	26.3	157
35 or more	17.2	129	15.4	97	13.2	71
Missing	0.7	14	0.9	17	1.1	36
Number of children						
1	27.0	176	13.8	96	20.7	144
2	43.1	220	45.9	197	42.6	226
3	19.7	140	27.1	177	24.1	131
4 or more	9.6	80	12.3	72	11.4	54
Missing	0.7	14	0.9	17	1.1	36
Parental education						
Higher education	49.0	231	47.2	212	43.9	215
Secondary education	41.6	286	42.3	253	42.8	262
Basic education	8.6	99	9.6	77	12.1	78
Missing	0.7	14	0.9	17	1.1	36
Household income						
Highest quintile	19.7	72	19.9	89	20.3	113
Second quintile	19.8	106	19.9	88	20.0	109
Third quintile	20.0	100	19.9	97	19.8	108
Fourth quintile	20.0	139	19.9	131	19.7	109
Lowest quintile	19.9	201	19.8	141	19.6	120
Missing	0.5	12	0.6	13	0.7	32

[1] Based on un-weighted data = approx. 80% of all deaths, N=630, 559 and 591 at ages 1–4, 5–9 and 10–14 years, respectively.

During the same period, close to half of the person-years were spent in families where at least one parent was highly educated, and around 10% in families in which neither parent had more than a basic education (Table 2). Due to continuous educational expansion, there was also a visible difference in parental education between the younger and older children.

Mortality in childhood was clearly associated with socio-demographic factors. The strongest differentials by family type, parental education and household income showed in deaths between the ages of one and four. The differentials were somewhat less salient among the 5–9-year-olds, and there were no significant differentials among the 10–14-year-olds. Given the absence of differentials in the oldest group, the results on mortality are presented only for the two younger groups (Figures 10 and 11).

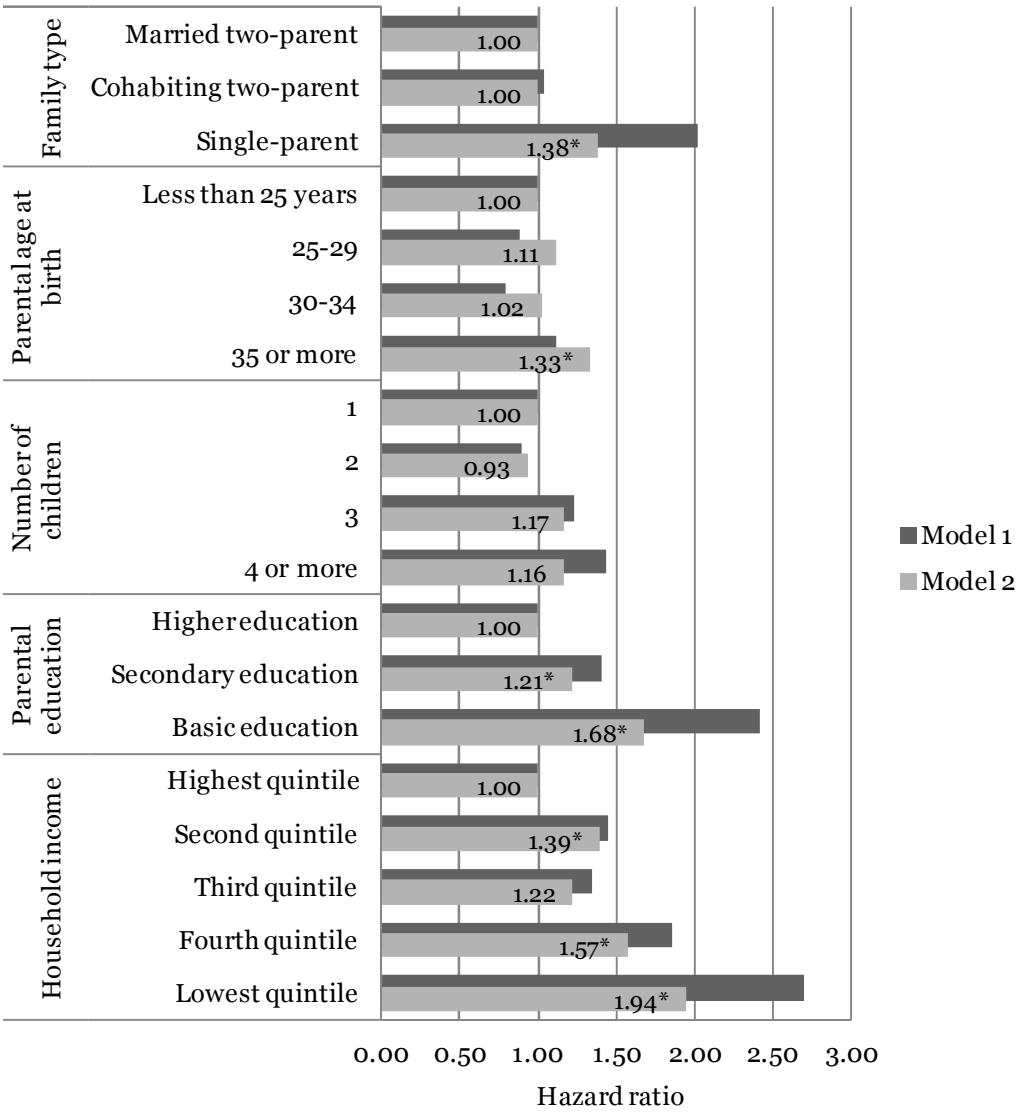

Figure 10 Hazard ratios of mortality by different family characteristics, children aged 1–4 years, 1990–2004, Finland. Model 1 adjusted only for degree of urbanisation, model 2 includes all the covariates. Models stratified by gender and five-year time period. *Statistically significant difference at the .05 level.

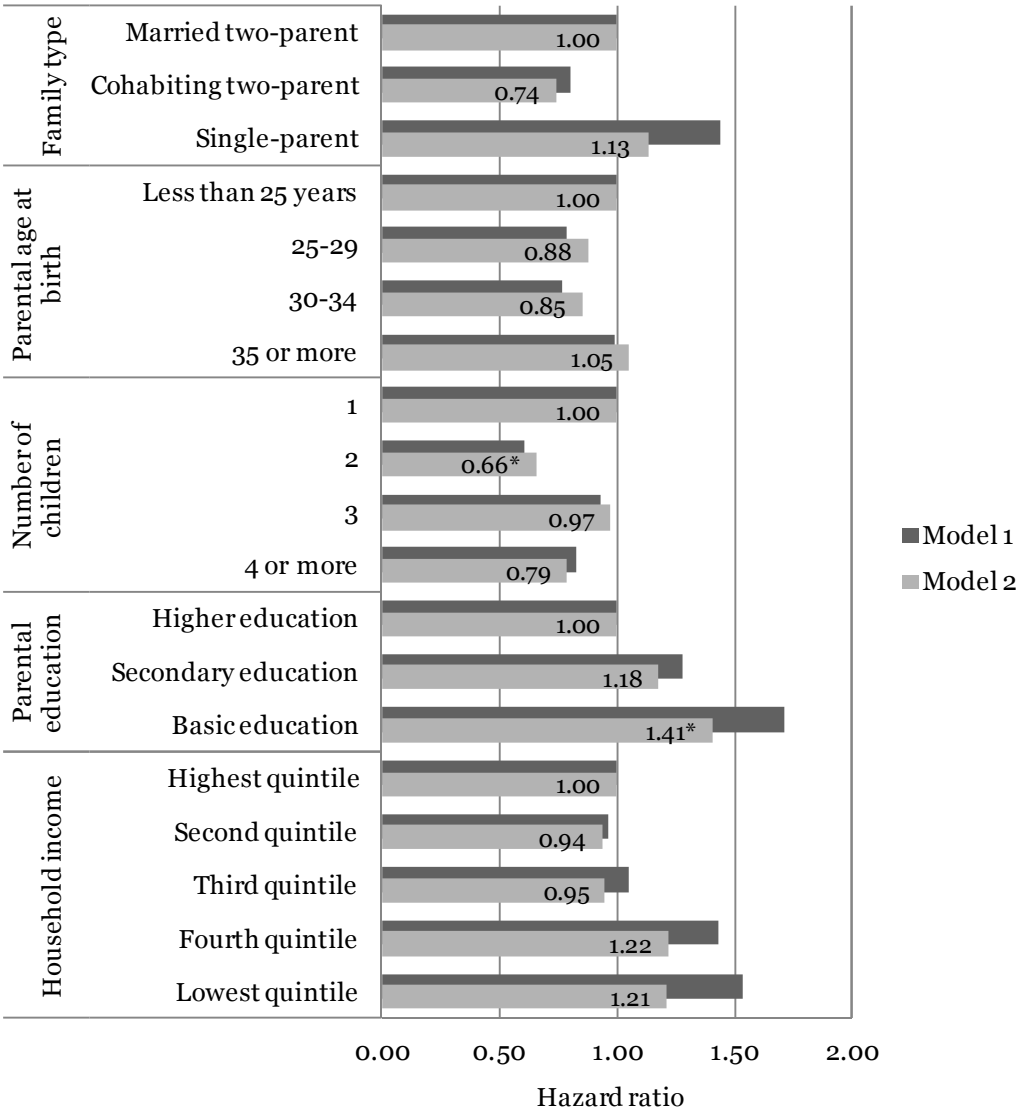

Figure 11 Hazard ratios of mortality by different family characteristics, children aged 5–9 years, 1990–2004, Finland. Model 1 adjusted only for degree of urbanisation, model 2 includes all the covariates. Models stratified by sex and five-year time period. *Statistically significant difference at the .05 level.

Cohabiting-parent families did not differ from married-parent families in terms of child mortality, but for children in single-parent families the hazard ratio of death was two-fold among the 1–4-year-olds, and over 40% higher among the 5–9-year-olds (Figures 10 and 11). Adjusting for parental age at birth and the number of children in the family had no major effect on the association between single-parent families and mortality in the younger age group (Study II, Table 1). In the full model, parental education and household income partly explained the excess mortality, but the hazard ratio still remained elevated for children of single parents (HR 1.38, 95% CI 1.07–1.79) (Study II, Table 1). Nevertheless, the strongest differentials concerned children whose parents were less highly educated and earned less (Figure 10). After all the adjustments, the hazard ratio of death was still almost two-

fold for children in the lowest household income quintile compared to those in the highest quintile.

Adjusting for parental age and the number of children slightly attenuated the association between single-parent families and mortality among the 5–9-year-olds, and further adjustment for parental education rendered the association insignificant (Study II, Table 2). Compared to the younger children (1–4 years), the associations between socioeconomic factors and mortality were also much weaker to begin with, and after all adjustments only basic parental education remained significantly associated with excess mortality (Figure 11).

The social differentials in mortality stemmed mainly from external causes of death, but among the 1–4-year-olds, children of single parents also faced elevated mortality attributable to diseases (Study II, Table 3). On average, single parents were younger than married or cohabiting parents and had fewer children, but these family characteristics showed at least partly independent associations with child mortality. An older parental age and having a larger number of children in the family were significant risk factors only among the 1–4-year-olds, and only with regard to mortality from external causes, whereas the lower mortality in families with two children aged 5–9 years was confined to deaths attributable to diseases (Study II, results not shown).

Child mortality declined considerably during the study period 1990–2004 (Figure 2), and there was also a decrease in the number of children living with less-highly-educated parents. In order find out whether educational differentials in child mortality had changed over time, the 15-year follow-up was divided into three five-year-periods. No significant interaction effects between parental education and the time period were found in any of the general or age- or cause-specific regression models. The period-specific mortality rates and relative indices of inequality nonetheless gave some indication of declining differentials among girls, but widening differentials among boys aged 1–14 years (Figure 12). No significant differentials between married and cohabiting families were found in any of the five-year periods. Among boys aged 1–4 years, however, single parenthood was clearly associated with all-cause mortality only in the last five-year period of the follow-up. Because this finding did not challenge the overall conclusions, the analyses of family type were stratified by gender and time period, and the results are presented for the whole study period.

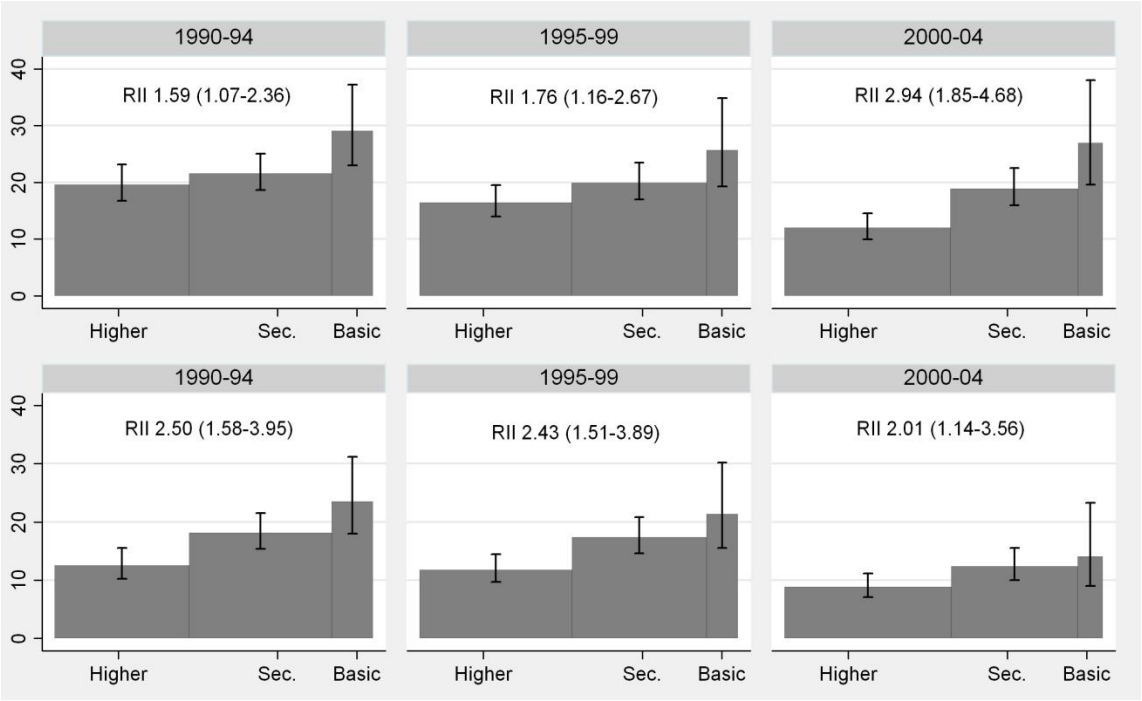

Figure 12 Mortality rates (per 100,000 person-years) and relative indices of inequality (RII) with 95% confidence intervals by parental education and time period. Males (top) and females (bottom) aged 1–14 years, 1990–2004, Finland. The width of the bars is directly proportional to the distribution (%) of parental education in each period.

Source: Remes, Martikainen, & Valkonen (2010), Figure 2. Adapted with permission from BMJ Publishing Group Limited.

5.2 PARENTAL SOCIAL BACKGROUND AND PERSONAL SOCIAL POSITION – MORTALITY IN LATE ADOLESCENCE AND EARLY ADULTHOOD

Mortality in late adolescence and early adulthood (17–29 years) was distinctly patterned by social factors. Compared with the majority of young adults who had lived all their childhood in an intact two-parent family, those with experiences of other types of families or family changes carried a clear excess risk in mortality from external causes (Figures 13 and 14). The association was weakest for those who had only experienced parental separation, but otherwise there were no marked differences between the different family histories. Among men, lower levels of parental education, occupational class and income were all strongly associated with higher mortality, but no gradients by parental socioeconomic factors were evident in mortality from external causes among women.

