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Early-life and adult socioeconomic determinants of myocardial infarction incidence and fatality

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ABSTRACT

Social inequalities in coronary heart disease mortality have roots in childhood conditions, but it is unknown whether they are associated both with the incidence of the disease and the following survival. We studied how several different early-life socioeconomic factors, together with later socioeconomic attainment, were associated with myocardial infarction (MI) incidence and fatality in Finland. The data was based on a register-based sample of households from a census in 1950 that also provided information on childhood circumstances. MI hospitalizations and mortality in 1988–2010 were studied in those who were up to 14 years of age at the time of the census and resident in Finland in 1987 (n = 94,501). Parental education, occupation, household crowding, home ownership, and family type were examined together with adulthood education and income. Hazard and odds ratios with 95% confidence intervals (CI) were calculated using Cox regression (incidence and long-term fatality) and logistic regression (short-term fatality) models. Lower parental education, occupational background and greater household crowding were associated with MI incidence. In models adjusted for adulthood variables, crowding increased the risk by 16% (95% CI 5–29%) in men and 25% (95% CI 3–50%) in women. Short-term survival was more favourable in sons of white-collar parents and daughters of owner-occupied households, but most aspects of childhood circumstances did not strongly influence long-term fatality risk. Socioeconomic attainment in adulthood accounted for a substantial part of the effects of childhood conditions, but the measured childhood factors explained little of the disparities by adulthood education and income. Moreover, income and education remained associated with MI incidence when adjusted for unobserved shared family factors in siblings. Though social and economic development in society seems to have mitigated the disease burden associated with poor childhood living conditions in Finland, low adult socioeconomic resources have remained a strong determinant of MI incidence and fatality.

1. Introduction

Social inequalities in coronary heart disease (CHD) mortality have been persistent (Harper et al., 2011). They may arise from socially patterned exposures to risk factors at any stage of the aetiological process from pre-clinical atherosclerosis to detected incidence and the subsequent survival. The inequalities however appear to have their roots in early-life conditions (Barker, 1991; Ben-Shlomo and Kuh, 2002; Brunner et al., 1999; Falkstedt and Hemmingsson, 2011; Galobardes et al., 2006; Loucks et al., 2012; Mishra et al., 2013; O'Rand and Hamil-Luker, 2005). Childhood socioeconomic circumstances are known to set the opportunities for later socioeconomic attainment, but may also remain independent predictors of later health (Nandi et al., 2012).

There is compelling evidence that the link between childhood disadvantage and later CHD incidence or mortality is partly independent of adulthood socioeconomic position (SEP) (Bowen, 2010; Falkstedt et al., 2011; Galobardes et al., 2006; Gliksman et al., 1995; Kaplan and Salonen, 1990; Nandi et al., 2012; Notkola et al., 1985; O'Rand and Hamil-Luker, 2005; Ramsay et al., 2007). The three main life course models proposed for understanding the early determinants of health are likely to operate simultaneously (Ben-Shlomo and Kuh, 2002; Galobardes et al., 2006; Pollitt et al., 2005). Firstly, early disadvantage increases the risk of a trajectory of social disadvantage, which ultimately leads to proximate risk

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factors for ill health in adulthood. From this perspective, adulthood socioeconomic attainment is a key social pathway from childhood origins to disease (Kuh et al., 2004; Pensola and Martikainen, 2004). Secondly, during sensitive phases in the life course, certain exposures may have long-lasting and potentially irreversible effects. Thirdly, deleterious health exposures are likely to have their most harmful effects when they accumulate across the life course. However, we still do not know whether disadvantaged childhood circumstances translate to greater mortality risk chiefly through an earlier onset of disease, as there is little understanding about whether they also influence survival following onset. Previous studies on childhood influences have tended to examine only incidence or mortality, whereas the fatality following disease onset has been largely uninvestigated (Rajaleid et al., 2009).

Several studies have found that early-life factors contribute to CHD and to the association between adulthood SEP and CHD, but the extent to which they explain it seems to vary (Falkstedt and Hemmingsson, 2011; Loucks et al., 2012; Madsen et al., 2014). One explanation may be the different measures used to assess childhood circumstances. Another reason may be contextual, as the broader socioeconomic environment in both childhood and adulthood may modify how strongly childhood circumstances affect health. The life course paths of the ageing cohorts in Finland present an interesting context common to many rapidly modernised societies, which have transitioned (or are in the process of transitioning) from agriculture to manufacturing and eventually to service sector work in a period of intense urbanization. Due to economic restructuring and educational expansion particularly during the latter half of the 20th century, Finnish birth cohorts born around the middle of the century experienced considerable upward social mobility (Karisto, 2007), which may potentially shield from the most harmful effects of childhood disadvantage.