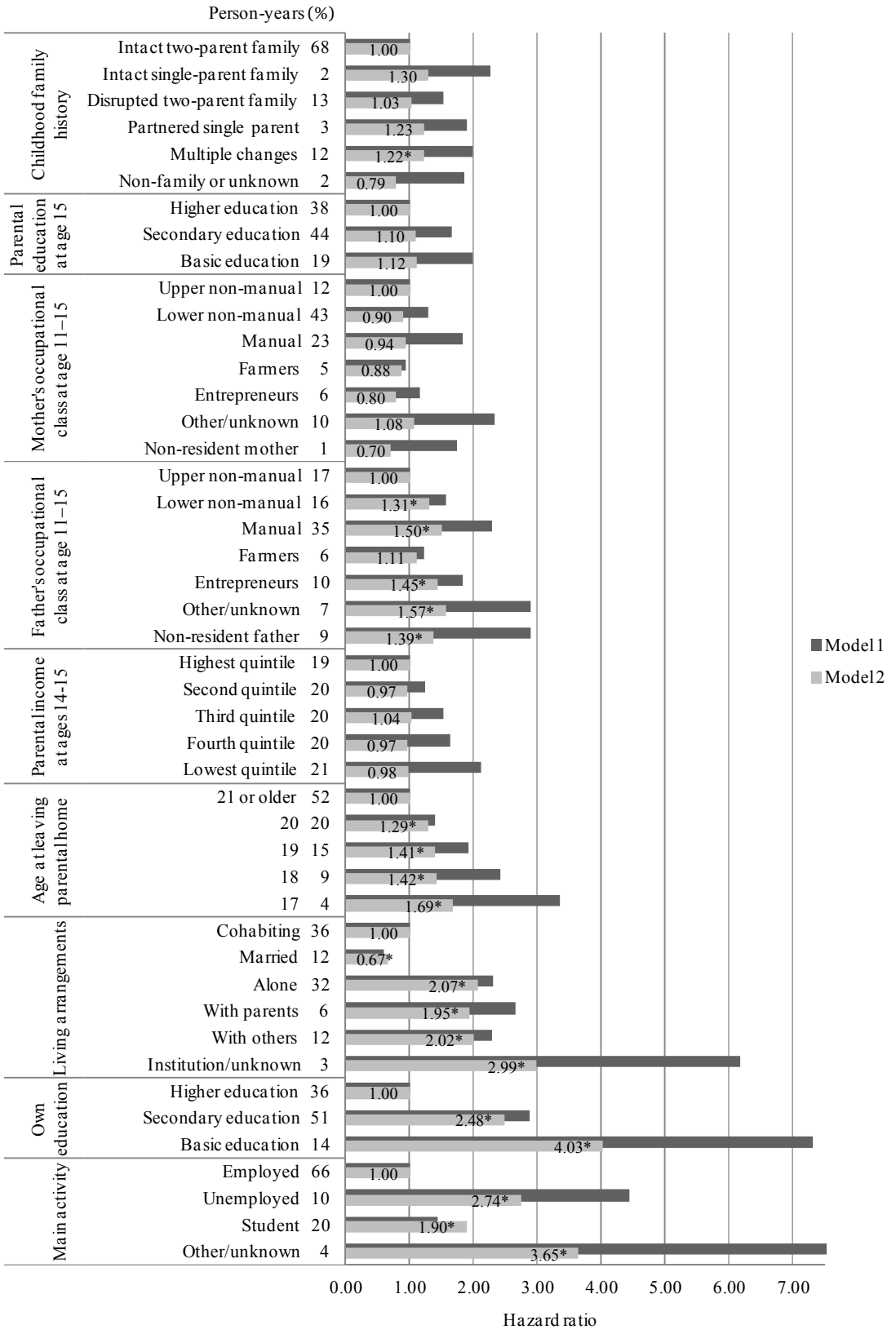

Figure 13 Hazard ratios of external mortality after leaving the parental home, males aged 17–29 years, 1990–2007, Finland. Model 1 is a univariate model, and model 2 includes all the covariates. *Statistically significant difference at the .05 level.

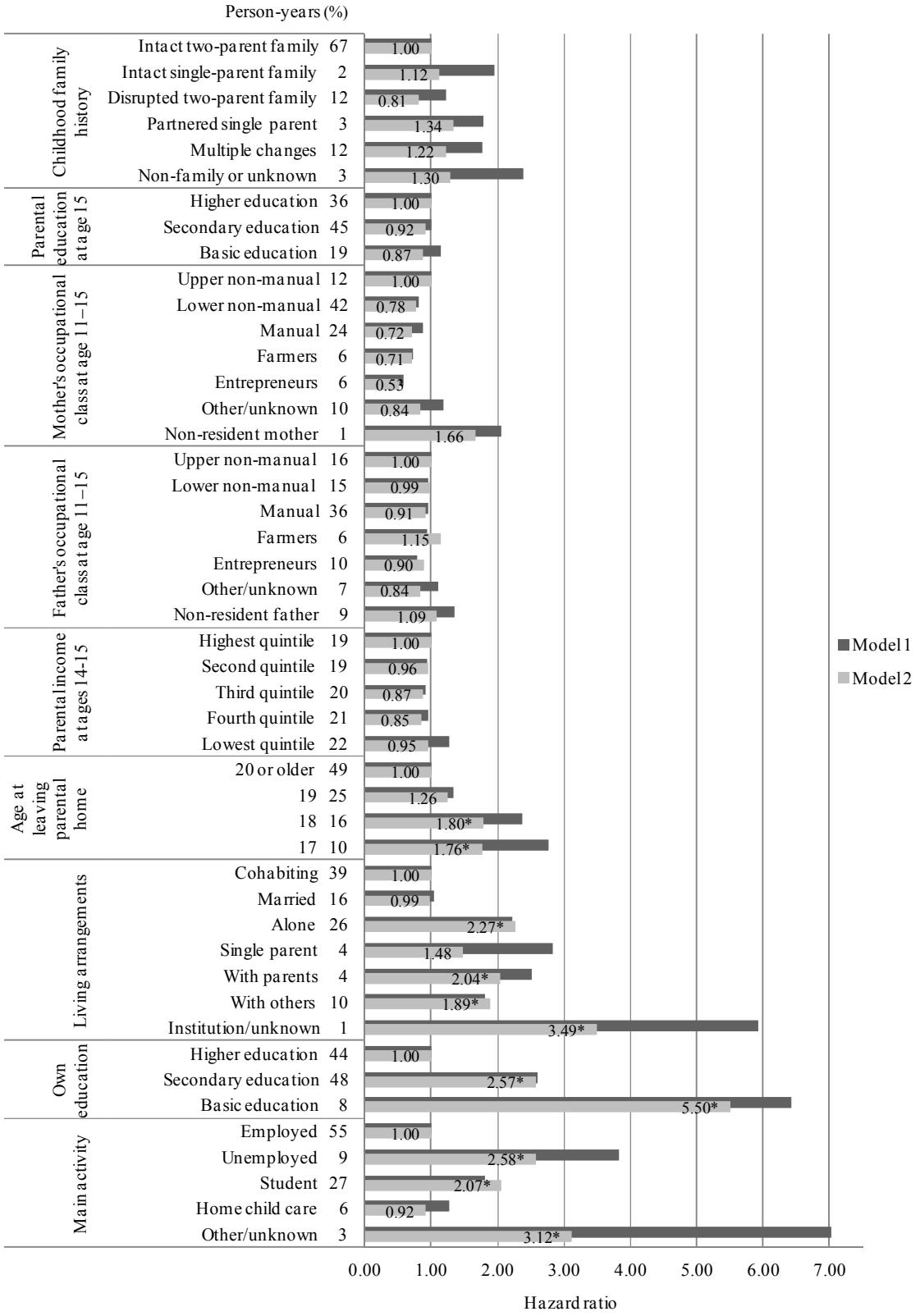

Figure 14 Hazard ratios of external mortality after leaving the parental home, females aged 17–29 years, 1990–2007, Finland. Model 1 is a univariate model, and model 2 includes all the covariates. *Statistically significant difference at the .05 level.

However, in further analyses of specific causes of death among women, parental socioeconomic factors showed clear mortality gradients in the case of alcohol-related deaths, but a reverse gradient for suicides (specifically with regard to maternal occupational class), whereas no associations were found in deaths attributable to diseases or non-alcohol-related external causes. Among men, in contrast, the patterning of these social differentials was largely consistent across the different causes of death (Study IV, Extra tables 1 and 2).

There were clear gradients associating leaving the parental home at an early age and external mortality among both men and women: the hazard ratios of death were two-to-threefold among the early leavers compared with those who left at the median age or later (Figures 13 and 14). Further, there were pronounced mortality differentials in own level of education (Figures 13 and 14). Compared with those on a higher-education track, the hazard ratios of external mortality for young adults with secondary education were over two-fold, and over six-fold for those with only a basic education. Not being employed and not living with a partner were also clear risk factors for both men and women (Figures 13 and 14). With the exception of deaths attributable to diseases among women, which only showed weak associations, social differentials in mortality by age at leaving the parental home, current living arrangements, educational level and current main activity were largely consistent across the different causes (Study IV, Extra tables 1 and 2).

The associations between childhood family history and mortality in early adulthood were attributable in part to the childhood family's socioeconomic position, and were partly mediated by the current factors and the timing of leaving the parental home (Study IV, Tables 2 and 3). Young adults from a lower socioeconomic background and with experience of other than an intact two-parent family structure in childhood were more likely to leave the parental home early and less likely to achieve a higher education and a stable employment career in early adulthood. Although no longer statistically significant in the fully adjusted models, family history seemed to retain some independent effects on mortality even after all adjustments (Figures 13 and 14). Among men, childhood socioeconomic factors showed clear gradients in mortality in early adulthood, and the excess mortality in relation to paternal occupational class remained significantly higher even after adjustment for the current factors (Figure 13). Nevertheless, in the fully adjusted models the current factors showed the strongest mortality differentials – for both men and women the hazard ratios of death remained two-to-fivefold for the less highly educated, the non-employed, and those not living with a partner (Figures 13 and 14). Leaving the parental home at young age also remained an independent risk factor for both males and females.

5.3 AGE-PATTERNING OF SOCIAL DIFFERENTIALS IN MORTALITY

Although social factors were associated with mortality across the studied age range, the presence and strength of the associations varied from early childhood to early adulthood. For males, the age-patterning of the association between parental education and mortality between the ages of one and 24 was U-shaped, with more pronounced differentials among the youngest and the oldest, and negligible differences among the 10–14-year-olds. Among the females, on the other hand, the differentials by parental education gradually declined with age (Figure 15; Study I, Table 3). The educational gradient was much sharper for external causes of death, but deaths from diseases contributed significantly to the differentials in both males and females among the youngest (1–4 years) and the oldest (20–24 years) groups (Figure 15; Study I, Table 3).

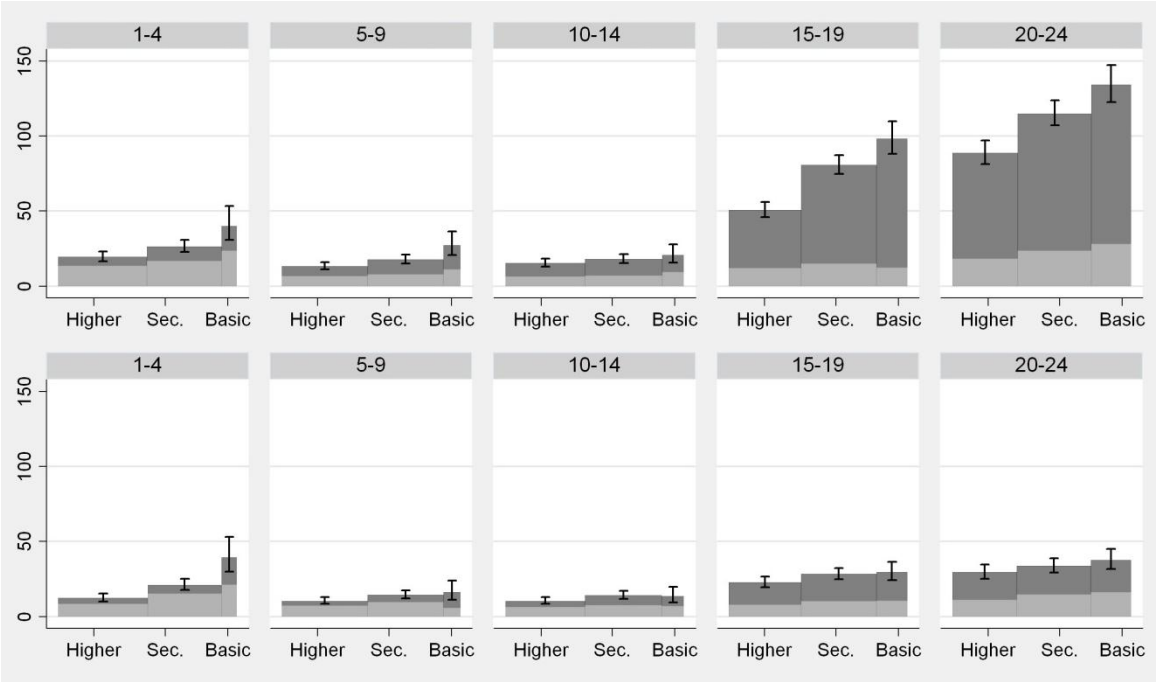

Figure 15 Mortality rates (per 100,000 person-years) by level of parental education and age group, males (top) and females (bottom), 1990–2004, Finland.

The graph depicts all-cause mortality rates with 95% confidence intervals. The bars are divided into two areas; the lighter area represents mortality due to diseases and the darker area mortality due to external causes. The width of the bars is directly proportional to the distribution (%) of parental education in each age group.

Source: Remes, Martikainen, & Valkonen (2010), Figure 1. Adapted with permission from BMJ Publishing Group Limited.

A closer examination of the specific causes of death revealed an association between the small mortality differentials among the 10–14-year-olds and age-related differences in the most common causes: the causes that carried the strongest mortality gradients, such as drowning among the younger children and suicide among the older age groups, were less common at this age. The proportion of fatal transport injuries was higher, however, but the link to parental education was weakest among those aged 10–14 years (Study I, results not shown; for age-group-specific cause composition see Figures 4–7, p. 15–16). Correspondingly, the notable re-emergence of the social gradient among males in late adolescence (15–19 years) was entirely due to external causes of death (Figure 15; Study I, Table 3).

Leaving the parental home in order to live independently is one of the key events in the transition to adulthood. Notwithstanding the considerable amount of individual variation in the timing of leaving, the typical living arrangements in early adulthood were closely associated with age and gender (Figures 16 and 17). Women tended to leave home and form partnerships earlier than men. The great majority of both males (93%) and females (84%) in their late teens (17–19 years) lived with their parents. Among the 20–24-year-olds, over half of the males' person-years were spent living in the parental home whereas 36% of women of the same age were already living with a partner. Almost half of the men and over 60% of the women aged 25–29 lived with a partner, although it was also still quite common for men to live with their own parents.

Living arrangements in early adulthood showed pronounced associations with external causes of death that were also related to age (Figures 16 and 17). The hazard ratios of death for young adults in their late teens and early 20s living alone or with others were double compared with those living in the parental home with married parents (Study III, Tables 2 and 3). Subjects living with cohabiting parents or a single parent likewise carried a clear excess risk of death. Cohabiting unions in particular were already common among those aged 20–24 years, and living with a partner carried a mortality risk similar to living with married parents (Figures 16 and 17). With regard to the 25–29-year-olds, the married had the lowest mortality risk among men, whereas among the women, living with a partner and children, irrespective of the marital status of the union, carried the lowest risk. Mortality was somewhat higher among single mothers and men living in a cohabiting union with children than among married couples with children (Figures 16 and 17).

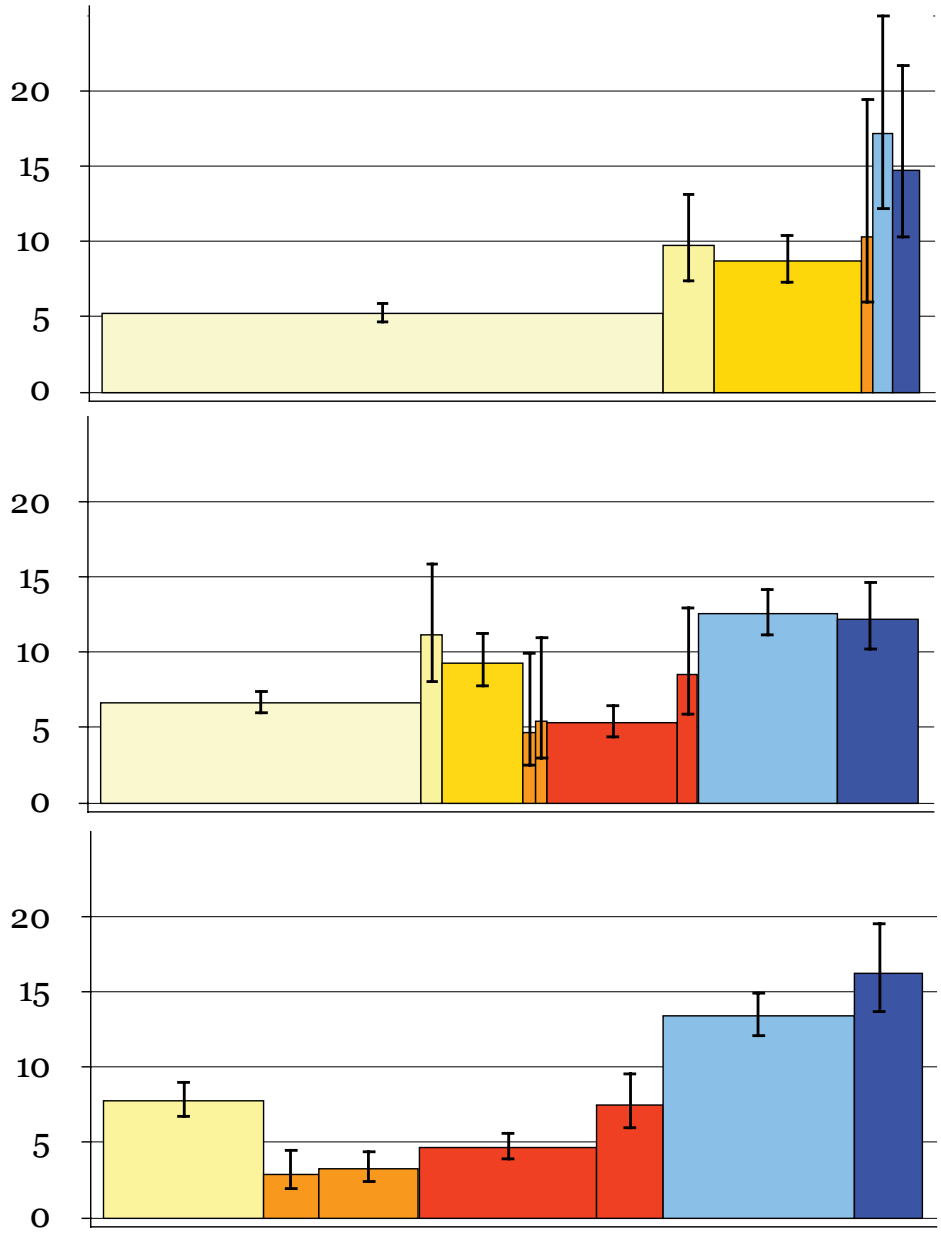

Figure 16 External mortality rates (per 10 000) by living arrangements among males aged 17–19 (top), 20–24 (middle), and 25–29 (bottom), 1995–2004, Finland. The width of the bars is directly proportional to the distribution (%) of living arrangements.

Ages 17–19 (top), categories from left to right: with married parents, with cohabiting parents, with one parent, married/cohabiting, alone, with others.

Ages 20–24 (middle), categories from left to right: with married parents, with cohabiting parents, with one parent, childless married, married with children, childless cohabiting, cohabiting with children, alone, with others.

Ages 25–29 (bottom), categories from left to right: with parents, childless married, married with children, childless cohabiting, cohabiting with children, alone, with others.

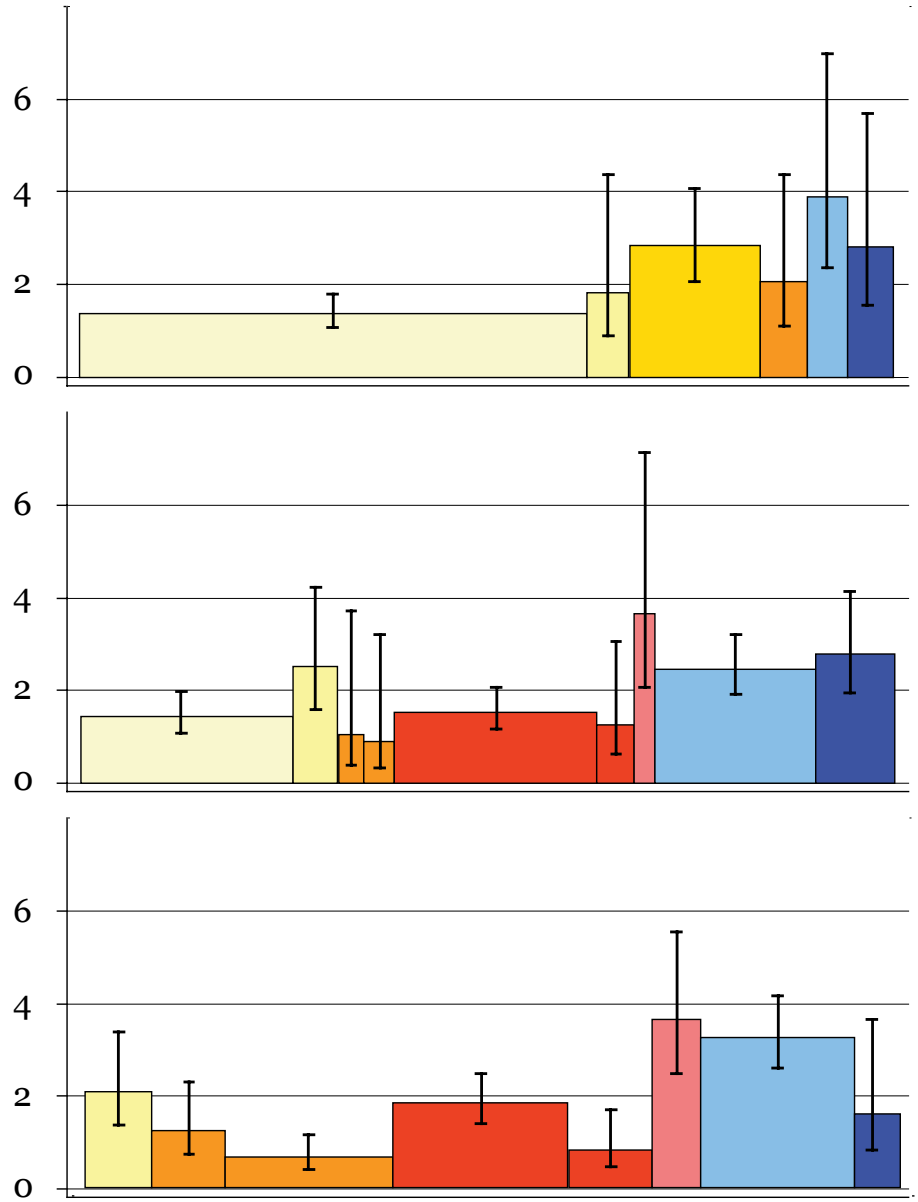

Figure 17 External mortality rates (per 10 000) by living arrangements among females aged 17–19 (top), 20–24 (middle), and 25–29 (bottom), 1995–2004, Finland. The width of the bars is directly proportional to the distribution (%) of living arrangements.

Ages 17–19 (top), categories from left to right: with married parents, with cohabiting parents, with one parent, married/cohabiting, alone, with others.

Ages 20–24 (middle), categories from left to right: with married parents, with cohabiting parents/with one parent, childless married, married with children, childless cohabiting, cohabiting with children, single parent, alone, with others.

Ages 25–29 (bottom), categories from left to right: with parents, childless married, married with children, childless cohabiting, cohabiting with children, single parent, alone, with others.

Specific associations between the current main activity and mortality from external causes in late adolescence and early adulthood were also evident (Study III, Tables 2–4). Compared to having a job, being unemployed was associated with increased mortality in each of the age groups (17–19, 20–24, and 25–29 years), except among the youngest women. The excess mortality among the unemployed was most pronounced in the oldest age group, however. A similar, even stronger relation to age was evident among the non-employed who were neither enrolled in education nor seeking employment. Among those in their late 20s, when the proportion of people in full-time education had already greatly diminished, also students showed excess mortality compared to the employed.

6 DISCUSSION

6.1 THE MAIN FINDINGS AND THEIR INTERPRETATION

Mortality at a young age was strongly associated with socially determined risk factors. There were clear associations with family type and living arrangements, education, occupational class and main activity, and household income, with reference to parental background and the individuals. These associations are discussed in more detail below, first with regard to family type and living arrangements, second in terms of socioeconomic factors, and finally focusing on the age patterning of mortality differentials across the early life course.

6.1.1 FAMILY TYPE AND LIVING ARRANGEMENTS

Childhood

The results of this study revealed no differences between children of cohabiting parents and children of married parents in terms of mortality during childhood. There is still a lack of research on the associations between parental cohabitation and specific health outcomes among children, but the few findings suggest a negative effect (Carr & Springer, 2010; Schmeer, 2011). Numerous studies on child well-being and behavioural outcomes, predominantly based on US data, have indicated that children and adolescents tend to fare worse when living in cohabiting-parent families than in married-parent families (Brown, 2004; Hofferth, 2006; Brown & Rinelli, 2010). Economic resources, maternal depressive symptoms and parenting practices have been found to explain the association between parental cohabitation and child well-being among 4–6-year-olds (Artis, 2007). In fact, compared to married parents, cohabiting parents have been shown to suffer from higher mortality and morbidity (Brown, 2000; Koskinen, Joutsenniemi, et al., 2007). More likely to be socioeconomically disadvantaged than married parents, cohabiting parents may also receive less support from their social networks (Brown, 2004; Manning & Brown, 2006).

Probably largely due to the various measures of health with mortality and well-being at the extremes, differing results concerning the effects of living in cohabiting families may also relate to cultural factors and the social acceptability of cohabitation as a context in which to raise children. In contrast to evidence from the US, with regard to the UK Robson (2009) found no difference in happiness and self-esteem among children aged 11–15 years living with cohabiting or married natural parents. Negative effects on happiness, self esteem and income were nevertheless experienced following

change from a two-parent natural family to any other family form. Cohabiting parenthood has become increasingly common in Finland, and cohabiters with children have been widely regarded as legitimate families since the 1990s (Kiernan, 2004). However, cohabiters are a very heterogeneous group, the members of which vary widely in their reasons for choosing cohabitation over legal marriage (Kiernan, 2004). Although many cohabiting parents eventually marry each other, they are also more likely to separate than married parents. Children born to cohabiting parents have typically been twice as likely to experience a family break-up as children born to married parents (Andersson, 2002). In 2005 in Finland, family disruption was three times more common in families with cohabiting as opposed to married parents (Statistics Finland & Stakes, 2007). The family composition is, however, also influential. Among all cohabiting-parent families with children aged 0–7 years in 2004, 6% of the parents with only common children, and almost 14% of the parents with no common children had separated within one year (Statistics Finland & Stakes, 2007).

As opposed to cohabiting, living in a single-parent family was clearly associated with increased mortality, the strongest effects being on the youngest children. This excess mortality was largely attributable to the associated lower levels of parental education and household income, although the difference still remained clear with regard to deaths from external causes among the 1–4-year-olds. Higher levels of mortality, morbidity and stress have been associated with being a single parent (Weitoft et al., 2002; Koskinen, Joutsenniemi, et al., 2007; Brown, 2000; Burström et al., 2010; Amato, 2005). Coupled with economic hardship and parental time constraints, the quality of parenting may also suffer in single-parent families (Amato, 2005). Single parents cannot rely on the support of a partner in rearing the child to the same extent as married or cohabiting parents, not even when the parenting arrangements are shared. In addition, the kin and other social networks of a single-parent family are also likely to be more limited.

In the few studies that have accounted for both the social position and previous health problems of the parent, most of the child health disadvantage associated with single parenthood has been attributed to economic hardship and socioeconomic position (Hjern & Bremberg, 2002; Weitoft et al., 2003). With only one potential earner, and one or more dependent family members, single-parent-headed households do not benefit from economies of scale. Over half of the children in single-parent families aged between one and 14 years in this study fell into the lowest income quintile, largely due to the relatively high rates of parental non-employment. Both parenting responsibilities, daily child-care arrangements in particular, and the lower level of education limit the available employment opportunities. Nevertheless, given the universal and relatively generous social-policy programmes, poverty among single parents in Finland is still low in international comparisons (Rainwater & Smeeding, 2004; UNICEF, 2007;

Lundberg et al., 2008). The continuing deterioration in the financial situation of single parents, in terms of both relative income level and self-reported financial difficulties (Salmi, Sauli, & Lammi-Taskula, 2009), is nevertheless a cause for concern that may involve potential health consequences for these parents and their offspring.

Overall, even though the majority of children in developed countries continue to spend all their childhood in married two-parent families, a growing number also experience family structures that are increasingly complex and characterised by instability (Heuveline, Timberlake, & Furstenberg, 2003; Statistics Finland & Stakes, 2007). It should be noted, though, that children in high-conflict or abusive families may actually benefit from the separation of the parents (Amato, 2000; Musick & Meier, 2010). The living arrangements of the children examined in this study were measured annually with no reference to previous years. This procedure provided a reliable measure of the prevailing family situation, but using a measure of family type that would have incorporated family instability and the biological status of the parents and siblings could have given additional information on the association between family type and mortality (Bzostek & Beck, 2011). Unfortunately the mortality data did not allow more specific analysis of young children due to the relatively small number of cases.