In this study, we utilize nationally representative longitudinal register-data to examine how childhood socioeconomic factors and later socioeconomic attainment are associated with myocardial infarction (MI) incidence and fatality in Finnish adults who experienced their childhoods in 1940-50s when the country was still poor. A limitation of many previous studies of childhood effects on CHD is that they have been measured with retrospective recall, which may introduce considerable bias (Kauhanen et al., 2006). Register-based data are a valuable source of information for life course epidemiology, as they suffer substantially less from recall bias, and are more robust in terms of missing data and loss to follow up than survey-based methods. The data also enable a comparison of different dimensions of childhood disadvantage rather than examining only one, such as father's occupation, which has been most often used.

To address some of the important gaps in the previous literature, the primary aim of the study is to examine the long-term effects of several different aspects of childhood socioeconomic circumstances on MI incidence and fatality. It is hypothesized that experience of childhood disadvantage increases both the incidence of MI as well as the subsequent fatality. Moreover, we study whether adulthood education and income account for some of their effects. The secondary aim is to examine the extent to which the childhood factors explain the disparities in incidence and fatality by adulthood education and income; these analyses are complemented with sibling fixed effect models to adjust for time-invariant shared family factors in siblings.

2. Materials and methods

2.1. Data

The data are based on a 10% sample of households from the census in 1950. Statistics Finland has linked the data from the census with information from administrative registers up to the year 2010 by means of personal identification codes (permission to use data for research purposes TK53-789-10). In the sample, there were 109,567 persons aged up to 14 years who could be identified as belonging to a family at the time of the census as described in detail earlier (Elo et al., 2014). We selected those who were alive and still living in Finland at the end of 1987 (ages 37–51) (n = 96,385). Persons with hospitalizations for CHD (International Classification of Diseases (ICD) 8/9 diagnosis codes 410–414) in 1970-87 (1%) and persons who did not reside in private households in 1987 (1%) were excluded. The follow-up began on the 31st December 1987 and ended on the date of first MI, date of death, at beginning of the year when the person no longer resided in Finland (information available until 2007), or on the 31st December 2010, whichever occurred first. The first incidences of MI (ICD 8/9 410, ICD 10 I21-22) were identified from the hospital discharge register and the cause of death register (when there was no prior hospitalization for MI).

2.2. Variables

2.2.1. Childhood circumstances

Information on childhood circumstances derives from the 1950 census. Information on both mother and father was used to identify the highest level of parental education, which distinguished qualifications equivalent to 1) less than primary school or schooling unknown (2% unknown), 2) primary school, 3) past primary school. Father's occupation was used to identify parental SEP, except in mother-only households where mother's occupation was used. Parental SEP was divided into categories of 1) professional or administrative, 2) agricultural and manual workers, 3) farmers with less than 10 ha of land, 4) farmers with 10 ha of land or more, 5) employer or self-employed, or 6) other or unknown. Housing conditions were measured with an indicator of crowding in household, calculated by number of persons per heated room. Home ownership differentiated between owner-occupier and tenant families (and residual group of unknown). The variable on family structure was constructed using information on whether the child was living in a two-parent or single parent family (<1% unknown). Region of residence in 1950 was included as a potential confounder and categorized into the wealthier areas of 1) Western Finland, 2) Helsinki capital region, 3) rest of Southern Uusimaa region, and the poorer areas of 4) Eastern Finland and 5) Lapland. Birth cohort distinguished those who were born before (before 30.11.1939), during (30.11.1939–19.9.1944) or after (after 19.9.1944) World War II.

2.2.2. Adulthood education and income

Highest attained educational level was identified from the baseline in 1987 and coded into 1) tertiary (13 + years of education), 2) secondary (10–12 years), 3) basic or schooling unknown (9 years or less). Individual taxable income in 1987 included wages, capital income and taxable income transfers, and was divided into quintiles calculated separately for men and women.

2.3. Outcomes

Three outcomes were examined: first MI incidence (fatal and non-fatal), short-term fatality (all-cause mortality within 28 days of incidence) and long-term fatality after MI incidence (all-cause mortality in the individuals who experienced MI and survived 28 days after incidence). All-cause mortality was examined as the outcome for fatality as underlying coronary heart disease may also have contributed to deaths from other causes.