Late adolescence and early adulthood

Among those who had left the parental home, experiences of childhood family instability, as well as living in an intact single-parent family from birth until the age of 16, were associated with excess mortality between the ages of 17 and 29. In the case of young adults still living at home, mortality from external causes among those currently residing in single- or cohabiting-parent families was also much higher than among those living with married parents. These differences were only partly attributable to parental socioeconomic background, and another potential factor might be engagement in health-threatening behaviours and risk taking that have been found to be more common among young people living in non-married families and in those from a lower socioeconomic background (Droomers, Schrijvers, Casswell, & Mackenbach, 2003; Petridou et al., 1997; Hanson & Chen, 2007; Kestilä et al., 2008; Brown & Rinelli, 2010). Moreover, the consequences of leading a hazardous lifestyle may differ according to parental social background, a dependence shown in research concerning the association between lifestyle and educational track in adolescence (Koivusilta, Rimpelä, & Rimpelä, 1999).

Most young people in Northern Europe seem to prefer independent living (Iacovou, 2010), and leaving the parental home occurs early compared to other European countries (Billari & Liefbroer, 2010). Leaving home at a very young age (in adolescent years) has nevertheless been associated with subsequent adult social disadvantage such as early parenthood, lower

educational attainment, poverty and health problems (Bernhardt, Gähler, & Goldscheider, 2005; Aassve, Iacovou, & Mencarini, 2006; Wickrama, Wickrama, & Baltimore, 2010). Given that a lack of parental resources and living in a non-intact family, particularly in the presence of a step-parent or family conflict, tend to promote it (Bernhardt et al., 2005; Blaauboer & Mulder, 2009), early leaving may act as a mediator in the intergenerational transmission of social disadvantage. Consistently with this line of thinking, the results of this study indicate that a disadvantageous parental background is associated with early leaving, and that early leaving is further associated with higher mortality rates. Moreover, up to the median age, early leaving showed a monotonic association with mortality that was not restricted to the youngest leavers. Their lower level of educational attainment partly explained the excess mortality, but leaving the parental home at a young age still remained a strong independent risk factor for premature death. On top of financial difficulties and a lack of social support and control that may relate to independent living at a young age, the remaining gradient could reflect experiences of childhood disadvantage such as family conflict that could not be measured in this study.

Mortality from external causes in late adolescence and early adulthood was lowest either among men and women living with married parents, or among those living with a partner. The highest rates were observed among those living alone or with others. These findings are consistent with previous results on living arrangements and mortality in the Finnish adult population, although the difference between cohabitation and marriage was much less pronounced among the young (Koskinen, Joutsenniemi, et al., 2007). More likely to enjoy a higher socioeconomic position, young adults living with married parents or a partner are also likely to benefit from both social support and the control of health-related behaviours to a greater degree than those living alone or with others (Thomson, Hanson, & McLanahan, 1994; Carr & Springer, 2010). The somewhat lower mortality level among married as opposed to cohabiting men was largely confined to alcohol-related deaths, and may thus associate with a decline in substance use following the assumption of family roles in early adulthood (Staff et al., 2010).

On the other hand, living with children was associated with lower rates of mortality from external causes only among partnered women, and irrespective of their marital status. Although living with children has been shown to associate with lower mortality among both men and women in the adult population (Koskinen, Joutsenniemi et al., 2007; Ringbäck Weitoft et al., 2004), the association seems to be more complex in early adulthood, probably depending more on the timing and context of the transition to parenthood (Umberson, Pudrovska, & Reczek, 2010). Furthermore, the timing and context of childbearing may also reflect continuities in social disadvantage from childhood to early adulthood. According to a prospective study comparing British birth cohorts of 1958 and 1970, experiences of childhood disadvantage in various domains including socioeconomic

deprivation and family disruption were consistently associated with earlier entry into parenthood and with parenthood occurring in less favourable partnership contexts among both sexes (Hobcraft, 2008).

Single parenthood is known to associate with worse health and higher mortality, as well as with material disadvantage (Whitehead, Burström, & Diderichsen, 2000; Weitoft et al., 2002; Burström et al., 2010). Moreover, age at first birth may play a significant role in the consequences of single parenthood. In the UK, for example, experience of early parenthood (by the age of 22), especially in the context of lone motherhood, was persistently associated with social disadvantage at both 23 and 33 years of age (Hobcraft, 2003). Teenage childbearing is much less common in Finland than in the UK (S. Singh & Darroch, 2000), but lone parenthood at a young age is nevertheless likely to restrict opportunities for obtaining educational qualifications and building a stable employment career and a family. Predominantly mothers, many of the young single parents in this study were socioeconomically disadvantaged. Highly reflective of the mortality patterns among children of single parents, the excess mortality among lone parents themselves was largely attributable to lower levels of education and household income. Furthermore, mortality differentials among single parents stemmed in particular from suicides and alcohol-related deaths attributable to external causes, suggesting a wider prevalence of parental mental-health problems and substance abuse that may have detrimental effects also on the health of their offspring.

6.1.2 SOCIOECONOMIC FACTORS

Childhood

Parental education and household income showed both strong and partly independent associations with mortality in childhood. Although mainly attributable to external causes, diseases contributed to the differentials among the youngest children, aged 1–4 years. Other studies based on Finnish data from approximately the same period have also reported socioeconomic differentials in infant mortality and perinatal health by maternal occupation (1991–2006: Gissler, Rahkonen, Arntzen et al., 2009) and by maternal education (1987–2000: Arntzen et al., 2008). Another study covering the period 1987–95 found no systematic mortality gradient by parental social class among 5–14-year-olds, although excess mortality was evident for external causes of death in specific age groups (Pensola & Valkonen, 2000). Furthermore, according to data from the end of the 1980s, paternal education was no longer of major significance to mortality differentials among children aged 5–14 years (Rimpelä, 1993). The different measures of social position and the absence of data on mortality among 1–4-year-olds make comparison with these earlier Finnish results difficult. A recent study

focusing on gender differences in child and adolescent mortality by parental education in the Nordic countries reports an association with both paternal education and maternal education in all the countries covered, including Finland. In line with the results of this study, educational gradients revealed relatively similar gender patterns, despite the clear excess mortality among boys (Gissler et al., 2012).

Several pathways and mechanisms have been suggested to explain the association between parental socioeconomic factors and child health, but rather few studies have explicitly tested for the effects of potential mediators, particularly concerning physical health outcomes (Chen et al., 2002; Chen, 2004). A more recent debate originating in the discipline of health economics concerns the direction of causality and unobserved heterogeneity in the association with parental education and income (Case et al., 2008; Currie, 2009; Khanam et al., 2009). Overall, apart from a strong positive correlation, the findings are mixed. Interestingly, Propper (2007) found in a study based on UK data that the income gradient in the health of children up to the age of seven could be fully attributed to other factors, maternal mental health in particular. Khanam et al. (2009) reported similar results for Australia. Given the differences in study design and the use of self-reported, less severe measures of health, the relevance of these findings to the results of this study is difficult to determine. Unfortunately the present data included no measures of parental health, but it seems unlikely that mortality differentials that stem from diverse causes of death could be explained solely in those terms. However, with regard to deaths related to suicide among 10–21-year-olds, a Danish study has provided supporting evidence on the role of a family history of mental illness and suicide behind the association between parental socioeconomic factors and children's suicide (Agerbo et al., 2002).

Both Currie (2009) and Kawachi et al. (2010) conclude from their recent reviews covering education, income and health that despite the strong and robust correlation between parental social position and child health, evidence on the causality of the effects of socioeconomic factors remains, on the whole, inconclusive. Nevertheless, it does suggest that early childhood is the life stage when socioeconomic resources matter the most.

The relative size and composition of the groups under comparison may be highly influential in studies on health inequalities. For example, as socially disadvantaged groups diminish in size they tend to comprise even more highly disadvantaged individuals. With regard to parental education, the continuous expansion in education and the decreasing employment opportunities for the less highly educated are likely to result in the further marginalisation of the increasingly small group of children whose parents have only a basic education, and the relative excess mortality in this group may well remain high. On the other hand, an increasing proportion of children are experiencing relative poverty. During the study period from 1995 to 2007, relative poverty in the Finnish child population grew more quickly than in the whole population, particularly in the youngest age group and

among children in single-parent families. In 2007, household income was below 60% of median income in 13% of families with children, compared to 5% in 1995 (Salmi et al., 2009). Moreover, child poverty increased in 17 out of 24 OECD countries in the 1990s (UNICEF, 2007). Given the increasing evidence confirming the importance of family income during early childhood as a determinant of health in later life (Kawachi et al., 2010), the increasing number of young children experiencing poverty may be a serious public-health concern.

In the present study, both household income and parental education produced the steepest mortality gradients among the 1–4-year-olds. In the case of household income, parental education and age, household size and family type offered only a partial explanation, although there was an association with each of these factors. Parental unemployment and a low level of education are known to associate with child poverty and low household income (Salmi et al., 2009). Furthermore, younger parents are more likely to have a low household income, as are single-parent families and families with many children. These factors are intertwined, however, and it is difficult to estimate their independent associations with child mortality.

Changes in the overall prevalence of an outcome may also affect the observed differentials. For example, increasing relative differentials seem to accompany declining mortality trends (Shkolnikov et al., 2012). Moreover, as noted earlier, between-group differentials are affected by changes in the relative size of the groups under comparison. According to the results of this study, however, although child mortality declined quite consistently during the whole study period, mortality differentials showed no clear changes, except for some indication of widening by parental education among boys aged 1–14, and diminishing among girls of the same age. Previous studies on time trends in mortality differentials among children have also shown inconsistent results, despite the consistent trend of mortality decline (Edwards et al., 2006; Shaw, Blakely, Atkinson, et al., 2005). The prevalent conclusion, however, is that mortality inequalities have not disappeared. All in all, trying to identify trends among children and young people may not be worth the effort: the associations vary by age and the cases are few with regard to specific causes of death, whereas total mortality covers very different causes that vary considerably in aetiology.

Late adolescence and early adulthood

Among young men, parental education, maternal and paternal occupational class, and household income in adolescence were all systematically associated with mortality in late adolescence and early adulthood. The associations of parental socioeconomic factors among young men were very similar in cases of suicide and non-suicidal death attributable to external causes: this contrasts with the findings of Saarela and Finnäs (2008), who studied mortality differentials among 15–30-year-olds in

1970–2004. In contrast to Saarela and Finnäs (2008) and Pensola and Valkonen (2000), the present study also identified social differentials in deaths attributable to diseases, although of a smaller magnitude than in the case of external causes. The different study periods and differences in study design may explain the varying results. Moreover, the present results were not adjusted for geographical region or mother tongue, although preliminary analyses including region in the models induced no major changes in the associations with the parental socioeconomic factors. In addition to the higher coincidental variation due to the lower number of deaths, the inconsistent associations among women reported by Saarela and Finnäs could be attributed to the differing associations according to the cause of death, especially the opposite directions of the socioeconomic gradients in suicide and alcohol-related mortality.

There is a lack of empirical evidence on mortality differentials in late adolescence and early adulthood by socioeconomic factors that refer to young people's own social position. Education and particularly occupational class tend to be far from established at this age, and earnings are likely to fluctuate while studying and during the early career. With regard to these factors, most of the mobility between categories during this transitional life period is nevertheless likely to be upward following the completion of higher-level education and career advances. Students in Finland tend to finish their higher education relatively late, which is why on-going education was used as a proxy measure for educational attainment in this study. However, those with only basic qualifications are less likely to continue their studies at older ages. In fact, Rimpelä's study (1993) on education-related mortality differentials among 20–29-year-olds in 1986–90, which was based on completed education, provided results that were largely similar to the findings reported here. Moreover, a Belgian study on mortality differentials among 15–29-year-olds in 1993–95 also reported largely similar associations: for both men and women, achieved education and occupational class were strongly associated with mortality due to external causes and diseases other than neoplasms (Gadeyne, 2006). To an extent, however, these differentials may have been driven by the associations among the older individuals within the age range.

The association between parental education and mortality among men was completely mediated by their own level of education. Among women, parental education was only associated with alcohol-related deaths, whereas own level of education showed marked mortality gradients across all the studied causes of death. Similar results stressing the importance of achieved social position over parental background have been found with regard to mortality from various causes among 25–46-year-olds in Norway (Strand & Kunst, 2007) and 31–42-year-olds in Finland (Pensola & Martikainen, 2003a, 2004), and also in limiting long-standing illness and self reported health among young adults aged 20–39 in Britain and Finland (Rahkonen, Arber, & Lahelma, 1995).

Some of the excess mortality associated with a lower paternal occupational class persisted among men, even after adjustment for own level of education and employment status. Among women, although specifically only with regard to suicide, it was the mother's occupational class that mattered, even after adjustment for the current factors. Moreover, the excess mortality concerned daughters of mothers in the upper non-manual class. Evidence of a similar association between a high parental socioeconomic position and an increased risk of suicide among women has been found previously in Finland, and also in other Nordic countries (Hjern & Bremberg, 2002; Saarela & Finnäs, 2008; Strand & Kunst, 2007). The reasons for the reverse gradient remain unknown, but could possibly relate to higher levels of psychological stress among the children of parents with a higher-level social background (Kestilä et al., 2006). In contrast to the associations with maternal occupational class, women who themselves were in the upper non-manual class as 31–42-year-olds had clearly lower suicide mortality than all other women (Pensola & Martikainen, 2003a).

Following adjustment for parental background, and current living arrangements and main activity, the hazard ratios of death remained multiplied for young adults with a lower level of education. Given the educational expansion in recent decades, the numbers of young people with only basic qualifications have fallen drastically, particularly among women. The on-going structural changes in the labour market that have markedly diminished the opportunities for those who lack skills and qualifications constitute a significant challenge in terms of preventing social exclusion among the less highly educated (Myrskylä, 2011). Unsurprisingly, the highest mortality rates found in this study were among the young men and women who were in the margins or out of reach of administrative register data. Often excluded in studies of social inequalities due to missing data, these fortunately rather small groups (<4% in this study) include young people living without a permanent address, or in institutions, and the non-employed who are neither enrolled in education nor currently seeking employment. Overall, the degree of integration into the labour market was an important determinant of mortality even in early adulthood. In fact, experiences of unemployment in the early career have been shown to have detrimental effects on health and health behaviours also later in life (Wadsworth, Montgomery, & Bartley, 1999; Hammarström & Janlert, 2002; Pensola & Martikainen, 2004).

6.1.3 THE PRESENCE AND STRENGTH OF MORTALITY INEQUALITIES ACROSS THE EARLY LIFE COURSE

The patterning of mortality across the life course is strongly defined by age. This applies not only to the overall level of mortality and the common causes of death, but also to the social determinants. Depending on the health outcome, both constant and age-varying socio-economic gradients have been

found within childhood and adolescence (West & Sweeting, 2004; Chen et al., 2006; Case et al., 2008). Social differentials in perinatal health point to the fact that those in lower social positions suffer from poorer health right from the start (Gissler, Rahkonen, Arntzen et al., 2009). Also in this study, the differentials shown in disease mortality in early childhood stemmed from congenital malformations and chromosomal abnormalities (Study I). Even pre-birth conditions may thus set children on disadvantageous health trajectories (Case, Fertig, & Paxson, 2005; Adler & Stewart, 2010). Furthermore, early experiences of poor health may also affect educational and labour-market outcomes in later life, which again are further associated with health (Currie, 2009). However, previous studies on educational attainment in Finland have found only minor effects directly attributable to health selection (Koivusilta, Rimpelä & Vikat, 2003; Huurre, Aro, Rahkonen & Komulainen, 2006).

The results of this study reveal an association between parental education and mortality during all periods of childhood and young adulthood, with some evidence of convergence in late childhood and re-emergence in late adolescence, particularly with regard to external causes of death among men. The near absence of differentials among 10–14-year-olds was partly attributable to age-related differences in the typical causes of death. Furthermore, consistently with the equalisation hypothesis (West, 1997), the weaker association with fatal transport injuries at these ages might have been due to similar activities and exposure to risk when children gain independence in traffic as pedestrians and cyclists, but are not yet allowed to drive motor vehicles. The age-related decreases in mortality inequalities in pedestrian injuries reported in a recent study on deaths among 0–15-year-olds in 2001–03 conducted in England and Wales lend some support to this interpretation (Siegler et al., 2010).

In contrast with the results of this study, Siegler et al. (2010) found the lowest ratio of external deaths between parents in the non-occupied or routine category and the higher managerial/professional class among 5–9-year-olds. With the exception of infant mortality, the differences between the age groups were, on the whole, modest. A study examining socioeconomic age-varying mortality differentials by cause of death from birth to the age of eight in South Korea plotted the cumulative incidence of mortality by maternal education (Kim et al., 2009). The figures clearly show how differentials in mortality attributable to congenital malformations and other perinatal causes increased mainly during the first few years of life and then reached a plateau, whereas in the case of external causes, mortality increased and the differentials widened by age in a linear fashion. Contrary patterns emerged in this study: the gradients for both congenital malformations and external causes of death diminished by age – until the strong re-emergence of social gradients in late adolescence. Other studies on mortality differentials by parental occupational class conducted in Finland, Sweden and the UK have also shown age-varying associations between the ages of

one and 19, but the patterns are inconsistent (Östberg, 1992; Blane et al., 1994; Pensola & Valkonen, 2000).

Differences in the presence and strength of the observed social gradients may be attributable to various factors: sample composition, methodological differences, varying measures of social position and different study periods. Moreover, there may be differences in the causes of death that contribute most to mortality and mortality differentials. The highest childhood mortality gradient in England and Wales, for example, was in deaths from exposure to fire and hot substances, whereas those for drowning, falls and other injuries were low (Siegler et al., 2010). In Finland, on the other hand, the gradients were high for drowning whereas deaths at young ages related to fire and hot substances were too few to contribute to population-group differences (Study I). In contrast to the findings of this study, an ecological study of mortality in England in 1997–99 found evidence of equalization in mortality risk at ages 16–18 years (Dibben & Popham, 2012). Interestingly, in this case the equalization was largely attributable to increased risks in land transport deaths among young people living in the least deprived areas of the country, reflecting their higher access to cars.

Multiple simultaneous or cumulative risk exposures may also further accentuate the effects of social disadvantage, although the evidence concerning physical health outcomes among children and young people is still very limited (Evans & Kim, 2010). No measures of cumulative risk factors were used in this study, but the results nonetheless point to strong interrelatedness among factors such as low levels of parental education, low household income and single parenthood, as well as to links between living arrangements, education and main activity in early adulthood. Longitudinal studies still provide evidence that social disadvantage is not deterministic or rigid through the life course (Wise, 2009). The previously disadvantaged may stay at greater risk of subsequent disadvantage, but there seems to be considerable turnover in terms of who is disadvantaged at any one time (Hobcraft, 2003).

Young people gradually gain independence during adolescence and early adulthood, and at some point personal resources and health behaviours are likely to become more dominant than parental social background. Social mobility may have an additional effect on social differentials in mortality during this process, as the differentials by cumulative social class among men aged 31–42 years indicate (Pensola & Martikainen, 2003b). In this study, the re-emergence of mortality differentials among men in late adolescence was also evident in the parental factors, but for both men and women factors referring to their current social position and living arrangements were much more important. Although the associations between parental social background and mortality were almost entirely mediated through the young people's own social position in the case of mortality below the age of 30, associations between parental background and mortality will most likely re-emerge as these cohorts age and the typical causes of death change. Among

the cohorts born in 1956–60, independent associations with parental background were found with regard to deaths due to cardiovascular diseases, and among men also in alcohol-related deaths among the 31–42-year-olds (Pensola & Martikainen, 2003a, 2004).

The transition to adulthood is related to major changes in the proximal risk factors for mortality. Apparently partly attributable to developmental changes in brain functioning, adolescence and early adulthood are periods of increased risk-taking, including binge-drinking and experimentation with drugs, engagement in violent and criminal activities, sexual risk-taking and involvement in transport and other accidents (Casey, Jones, & Hare, 2008; Steinberg, 2008). Previous research has revealed partly independent associations between health behaviours such as recurring drunkenness in adolescence and parental social background, and later injury mortality (Mattila et al., 2008). In this study too, the pertinence of health behaviours to mortality differentials in early adulthood was clearly evident in the high proportion of deaths in which alcohol was a contributing cause. Nevertheless, there were largely similar associations between the studied social determinants of mortality and alcohol-related and non-alcohol-related deaths.

The existence of social differentials in mortality despite the major differences in risk exposure lends support to Link and Phelan's (1995) theory that social conditions are fundamental causes of health inequalities. According to the theory, the flexibility of the resources that individuals and groups deploy in order to avoid risks and protect themselves largely explains the persistence of the relationship between social position and multiple health outcomes. Resources such as knowledge, money, power, prestige and social connections can be used in many ways depending on the risk and protective factors in any given circumstance (Phelan, Link, & Tehranifar, 2010). Consequently, simply the endless and ever-changing diversity of strategies and contexts may explain the difficulties associated with efforts to identify the pathways and mechanisms through which the social determinants of health exert their effects.

6.2 METHODOLOGICAL CONSIDERATIONS

This study is based on longitudinal register data that enabled the following of a large population-representative sample of young people from early childhood to adolescence and the first decade of adulthood. Loss to follow-up was minimal, consisting of those who emigrated from the country. The 80% coverage of all deaths over a 20-year period facilitated the statistical analysis of the social determinants of mortality by sex, age group and cause of death. Occasionally, among children and young women in particular, the number of cases involving specific causes of death was too small to allow for the drawing

of conclusions, and the estimates among females were also generally less precise than among males.

Based on administrative registers and thus free from any self-report bias, the data included multiple measures of both childhood and current socio-demographic factors. Living arrangements, level of education, main activity and household income were all annually updated during the follow-up in order to reflect the current situation as accurately as possible.

In general, the reliability of Finnish register data covering place of residence and living arrangements is high. Sample surveys on the correctness of address information are carried out annually, and based on the 2010 survey, for example, the addresses at the Population Register Centre were deemed to be correct in 98% of the cases, assuming incorrect address information for the non-respondents (Statistics Finland, 2010). However, in early adulthood, young people, students in particular, may be more likely to be registered at an address other than the one at which they actually live. According to a survey conducted among 18–29-year-olds in 2005, such misclassification occurred in 7% of cases and was most common among 19–22-year-olds (Ilmonen, Hirvonen, & Manninen, 2005). Given that it is less plausible to be mistakenly registered as living alone or in a union, the potential bias is most likely to concern those classified as living with their parents. As far as current living arrangements are concerned, inferring cohabiting couples from register data is also bound to result in the misclassification of people who share the same household and fit the criteria (different gender, unmarried, not siblings, over the age of 18 and the difference between ages less than 16 years), but do not have any romantic involvement. The number of cohabiting couples has, however, been found to correspond reasonably well to survey estimates (Statistics Finland, 2010).

One limitation of household-based measures in register data with regard to children is its inability to identify shared parenting. Children can be registered at only one address in Finland, even if those in joint custody may reside alternately with both of their parents and hence maintain contact and benefit from both parents' resources. Moreover, it was not feasible to study the effects of living in reconstituted families because we could not distinguish between biological and step-parents in married-parent families and the number of reconstituted families was thus too small for statistical analysis of childhood mortality. Between 1990 and 2005 in Finland, 7–9% of all families with children aged 0–17 years were reconstituted families, and in over half of such families the parents were not married (Statistics Finland, 2006). Although research based on register data cannot capture the whole variety of family forms, a clear strength of using household-based measures was the possibility to take into account the socioeconomic position of both of the parents in two-parent households, and the annual data updates that provided accurate information on the current living arrangements and allowed tracking of family histories with several measurements points during childhood.

Unfortunately, the study data included no direct measures of the health and health behaviours of parents and their children. In particular, this prevented the empirical assessment of the role of parental health and health behaviours in bringing about social inequalities in child mortality. During the transition to adulthood, selection into lower educational attainment, non-employment, leaving the parental home at a young age, and certain living arrangements may arise from somatic and mental health problems, family adversities in childhood or adolescence, or engagement in health-compromising or criminal behaviours, and this selection may in part explain the observed differentials in mortality. In the case of young adults, we did, however, have some indirect measures for health status and health behaviour. Firstly, causes of death gave some insight into the reasons behind the differentials. In particular, the importance of substance abuse was manifested in the high proportion of alcohol-related deaths, but the social differentials in mortality were by no means limited to alcohol-related causes. Secondly, we were able to control for granted disability pension that should capture effects relating to the most severe health conditions among the young. In this small group of young adults (0.6–1.8%), the relative excess mortality from external causes was very high, but controlling for being on disability pension had negligible effect on the associations between the other social determinants and mortality (Study III). However, considering the relatively high prevalence of mental disorders among young adults in Finland, and the strong links between mental disorders and unemployment and lower education (Suvisaari et al., 2009; Suokas et al., 2010), further research that could account for psychiatric morbidity would potentially add valuable information to our understanding of social inequalities in health and mortality during this transitional life stage.

7 CONCLUSIONS

Population-representative register data revealed a systematic association between parental social background and mortality in childhood, adolescence and early adulthood. The associations between their own social position and living arrangements among young adults were much stronger, but parental social background remained influential in conditioning the pathways to the current life situation. Social inequalities in mortality persisted during the whole study period (1990–2004/2007) without any clearly identifiable trends.

Despite the relative rareness of fatal diseases and injuries at young ages, mortality differentials between population groups provide very concrete and reliable evidence of the existence of social inequalities in health. In order to identify causality in the potential pathways and mechanisms through which the social determinants of health have their effects on the young, it may be necessary to shift the focus from mortality to health conditions that are relatively highly prevalent on the population level. Evidence of social differentials in mortality nevertheless provides a solid basis for further research, and helps to identify high-risk groups that could benefit from optimally timed preventive efforts. Education, occupational class and main activity, household income and living arrangements all showed at least partly independent associations with mortality in this study. The most vulnerable life periods in terms of socially determined risks for premature death were early childhood on the one hand, and late adolescence and early adulthood on the other.

This study provided some support for the hypothesis positing relative equalisation in health during the transition from childhood to adolescence. In contrast, the strong excess mortality among young men and women with lower levels of education, the non-employed, those who had left the parental home early, and those currently living without a partner highlights the importance of the transition to adulthood as a critical period for emerging health inequalities. The temporary peak in mortality from external causes during adolescence and early adulthood may be driven by physiological factors, but those in the most disadvantaged social position seem to be most affected by the consequences of increased risk-taking and health-compromising behaviours. Furthermore, because of the persistent association between parental social background and adult health, the similarly persistent nature of once adopted health behaviours, and the low likelihood of gaining educational qualifications at older ages, social inequalities in mortality are likely to remain as these cohorts age.

ACKNOWLEDGEMENTS

This study was carried out at the Population Research Unit at the Department of Sociology (today a discipline at the Department of Social Research) at the University of Helsinki. I'm very grateful for the research facilities provided by the Department, and most of all, for the friendly and supportive work environment created by all the people at the Department.

The financial support from the Finnish Doctoral Program in Social Sciences (SOVAKO), the Ministry of Social Affairs and Health in Finland and Academy of Finland is gratefully acknowledged. The present study first started as part of a collaborative project between the Population Research Unit and the National Public Health Institute (with Seppo Koskinen and Tuija Martelin) and I sincerely appreciate being given the opportunity. None of this research would have been possible without the extensive register data of Statistics Finland, and I wish to thank especially Jari Hellanto, Senior Statistician, for his efforts in providing us with the data.

I have been extremely fortunate to have excellent guidance from my two supervisors, Professor emeritus Tapani Valkonen and Professor Pekka Martikainen. The combination of such knowledge, experience, practical know-how and sense of humour just cannot fail. After the retirement of Tapani Valkonen, Pekka Martikainen took the main responsibility for supervising my dissertation, and I truly appreciate that he has always found time to read and discuss my work despite his often heavy schedule.

The encouraging comments and the constructive criticism from the two official pre-examiners of this dissertation, Docent Leena Koivusilta and Docent Mikko Laaksonen were very helpful in improving this summary. Thank you for your careful and efficient work.

I have been involved in two doctoral programs, Doctoral Programs in Public Health (DPPH) and Population, Health and Living Conditions (VTE, within SOVAKO). Both programs have provided opportunities to attend many inspiring courses and seminars. In particular, the presentations and discussions at the Monday seminars of the VTE have been most useful and the members of the steering group for VTE, currently Docent Ossi Rahkonen, Professor Eero Lahelma, Professor Pekka Martikainen, Docent Ari Haukkala, and Hanna Konttinen, as well as all the participants deserve thanks for keeping the seminar going. Thank you all for your valuable comments and good company. For their constructive comments and encouragement I also wish to thank my SOVAKO follow-up committee, Ossi Rahkonen and Docent Sakari Karvonen.

The former and current colleagues and associates at the Population Research Unit have made the day-to-day work enjoyable. It is a pleasure to work with people who are not only fun to be with, but also very skillful and always willing to share their knowledge. A sincere thank you to Netta Mäki,

Petteri Sipilä, Elina Einiö, Heta Moustgaard, Niina Metsä-Simola, Kimmo Herttua, Karri Silventoinen, Timo Kauppinen, Marika Jalovaara, Riikka Shemeikka, Karoliina Majamaa, Lasse Tarkiainen, Jessica Nisén, Outi Sirniö, Taina Leinonen, Mikko Aaltonen, Elina Mäenpää, Riina Peltonen and Saska Saarikoski.

Finally, I wish to thank all my family and friends for their support, encouragement and patience. You always manage to cheer me up. Special thanks to Sami for his expert help with some of the graphs – and just for being there.

Helsinki, May 2012

Hanna Remes

REFERENCES

Aassve, A., Iacovou, M., & Mencarini, L. (2006). Youth poverty and transition to adulthood in Europe. *Demographic Research*, *15*, 21–50. doi:10.4054/DemRes.2006.15.2

Adler, N. E., & Stewart, J. (2010). Health disparities across the lifespan: Meaning, methods, and mechanisms. *Annals of the New York Academy of Sciences*, *1186*(1), 5–23. doi:10.1111/j.1749-6632.2009.05337.x

Agerbo, E., Nordentoft, M., & Mortensen, P. B. (2002). Familial, psychiatric, and socioeconomic risk factors for suicide in young people: nested case-control study. *British Medical Journal (Clinical Research Ed.)*, *325*(7355), 74.

Amato, P. R. (2000). The Consequences of Divorce for Adults and Children. *Journal of Marriage and Family*, *62*(4), 1269–1287. doi:10.1111/j.1741-3737.2000.01269.x

Amato, P. R. (2001). Children of divorce in the 1990s: an update of the Amato and Keith (1991) meta-analysis. *Journal of Family Psychology: JFP: Journal of the Division of Family Psychology of the American Psychological Association (Division 43)*, *15*(3), 355–370.

Amato, P. R. (2005). The impact of family formation change on the cognitive, social, and emotional well-being of the next generation. *The Future of Children / Center for the Future of Children, the David and Lucile Packard Foundation*, *15*(2), 75–96.

Andersson, G. (2002). Children's experience of family disruption and family formation: Evidence from 16 FFS countries. *Demographic Research*, *7*, 343–364. doi:10.4054/DemRes.2002.7.7

Arntzen, A., Mortensen, L., Schnor, O., Cnattingius, S., Gissler, M., & Nybo Andersen, A.-M. (2008). Neonatal and postneonatal mortality by maternal education—a population-based study of trends in the Nordic countries, 1981–2000. *The European Journal of Public Health*, *18*(3), 245–251. doi:10.1093/eurpub/ckm125

Artis, J. E. (2007). Maternal Cohabitation and Child Well-Being Among Kindergarten Children. *Journal of Marriage and Family*, *69*(1), 222–236. doi:10.1111/j.1741-3737.2006.00355.x

Autti-Rämö, I. (2000). Twelve-year follow-up of children exposed to alcohol in utero. *Developmental Medicine & Child Neurology*, *42*(6), 406–411. doi:10.1111/j.1469-8749.2000.tb00120.x

Barry, M. S., Auger, N., & Burrows, S. (2011). Portrait of socio-economic inequality in childhood morbidity and mortality over time, Québec, 1990–2005. *Journal of Paediatrics and Child Health*. doi:10.1111/j.1440-1754.2011.02224.x

Bernhardt, E., Gähler, M., & Goldscheider, F. (2005). Childhood Family Structure and Routes Out of the Parental Home in Sweden. *Acta Sociologica*, *48*(2), 99–115. doi:10.1177/0001699305053766

Billari, F. C., & Liefbroer, A. C. (2010). Towards a new pattern of transition to adulthood? *Advances in Life Course Research*, *15*(2-3), 59–75. doi:10.1016/j.alcr.2010.10.003

Blaauboer, M., & Mulder, C. H. (2009). Gender differences in the impact of family background on leaving the parental home. *Journal of Housing and the Built Environment*, *25*, 53–71. doi:10.1007/s10901-009-9166-9

Blakely, T., Atkinson, J., Kiro, C., Blaiklock, A., & D'Souza, A. (2003). Child mortality, socioeconomic position, and one-parent families: independent associations and variation by age and cause of death. *International Journal of Epidemiology*, *32*(3), 410 –418. doi:10.1093/ije/dyg154

Blane, D., Bartley, M., Smith, G. D., Filakti, H., Bethune, A., & Harding, S. (1994). Social patterning of medical mortality in youth and early adulthood. *Social Science & Medicine (1982)*, *39*(3), 361–366.

Bolte, G., Tamburlini, G., & Kohlhuber, M. (2010). Environmental inequalities among children in Europe—evaluation of scientific evidence and policy implications. *The European Journal of Public Health*, *20*(1), 14–20. doi:10.1093/eurpub/ckp213

Bremberg, S. (2003). Does an increase of low income families affect child health inequalities? A Swedish case study. *Journal of Epidemiology and Community Health*, *57*(8), 584–588. doi:10.1136/jech.57.8.584

Brown, S. L. (2000). The Effect of Union Type on Physiological Well-being: Depression Among Cohabitors Versus Marrieds. *Journal of Health & Social Behavior*, *41*(3), 241–255.

Brown, S. L. (2004). Family Structure and Child Well-being: The Significance of Parental Cohabitation. *Journal of Marriage and Family*, *66*(2), 351–367.

Brown, S. L. (2010). Marriage and Child Well-Being: Research and Policy Perspectives. *Journal of Marriage and Family*, *72*(5), 1059–1077. doi:10.1111/j.1741-3737.2010.00750.x

Brown, S. L., & Rinelli, L. N. (2010). Family Structure, Family Processes, and Adolescent Smoking and Drinking. *Journal of Research on Adolescence*, *20*(2), 259–273. doi:10.1111/j.1532-7795.2010.00636.x

Buis, M. L. (2012). The Composition of Family Background: The Influence of the Economic and Cultural Resources of Both Parents on the Offspring's Educational Attainment in the Netherlands Between 1939 and 1991. *European Sociological Review*. doi:10.1093/esr/jcs009

Burström, B., Whitehead, M., Clayton, S., Fritzell, S., Vannoni, F., & Costa, G. (2010). Health inequalities between lone and couple mothers and policy under different welfare regimes – The example of Italy, Sweden and Britain. *Social Science & Medicine*, *70*(6), 912–920. doi:10.1016/j.socscimed.2009.11.014

Bzostek, S. H., & Beck, A. N. (2011). Familial instability and young children's physical health. *Social Science and Medicine*, *73*(2), 282–292.

Carr, D., & Springer, K. W. (2010). Advances in Families and Health Research in the 21st Century. *Journal of Marriage and Family*, *72*(3), 743–761. doi:10.1111/j.1741-3737.2010.00728.x

Case, A., Fertig, A., & Paxson, C. (2005). The lasting impact of childhood health and circumstance. *Journal of Health Economics*, *24*(2), 365–389. doi:10.1016/j.jhealeco.2004.09.008

Case, A., Lee, D., & Paxson, C. (2008). The income gradient in children's health: A comment on Currie, Shields and Wheatley Price. *Journal of Health Economics*, *27*(3), 801–807. doi:10.1016/j.jhealeco.2007.10.005

Casey, B. J., Jones, R. M., & Hare, T. A. (2008). The Adolescent Brain. *Annals of the New York Academy of Sciences*, *1124*(1), 111–126. doi:10.1196/annals.1440.010

Chapple, S. (2009). *Child Well-Being and Sole-Parent Family Structure in the OECD: An Analysis* (OECD Social, Employment and Migration Working Paper No. 82). OECD Publishing. Retrieved from http://ideas.repec.org/p/oec/elsaab/82-en.html

Chen, E. (2004). Why Socioeconomic Status Affects the Health of Children. *Current Directions in Psychological Science*, *13*(3), 112 –115. doi:10.1111/j.0963-7214.2004.00286.x

Chen, E., Martin, A. D., & Matthews, K. A. (2006). Socioeconomic status and health: do gradients differ within childhood and adolescence? *Social Science & Medicine (1982)*, *62*(9), 2161–2170. doi:10.1016/j.socscimed.2005.08.054

Chen, E., Matthews, K. A., & Boyce, W. T. (2002). Socioeconomic differences in children's health: how and why do these relationships change with age? *Psychological Bulletin*, *128*(2), 295–329.

Cohen, P. N., & Petrescu Prahova, M. (2006). Gendered Living Arrangements Among Children With Disabilities. *Journal of Marriage and Family*, *68*(3), 630–638. doi:10.1111/j.1741-3737.2006.00279.x

Corijn, M., & Klijzing, E. (Eds.). (2001). *Transitions to adulthood in Europe*. Dordrecht: Kluwer Academic Publishers.

Cox, D. R. (1972). Regression models and life-tables. *Journal of the Royal Statistical Society. Series B (Methodological)*, 187–220.

Currie, J. (2009). Healthy, Wealthy, and Wise: Socioeconomic Status, Poor Health in Childhood, and Human Capital Development. *Journal of Economic Literature*, *47*(1), 87–122. doi:10.1257/jel.47.1.87

Dibben, C., & Popham, F. (2012). Are Health Inequalities Evident at All Ages? An Ecological Study of English Mortality Records. *The European Journal of Public Health*. doi:10.1093/eurpub/cks019

Donovan, J. E. (2004). Adolescent alcohol initiation: a review of psychosocial risk factors. *Journal of Adolescent Health 35*(6), 529.e7–18. doi:10.1016/j.jadohealth.2004.02.003

Droomers, M., Schrijvers, C. T. M., Casswell, S., & Mackenbach, J. P. (2003). Occupational level of the father and alcohol consumption during adolescence; patterns and predictors. *Journal of Epidemiology and Community Health*, *57*(9), 704–710.

Due, P., Krølner, R., Rasmussen, M., Andersen, A., Trab Damsgaard, M., Graham, H., & Holstein, B. E. (2011). Pathways and mechanisms in adolescence contribute to adult health inequalities. *Scandinavian Journal of Public Health*, *39*(6 Suppl), 62–78. doi:10.1177/1403494810395989

Eberhardt, M. S., & Pamuk, E. R. (2004). The Importance of Place of Residence: Examining Health in Rural and Nonrural Areas. *American Journal of Public Health*, *94*(10), 1682–1686.

Edwards, P., Roberts, I., Green, J., & Lutchmun, S. (2006). Deaths from injury in children and employment status in family: analysis of trends in class specific death rates. *British Medical Journal*, *333*(7559), 119. doi:10.1136/bmj.38875.757488.4F

Ekblad, M., Gissler, M., Lehtonen, L., & Korkeila, J. (2010). Prenatal Smoking Exposure and the Risk of Psychiatric Morbidity Into Young Adulthood.

Archives of General Psychiatry, *67*(8), 841–849. doi:10.1001/archgenpsychiatry.2010.92

Engström, K., Diderichsen, F., & Laflamme, L. (2002). Socioeconomic differences in injury risks in childhood and adolescence: a nation-wide study of intentional and unintentional injuries in Sweden. *Injury Prevention*, *8*(2), 137 –142. doi:10.1136/ip.8.2.137

Erikson, R. (1984). Social Class of Men, Women and Families. *Sociology*, *18*(4), 500–514. doi:10.1177/0038038584018004003

Erola, J. (2009). Social Mobility and Education of Finnish Cohorts Born 1936–75. *Acta Sociologica*, *52*(4), 307 –327. doi:10.1177/0001699309348701

Evans, G. W., & Kim, P. (2010). Multiple risk exposure as a potential explanatory mechanism for the socioeconomic status–health gradient. *Annals of the New York Academy of Sciences*, *1186*(1), 174–189. doi:10.1111/j.1749-6632.2009.05336.x

Fleury, D., Peytavin, J. F., Alam, T., & Brenac, T. (2010). Excess accident risk among residents of deprived areas. *Accident Analysis & Prevention*, *42*(6), 1653–1660. doi:10.1016/j.aap.2010.04.004

Furstenberg, F. F. J. (2010). On a New Schedule: Transitions to Adulthood and Family Change. *The Future of Children*, *20*(1), 67–87. doi:10.1353/foc.0.0038

Gadeyne, S. (2006). *The ultimate inequality. Socio-economic differences in all-cause and cause-specific mortality in Belgium in the first half of the 1990s.* (Vol. 39). NIDI/CBGS-publicaties.

Gakidou, E., Cowling, K., Lozano, R., & Murray, C. J. (2010). Increased educational attainment and its effect on child mortality in 175 countries between 1970 and 2009: a systematic analysis. *The Lancet*, *376*(9745), 959–974. doi:10.1016/S0140-6736(10)61257-3

Galobardes, B., Lynch, J. W., & Davey Smith, G. (2004). Childhood Socioeconomic Circumstances and Cause-specific Mortality in Adulthood: Systematic Review and Interpretation. *Epidemiologic Reviews*, *26*(1), 7–21. doi:10.1093/epirev/mxh008

Galobardes, B., Lynch, J. W., & Davey Smith, G. (2008). Is the association between childhood socioeconomic circumstances and cause-specific mortality established? Update of a systematic review. *Journal of Epidemiology and Community Health*, *62*(5), 387 –390. doi:10.1136/jech.2007.065508

Galobardes, B., Shaw, M., Lawlor, D. A., Davey Smith, G., & Lynch, J. (2006). Indicators of socioeconomic position. In J. M. Oakes & J. S. Kaufman (Eds.), *Social Epidemiology* (pp. 47–85). San Francisco: John Wiley & Sons.

Galobardes, B., Shaw, M., Lawlor, D. A., Lynch, J. W., & Davey Smith, G. (2006). Indicators of socioeconomic position (part 1). *Journal of Epidemiology and Community Health*, *60*(1), 7–12. doi:10.1136/jech.2004.023531

Gilbert, R., Widom, C. S., Browne, K., Fergusson, D., Webb, E., & Janson, S. (2009). Burden and consequences of child maltreatment in high-income countries. *The Lancet*, *373*(9657), 68–81. doi:10.1016/S0140-6736(08)61706-7

Gissler, M., Keskimäki, I., Teperi, J., Järvelin, M., & Hemminki, E. (2000). Regional equity in childhood health--register-based follow-up of the Finnish 1987 birth cohort. *Health & Place*, *6*(4), 329–336.

Gissler, M., Rahkonen, O., Arntzen, A., Cnattingius, S., Nybo Andersen, A.-M., & Hemminki, E. (2009). Trends in socioeconomic differences in Finnish perinatal health 1991–2006. *Journal of Epidemiology and Community Health*, *63*(6), 420 –425. doi:10.1136/jech.2008.079921

Gissler, M., Rahkonen, O., Järvelin, M.-R., & Hemminki, E. (1998). Social class differences in health until the age of seven years among the Finnish 1987 birth cohort. *Social Science & Medicine*, *46*(12), 1543–1552. doi:10.1016/S0277-9536(98)00013-6

Gissler, M., Rahkonen, O., Mortensen, L., Arntzen, A., Cnattingius, S., Nybo Andersen, A.-M., & Hemminki, E. (2009). Sex differences in child and adolescent mortality in the Nordic countries, 1981—2000. *Scandinavian Journal of Public Health*, *37*(4), 340 –346. doi:10.1177/1403494809103905

Gissler, M., Rahkonen, O., Mortensen, L., Arntzen, A., Cnattingius, S., Nybo Andersen, A.-M., & Hemminki, E. (2012). Sex differences in child and adolescent mortality by parental education in the Nordic countries. *Journal of Epidemiology and Community Health*, *66*(1), 57–63. doi:10.1136/jech.2009.093153

Goldman, N. (2001). Social inequalities in health disentangling the underlying mechanisms. *Annals of the New York Academy of Sciences*, *954*, 118–139.

Goldscheider, F. K., & Goldscheider, C. (1998). The Effects of Childhood Family Structure on Leaving and Returning Home. *Journal of Marriage and Family*, *60*(3), 745–756. doi:10.2307/353543

Goodman, S. H. (2007). Depression in Mothers. *Annual Review of Clinical Psychology*, *3*(1), 107–135. doi:10.1146/annurev.clinpsy.3.022806.091401

Greenfield, E. A. (2010). Child abuse as a life-course social determinant of adult health. *Maturitas*, *66*(1), 51–55. doi:10.1016/j.maturitas.2010.02.002

Halldorsson, M., Kunst, A., Kohler, L., & Mackenbach, J. (2002). Socioeconomic differences in children's use of physician services in the Nordic countries. *Journal of Epidemiology and Community Health*, *56*(3), 200–204. doi:10.1136/jech.56.3.200

Hammarström, A., & Janlert, U. (2002). Early unemployment can contribute to adult health problems: Results from a longitudinal study of school leavers. *Journal of Epidemiology and Community Health*, *56*(8), 624–630.

Hanson, M. D., & Chen, E. (2007). Socioeconomic Status and Health Behaviors in Adolescence: A Review of the Literature. *Journal of Behavioral Medicine*, *30*(3), 263–285. doi:10.1007/s10865-007-9098-3

Heuveline, P., Timberlake, J. M., & Furstenberg, F. F. (2003). Shifting Childrearing to Single Mothers: Results from 17 Western Countries. *Population and Development Review*, *29*(1), 47–71. doi:10.1111/j.1728-4457.2003.00047.x

Hjern, A., & Bremberg, S. (2002). Social aetiology of violent deaths in Swedish children and youth. *Journal of Epidemiology and Community Health*, *56*(9), 688 –692. doi:10.1136/jech.56.9.688

Hjern, A., Vinnerljung, B., & Lindblad, F. (2004). Avoidable mortality among child welfare recipients and intercountry adoptees: a national cohort study. *Journal of Epidemiology and Community Health*, *58*(5), 412–417. doi:10.1136/jech.2003.014282

Hobcraft, J. (2003). Continuity and change in pathways to young adult disadvantage: results from a British birth cohort. CASE paper 66. LSE Centre for Analysis of Social Exclusion, London, UK. Retrieved from http://sticerd.lse.ac.uk/case

Hobcraft, J. (2008). The timing and partnership context of becoming a parent. *Demographic Research*, *19*, 1281–1322. doi:10.4054/DemRes.2008.19.34

Hofferth, S. L. (2006). Residential father family type and child well-being: Investment versus selection. *Demography*, *43*(1), 53–77.

Huurre, T., Aro, H., Rahkonen, O., & Komulainen, E. (2006). Health, Lifestyle, Family and School Factors in Adolescence: Predicting Adult Educational Level. *Educational Research*, *48*(1), 41–53.

Iacovou, M. (2010). Leaving home: Independence, togetherness and income. *Advances in Life Course Research*, *15*, 147–160. doi:10.1016/j.alcr.2010.10.004

Ilmonen, M., Hirvonen, J., & Manninen, R. (2005). Nuorten asuminen 2005 (Young people and housing 2005). Helsinki, Finland: Ympäristöministeriö. Retrieved from http://www.ymparisto.fi/default.asp?contentid=168773

Impinen, A., Lunetta, P., & Lounamaa, A. (2008). *Tapaturmakuolemat ja alkoholi Suomessa 1987-2006 (Injury deaths and alcohol in Finland 1987-2006)*. Helsinki: Kansanterveyslaitos.

Jaakkola, N., Jaakkola, M. S., Gissler, M., & Jaakkola, J. J. (2001). Smoking during pregnancy in Finland: determinants and trends, 1987-1997. *American Journal of Public Health*, *91*(2), 284–286.

Joutsenniemi, K., Martelin, T., Martikainen, P., Pirkola, S., & Koskinen, S. (2006). Living arrangements and mental health in Finland. *Journal of Epidemiology and Community Health*, *60*(6), 468–475. doi:10.1136/jech.2005.040741

Judge, K., & Benzeval, M. (1993). Health inequalities: new concerns about the children of single mothers. *British Medical Journal*, *306*(6879), 677–680.

Jung-Choi, K., & Khang, Y. H. (2011). Contribution of different causes of death to socioeconomic mortality inequality in Korean children aged 1–9: findings from a national mortality follow-up study. *Journal of Epidemiology and Community Health*, *65*(2), 124–129. doi:10.1136/jech.2008.086884

Kalland, M., Pensola, T., Meriläinen, J., & Sinkkonen, J. (2001). Mortality in children registered in the Finnish child welfare registry: population based study. *British Medical Journal* *323*(7306), 207–208. doi:10.1136/bmj.323.7306.207

Karvonen, S., Vikat, A., & Rimpelä, M. (2005). The role of school context in the increase in young people's health complaints in Finland. *Journal of Adolescence*, *28*(1), 1–16. doi:10.1016/j.adolescence.2004.05.006

Kawachi, I., Adler, N. E., & Dow, W. H. (2010). Money, schooling, and health: Mechanisms and causal evidence. *Annals of the New York Academy of Sciences*, *1186*(1), 56–68. doi:10.1111/j.1749-6632.2009.05340.x

Kestilä, L., Koskinen, S., Martelin, T., Rahkonen, O., Pensola, T., Aro, H., & Aromaa, A. (2006). Determinants of health in early adulthood: what is the role of parental education, childhood adversities and own education? *European Journal of Public Health*, *16*(3), 306–315. doi:10.1093/eurpub/cki164

Kestilä, L., Martelin, T., Rahkonen, O., Joutsenniemi, K., Pirkola, S., Poikolainen, K., & Koskinen, S. (2008). Childhood and current determinants of heavy drinking in early adulthood. *Alcohol and Alcoholism (Oxford, Oxfordshire)*, *43*(4), 460–469. doi:10.1093/alcalc/agn018

Khanam, R., Nghiem, H. S., & Connelly, L. B. (2009). Child health and the income gradient: Evidence from Australia. *Journal of Health Economics*, *28*(4), 805–817. doi:10.1016/j.jhealeco.2009.05.001

Kiernan, K. (2004). Unmarried Cohabitation and Parenthood in Britain and Europe. *Law & Policy*, *26*(1), 33–55. doi:10.1111/j.0265-8240.2004.00162.x

Kim, J., Son, M., Kawachi, I., & Oh, J. (2009). The extent and distribution of inequalities in childhood mortality by cause of death according to parental socioeconomic positions: A birth cohort study in South Korea. *Social Science & Medicine*, *69*(7), 1116–1126. doi:10.1016/j.socscimed.2009.07.014

Koivusilta, L., Rimpelä, A., & Rimpelä, M. K. (1999). Health-related lifestyle in adolescence--origin of social class differences in health? *Health Education Research*, *14*(3), 339–355.

Koivusilta, L., Rimpelä, A., & Vikat, A. (2003). Health behaviours and health in adolescence as predictors of educational level in adulthood: a follow-up study from Finland. *Social Science & Medicine (1982)*, *57*(4), 577–593.

Koskinen, S., Joutsenniemi, K., Martelin, T., & Martikainen, P. (2007). Mortality differences according to living arrangements. *International Journal of Epidemiology*, *36*(6), 1255–1264. doi:10.1093/ije/dym212

Koskinen, S., & Martelin, T. (2007). Kuolleisuus (Mortality). In S. Koskinen, T. Martelin, I.-L. Notkola, V. Notkola, K. Pitkänen, M. Jalovaara, E. Mäenpää, et al. (Eds.), *Suomen väestö* (pp. 169–238). Helsinki, Finland: Gaudeamus.

Koskinen, S., Martelin, T., Notkola, I.-L., Notkola, V., Pitkänen, K., Jalovaara, M., Mäenpää, E., et al. (Eds.). (2007). *Suomen väestö (Population of Finland)*. Helsinki, Finland: Gaudeamus.

Kuh, D., Ben-Shlomo, Y., Lynch, J., Hallqvist, J., & Power, C. (2003). Life course epidemiology. *Journal of Epidemiology and Community Health*, *57*(10), 778 –783. doi:10.1136/jech.57.10.778

Laflamme, L., Hasselberg, M., & Burrows, S. (2010). 20 Years of Research on Socioeconomic Inequality and Children's—Unintentional Injuries Understanding the Cause-Specific Evidence at Hand. *International Journal of Pediatrics*, *2010*, 1–23. doi:10.1155/2010/819687

Lahti, R. A., & Vuori, E. (2002). Fatal alcohol poisoning: medico-legal practices and mortality statistics. *Forensic Science International*, *126*(3), 203–209.

Launiainen, T., Broms, U., Keskitalo-Vuokko, K., Pitkäniemi, J., Pelander, A., Kaprio, J., & Ojanperä, I. (2011). Nicotine, Alcohol, and Drug Findings in Young Adults in a Population-Based Postmortem Database. *Nicotine & Tobacco Research*, *13*(9), 763 –771. doi:10.1093/ntr/ntr069

Le Cann, P., Bonvallot, N., Glorennec, P., Deguen, S., Goeury, C., & Le Bot, B. (2011). Indoor environment and children's health: Recent developments in chemical, biological, physical and social aspects. *International Journal of Hygiene and Environmental Health*, *215*(1), 1–18. doi:10.1016/j.ijheh.2011.07.008

Link, B. G., & Phelan, J. (1995). Social Conditions As Fundamental Causes of Disease. *Journal of Health and Social Behavior*, *35*, 80–94. doi:10.2307/2626958

Lundberg, O., Yngwe, M. Å., Stjärne, M. K., Elstad, J. I., Ferrarini, T., Kangas, O., Norström, T., et al. (2008). The role of welfare state principles and generosity in social policy programmes for public health: an international comparative

study. *The Lancet*, *372*(9650), 1633–1640. doi:10.1016/S0140-6736(08)61686-4

Låftman, S. B. (2009). Family Structure and Children's Living Conditions. A Comparative Study of 24 Countries. *Child Indicators Research*, *3*(1), 127–147. doi:10.1007/s12187-009-9059-1

Mackenbach, J. P., & Kunst, A. E. (1997). Measuring the magnitude of socio-economic inequalities in health: An overview of available measures illustrated with two examples from Europe. *Social Science & Medicine*, *44*(6), 757–771. doi:10.1016/S0277-9536(96)00073-1

Mackenbach, J. P., Stirbu, I., Roskam, A.-J. R., Schaap, M. M., Menvielle, G., Leinsalu, M., & Kunst, A. E. (2008). Socioeconomic inequalities in health in 22 European countries. *The New England Journal of Medicine*, *358*(23), 2468–2481. doi:10.1056/NEJMsa0707519

Manning, W. D., & Brown, S. L. (2006). Children's Economic Well-Being in Married and Cohabiting Parent Families. *Journal of Marriage and Family*, *68*(2), 345–362. doi:10.1111/j.1741-3737.2006.00257.x

Marmot, M., Friel, S., Bell, R., Houweling, T. A., & Taylor, S. (2008). Closing the gap in a generation: health equity through action on the social determinants of health. *The Lancet*, *372*, 1661–1669. doi:10.1016/S0140-6736(08)61690-6

Martelin, T., Mäkelä, P., & Valkonen, T. (2004). Contribution of deaths related to alcohol or smoking to the gender difference in life expectancy. *The European Journal of Public Health*, *14*(4), 422 –427. doi:10.1093/eurpub/14.4.422

Mattila, V. M. (2005). *Injuries & Their Risk Factors in Finnish Adolescents*. Tampere University Press.

Mattila, V. M., Parkkari, J., Koivusilta, L., Nummi, T., Kannus, P., & Rimpelä, A. (2008). Adolescents' health and health behaviour as predictors of injury death. A prospective cohort follow-up of 652,530 person-years. *BMC Public Health*, *8*, 90–90. doi:10.1186/1471-2458-8-90

Mattila, V. M., Parkkari, J., Niemi, S., & Kannus, P. (2005). Injury-related deaths among Finnish adolescents in 1971–2002. *Injury*, *36*(9), 1016–1021. doi:10.1016/j.injury.2005.05.029

Meadows, S. O., McLanahan, S. S., & Brooks-Gunn, J. (2008). Stability and Change in Family Structure and Maternal Health Trajectories. *American Sociological Review*, *73*(2), 314–334. doi:10.1177/000312240807300207

Musick, K., & Meier, A. (2010). Are both parents always better than one? Parental conflict and young adult well-being. *Social Science Research*, *39*(5), 814–830. doi:10.1016/j.ssresearch.2010.03.002

Myrskylä, P. (2011). *Nuoret työmarkkinoiden ja opiskelun ulkopuolella (The young outside the labour market and education)*. Helsinki, Finland: Työ- ja elinkeinoministeriön julkaisuja.

Mäkelä, P. (1998). Alcohol-related mortality by age and sex and its impact on life expectancy. *The European Journal of Public Health*, *8*(1), 43–51. doi:10.1093/eurpub/8.1.43

Mäkelä, P., Valkonen, T., & Martelin, T. (1997). Contribution of deaths related to alcohol use to socioeconomic variation in mortality: register based follow up study. *British Medical Journal,* *315*(7102), 211–216. doi:10.1136/bmj.315.7102.211

Nihtilä, E. K., Martikainen, P. T., Koskinen, S. V. P., Reunanen, A. R., Noro, A. M., & Häkkinen, U. T. (2008). Chronic Conditions and the Risk of Long-Term

Institutionalization Among Older People. *The European Journal of Public Health*, *18*(1), 77–84. doi:10.1093/eurpub/ckm025

OECD. (2009). What are equivalence scales? Retrieved April 15, 2012, from http://www.oecd.org/dataoecd/61/52/35411111.pdf

Parkkari, J., Kannus, P., Niemi, S., Koskinen, S., Palvanen, M., Vuori, I., & Järvinen, M. (2000). Childhood deaths and injuries in Finland in 1971–1995. *International Journal of Epidemiology*, *29*(3), 516–523. doi:10.1093/ije/29.3.516

Parkkari, J., Mattila, V. M., Niemi, S., & Kannus, P. (2003). Injury-related deaths among Finnish children, 1971-2001. *Journal of the American Medical Association*, *289*(6), 702–703.

Patton, G. C., Coffey, C., Sawyer, S. M., Viner, R. M., Haller, D. M., Bose, K., Vos, T., et al. (2009). Global patterns of mortality in young people: a systematic analysis of population health data. *The Lancet*, *374*(9693), 881–892. doi:10.1016/S0140-6736(09)60741-8

Peden, M. M., Oyebite, K., & Ozanne-Smith, J. (2008). *World report on child injury prevention*. World Health Organization.

Pensola, T., & Martikainen, P. (2003a). Effect of living conditions in the parental home and youth paths on the social class differences in mortality among women. *Scandinavian Journal of Public Health*, *31*(6), 428–438. doi:10.1080/14034950310003980

Pensola, T., & Martikainen, P. (2003b). Cumulative social class and mortality from various causes of adult men. *Journal of Epidemiology and Community Health*, *57*(9), 745–751. doi:10.1136/jech.57.9.745

Pensola, T., & Martikainen, P. (2004). Life-course experiences and mortality by adult social class among young men. *Social Science and Medicine*, *58*(11), 2149–2170.

Pensola, T., & Valkonen, T. (2000). Mortality differences by parental social class from childhood to adulthood. *Journal of Epidemiology and Community Health*, *54*(7), 525–529.

Pensola, T., & Valkonen, T. (2002). Effect of parental social class, own education and social class on mortality among young men. *European Journal of Public Health*, *12*(1), 29–36.

Petridou, E., Zavitsanos, X., Dessypris, N., Frangakis, C., Mandyla, M., Doxiadis, S., & Trichopoulos, D. (1997). Adolescents in High-Risk Trajectory: Clustering of Risky Behavior and the Origins of Socioeconomic Health Differentials. *Preventive Medicine*, *26*(2), 215–219. doi:10.1006/pmed.1996.0130

Petrou, S., Kupek, E., Hockley, C., & Goldacre, M. (2006). Social class inequalities in childhood mortality and morbidity in an English population. *Paediatric and Perinatal Epidemiology*, *20*(1), 14–23. doi:10.1111/j.1365-3016.2006.00688.x

Phelan, J. C., Link, B. G., & Tehranifar, P. (2010). Social Conditions as Fundamental Causes of Health Inequalities. *Journal of Health and Social Behavior*, *51*(1 suppl), S28–S40. doi:10.1177/0022146510383498

Pickett, W., Schmid, H., Boyce, W. F., Simpson, K., Scheidt, P. C., Mazur, J., Molcho, M., et al. (2002). Multiple Risk Behavior and Injury: An International Analysis of Young People. *Archives of Pediatrics & Adolescent Medicine*, *156*(8), 786–793. doi:10.1001/archpedi.156.8.786

Propper, C., Rigg, J., & Burgess, S. (2007). Child health: evidence on the roles of family income and maternal mental health from a UK birth cohort. *Health Economics*, *16*(11), 1245–1269. doi:10.1002/hec.1221

Raatikainen, K., Huurinainen, P., & Heinonen, S. (2007). Smoking in early gestation or through pregnancy: A decision crucial to pregnancy outcome. *Preventive Medicine*, *44*(1), 59–63. doi:10.1016/j.ypmed.2006.07.017

Rahkonen, O., Arber, S., & Lahelma, E. (1995). Health inequalities in early adulthood: a comparison of young men and women in Britain and Finland. *Social Science & Medicine (1982)*, *41*(2), 163–171.

Rainwater, L., & Smeeding, T. M. (2004). Single-parent poverty, inequality, and the welfare state. In D. P. Moynihan, T. M. Smeeding, & L. Rainwater (Eds.), *The future of the family* (pp. 96–115). New York: Russell Sage Foundation.

Reichman, N. E., Corman, H., & Noonan, K. (2003). Effects of Child Health on Parents' Relationship Status. *National Bureau of Economic Research Working Paper Series*, *No. 9610*. Retrieved from http://www.nber.org/papers/w9610

Remes, H., Martikainen, P., & Valkonen, T. (2010). Mortality inequalities by parental education among children and young adults in Finland 1990–2004. *Journal of Epidemiology and Community Health*, *64*(2), 130–135. doi:10.1136/jech.2008.082388

Repetti, R. L., Taylor, S. E., & Seeman, T. E. (2002). Risky families: Family social environments and the mental and physical health of offspring. *Psychological Bulletin*, *128*(2), 330–366. doi:10.1037/0033-2909.128.2.330

Rijken, A., & Liefbroer, A. (2009). Influences of the family of origin on the timing and quantum of fertility in the Netherlands. *Population Studies*, *63*(1), 71–85. doi:10.1080/00324720802621575

Rimpelä, A. (1993). Children. Adolescents and Young Adults. *Socio-economic Mortality Differences in Finland* (pp. 20–32). Helsinki, Finland: Statistics Finland.

Ringbäck Weitoft, G., Burström, B., & Rosén, M. (2004). Premature mortality among lone fathers and childless men. *Social Science & Medicine (1982)*, *59*(7), 1449–1459. doi:10.1016/j.socscimed.2004.01.026

Roberts, I., DiGuiseppi, C., & Ward, H. (1998). Childhood injuries: extent of the problem, epidemiological trends, and costs. *Injury Prevention*, *4*, S10–S16. doi:10.1136/ip.4.2008.S10

Robson, K. (2009). Changes in Family Structure and the Well-Being of British Children: Evidence from a Fifteen-Year Panel Study. *Child Indicators Research*, *3*(1), 65–83. doi:10.1007/s12187-009-9057-3

Rogers, J. M. (2009). Tobacco and pregnancy. *Reproductive Toxicology*, *28*(2), 152–160. doi:10.1016/j.reprotox.2009.03.012

Saarela, J., & Finnäs, F. (2008). Cause-specific mortality at young ages: Lessons from Finland. *Health & Place*, *14*(2), 265–274. doi:10.1016/j.healthplace.2007.06.007

Salmi, M., Sauli, H., & Lammi-Taskula, J. (2009). Lapsiperheiden toimeentulo. *Lapsiperheiden hyvinvointi 2009 (Well-being of families with children 2009)*. Helsinki, Finland: Terveyden ja hyvinvoinnin laitos.

Sarkola, T., Kahila, H., Gissler, M., & Halmesmäki, E. (2007). Risk factors for out-of-home custody child care among families with alcohol and substance abuse

problems. *Acta Paediatrica (Oslo, Norway: 1992)*, *96*(11), 1571–1576. doi:10.1111/j.1651-2227.2007.00474.x

Sauvola, A., Räsänen, P., Joukamaa, M., Jokelainen, J., Järvelin, M.-R., & Isohanni, M. (2001). Mortality of young adults in relation to single-parent family background. *The European Journal of Public Health*, *11*(3), 284–286. doi:10.1093/eurpub/11.3.284

Schmeer, K. K. (2011). The child health disadvantage of parental cohabitation. *Journal of Marriage and Family*, *73*(1), 181–193.

Sengoelge, M., Hasselberg, M., & Laflamme, L. (2011). Child home injury mortality in Europe: a 16-country analysis. *The European Journal of Public Health*, *21*(2), 166 –170. doi:10.1093/eurpub/ckq047

Shaw, C., Blakely, T., Atkinson, J., & Crampton, P. (2005). Do social and economic reforms change socioeconomic inequalities in child mortality? A case study: New Zealand 1981–1999. *Journal of Epidemiology and Community Health*, *59*(8), 638 –644. doi:10.1136/jech.2004.032466

Shaw, C., Blakely, T., Crampton, P., & Atkinson, J. (2005). The contribution of causes of death to socioeconomic inequalities in child mortality: New Zealand 1981-1999. *The New Zealand Medical Journal*, *118*(1227), U1779.

Shkolnikov, V. M., Andreev, E. M., Jdanov, D. A., Jasilionis, D., Kravdal, Ø., Vågerö, D., & Valkonen, T. (2012). Increasing Absolute Mortality Disparities by Education in Finland, Norway and Sweden, 1971–2000. *Journal of Epidemiology and Community Health*, *66*(4), 372–378. doi:10.1136/jech.2009.104786

Siegler, V., Al-Hamad, A., & Blane, D. (2010). Social inequalities in fatal childhood accidents and assaults: England and Wales, 2001–03. *Health Statistics Quarterly*, *48*, 3–35. doi:10.1057/hsq.2010.19

Singh, G. K., & Kogan, M. D. (2007). Widening Socioeconomic Disparities in US Childhood Mortality, 1969 2000. *American Journal of Public Health*, *97*(9), 1658–1665. doi:10.2105/AJPH.2006.087320

Singh, S., & Darroch, J. E. (2000). Adolescent pregnancy and childbearing: levels and trends in developed countries. *Family planning perspectives*, *32*(1), 14–23.

Sobotka, T., & Toulemon, L. (2008). Overview Chapter 4: Changing family and partnership behaviour. *Demographic Research*, *19*, 85–138. doi:10.4054/DemRes.2008.19.6

Sonkin, B., Edwards, P., Roberts, I., & Green, J. (2006). Walking, cycling and transport safety: an analysis of child road deaths. *Journal of the Royal Society of Medicine*, *99*(8), 402 –405. doi:10.1258/jrsm.99.8.402

Staff, J., Schulenberg, J. E., Maslowsky, J., Bachman, J. G., O'Malley, P. M., Maggs, J. L., & Johnston, L. D. (2010). Substance Use Changes and Social Role Transitions: Proximal Developmental Effects on Ongoing Trajectories from Late Adolescence Through Early Adulthood. *Development and Psychopathology*, *22* (Special Issue 04), 917–932. doi:10.1017/S0954579410000544

Statacorp. (2007). *Stata Statistical Software: Release 10.* College Station, TX: Statacorp LP.

Statistics Finland. (2005). *Causes of death 2004*. Health. Helsinki, Finland: Statistics Finland.

Statistics Finland. (2006). *Families 2005*. Population. Helsinki, Finland: Statistics Finland.

Statistics Finland. (2010). *Official Statistics of Finland (OSF): Families [e-publication]. Quality description, families 2010*. Helsinki: Statistics Finland. Retrieved from http://www.stat.fi/til/perh/2010/perh_2010_2011-05-27_laa_001_en.html

Statistics Finland. (2012). *Official Statistics of Finland (OSF): Causes of death [e-publication]*. Helsinki: Statistics Finland. Retrieved from http://www.stat.fi/til/ksyyt/index_en.html

Statistics Finland, & Stakes. (2007). *Suomalainen lapsi 2007 (Finnish child 2007)*. Population. Helsinki, Finland: Statistics Finland.

Steinberg, L. (2008). A social neuroscience perspective on adolescent risk-taking. *Developmental Review*, *28*(1), 78–106. doi:10.1016/j.dr.2007.08.002

Strand, B. H., & Kunst, A. (2007). Childhood Socioeconomic Position and Cause-specific Mortality in Early Adulthood. *American Journal of Epidemiology*, *165*(1), 85 –93. doi:10.1093/aje/kwj352

Suokas, J. T., Suominen, K., Heilä, H., Ostamo, A., Aalto-Setälä, T., Perälä, J., Saarni, S., et al. (2010). Attempted suicide in mental disorders in young adulthood. *Social Psychiatry and Psychiatric Epidemiology*, *46*(10), 965–974. doi:10.1007/s00127-010-0272-5

Suvisaari, J., Aalto-Setälä, T., Tuulio-Henriksson, A., Härkänen, T., Saarni, S. I., Perälä, J., Schreck, M., et al. (2009). Mental Disorders in Young Adulthood. *Psychological Medicine*, *39*(02), 287–299. doi:10.1017/S0033291708003632

Swartz, T. T., & Bengtson O'Brien, K. (2009). Intergenerational support during the transition to adulthood. In A. Furlong (Ed.), *Handbook of youth and young adulthood: new perspectives and agendas* (pp. 217–224). London: Routledge.

Syse, A., Lyngstad, T. H., & Kravdal, O. (2012). Is mortality after childhood cancer dependent on social or economic resources of parents? A population-based study. *International Journal of Cancer*, *130*(8), 1870–1878. doi:10.1002/ijc.26186

Sørensen, A. (2006). Welfare states, family inequality, and equality of opportunity. *Research in Social Stratification and Mobility*, *24*(4), 367–375. doi:10.1016/j.rssm.2006.09.001

Thomson, E., Hanson, T. L., & McLanahan, S. S. (1994). Family Structure and Child Well-Being: Economic Resources vs. Parental Behaviors. *Social Forces*, *73*(1), 221–242.

Townsend, P., & Davidson, N. (1982). *Inequalities in Health: the Black Report*. Harmondsworth: Penguin.

Turrell, G., & Mathers, C. D. (2001). Socioeconomic inequalities in all-cause and specific-cause mortality in Australia: 1985–1987 and 1995–1997. *International Journal of Epidemiology*, *30*(2), 231–239. doi:10.1093/ije/30.2.231

Umberson, D., Crosnoe, R., & Reczek, C. (2010). Social Relationships and Health Behavior Across Life Course. *Annual review of sociology*, *36*, 139–157. doi:10.1146/annurev-soc-070308-120011

Umberson, D., Pudrovska, T., & Reczek, C. (2010). Parenthood, Childlessness, and Well-Being: A Life Course Perspective. *Journal of Marriage and Family*, *72*(3), 612–629. doi:10.1111/j.1741-3737.2010.00721.x

UNICEF. (2001). *A League Table of Child Deaths by Injury in Rich Nations. Innocenti Report Card No 2*. Florence: Unicef Innocenti Research Centre. Retrieved from http://www.unicef-irc.org/publications/289

UNICEF. (2007). *Child poverty in perspective: an overview of child well-being in rich countries. Innocenti Report Card No 7*. Florence: Unicef Innocenti Research Centre. Retrieved from http://www.unicef-irc.org/publications/289

UNICEF, WHO, World Bank, & UN Population Division. (2011). Levels and trends in child mortality. Report 2011. Retrieved from http://www.who.int/child_adolescent_health/documents/child/childmortality_booklet_2011.pdf

Wadsworth, M. (1997). Health inequalities in the life course perspective. *Social Science & Medicine*, *44*(6), 859–869. doi:10.1016/S0277-9536(96)00187-6

Wadsworth, M., Montgomery, S., & Bartley, M. (1999). The persisting effect of unemployment on health and social well-being in men early in working life. *Social Science & Medicine*, *48*(10), 1491–1499. doi:10.1016/S0277-9536(99)00052-0

Wagstaff, A. (2000). Socioeconomic inequalities in child mortality: comparisons across nine developing countries. *Bulletin of the World Health Organization*, *78*(1), 19–29.

Waldfogel, J., Craigie, T.-A., & Brooks-Gunn, J. (2010). Fragile families and child wellbeing. *The Future of Children / Center for the Future of Children, the David and Lucile Packard Foundation*, *20*(2), 87–112.

Vallin, J., & Meslé, F. (2001). Trends in mortality in Europe since 1950: age-, sex- and cause-specific mortality. *Trends in mortality and differential mortality*. Council of Europe.

Weitoft, G. R., Haglund, B., Hjern, A., & Rosén, M. (2002). Mortality, severe morbidity and injury among long-term lone mothers in Sweden. *International Journal of Epidemiology*, *31*(3), 573 –580. doi:10.1093/ije/31.3.573

Weitoft, G. R., Hjern, A., Haglund, B., & Rosén, M. (2003). Mortality, severe morbidity, and injury in children living with single parents in Sweden: a population-based study. *The Lancet*, *361*(9354), 289–295. doi:10.1016/S0140-6736(03)12324-0

West, P. (1997). Health inequalities in the early years: is there equalisation in youth? *Social Science & Medicine (1982)*, *44*(6), 833–858.

West, P., & Sweeting, H. (2004). Evidence on equalisation in health in youth from the West of Scotland. *Social Science & Medicine (1982)*, *59*(1), 13–27. doi:10.1016/j.socscimed.2003.12.004

Whitehead, M., Burström, B., & Diderichsen, F. (2000). Social policies and the pathways to inequalities in health: a comparative analysis of lone mothers in Britain and Sweden. *Social Science & Medicine (1982)*, *50*(2), 255–270.

Wickrama, T., Wickrama, K. A. S., & Baltimore, D. L. (2010). Adolescent precocious development and young adult health outcomes. *Advances in Life Course Research*, *15*, 121–131. doi:10.1016/j.alcr.2010.08.003

Viner, R. M., Coffey, C., Mathers, C. D., Bloem, P., Costello, A., Santelli, J., & Patton, G. C. (2011). 50-year mortality trends in children and young people: A study of 50 low-income, middle-income, and high-income countries. *The Lancet*, *377*(9772), 1162–1174.

Viner, R. M., Ozer, E. M., Denny, S., Marmot, M., Resnick, M., Fatusi, A., & Currie, C. (2012). Adolescence and the social determinants of health. *The Lancet*, *379*(9826), 1641–1652. doi:10.1016/S0140-6736(12)60149-4

Virtanen, J. I., Berntsson, L. T., Lahelma, E., & Köhler, L. (2006). Children's use of general practitioner services in the five Nordic countries. *Journal of Epidemiology and Community Health*, *60*(2), 162–167. doi:10.1136/jech.2005.042390

Wise, P. H. (2009). Confronting Social Disparities in Child Health: A Critical Appraisal of Life-Course Science and Research. *Pediatrics*, *124*(Supplement), S203–S211. doi:10.1542/peds.2009-1100H

Vrijheid, M., Martinez, D., Aguilera, I., Ballester, F., Basterrechea, M., Esplugues, A., Guxens, M., et al. (2010). Socioeconomic status and exposure to multiple environmental pollutants during pregnancy: evidence for environmental inequity? *Journal of Epidemiology and Community Health*. doi:10.1136/jech.2010.117408

Östberg, V. (1992). Social class differences in child mortality, Sweden 1981-1986. *Journal of Epidemiology and Community Health*, *46*(5), 480–484.

Östberg, V. (1996). *Social structure and children's life chances: an analysis of child mortality in Sweden*. Swedish Institute for Social Research.

Östberg, V. (1997). The social patterning of child mortality: the importance of social class, gender, family structure, immigrant status and population density. *Sociology of Health & Illness*, *19*(4), 415–435. doi:10.1111/j.1467-9566.1997.tb00411.x

Östberg, V. (2003). Children in classrooms: peer status, status distribution and mental well-being. *Social Science & Medicine*, *56*(1), 17–29. doi:10.1016/S0277-9536(02)00006-0