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Income-related inequalities in cardiovascular disease from mid-life to old age in a Northern Swedish cohort: A decomposition analysis

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ABSTRACT

While the social determinants of cardiovascular disease (CVD) are fairly well-known, the determinants of socioeconomic inequalities in CVD are scarcely studied and almost completely based on cross-sectional designs in which the changing circumstances across the life course are not taken into account. The present study seeks to incorporate a life course approach to the social determinants of socioeconomic inequalities in CVD. The specific aims were to 1) examine how income-related inequalities in CVD change over two decades of the mid-late life course, and 2) identify the key social determinants of the inequalities at each time period. The cohort (N = 44,039) comprised all individuals aged 40–60 years in 1990 who during 1990–2010 were enrolled in the county-wide preventive effort :"Västerbotten Intervention Program" (VIP). The cohort was followed over these two decades by Swedish population register data linked within the Umeå SIMSAM Lab micro data infrastructure. First-time hospitalization for CVD and mean earned income were used to calculate the concentration index (C) during four periods of 5–6 years. The C for each period was decomposed by sociodemographic factors, using Wagstaff-type decomposition analysis. Results suggest that inequalities in CVD increase gradually from mid-life to old age; from initially non-significant to particularly marked among the elderly. The decomposition showed that, from middle to old age, educational and employment inequalities underwent a transition from initially dominant to a moderate role in explaining the health inequalities, coupled with an increasing importance of age and a stable role of income. In conclusion, the study illustrates the need for incorporating a dynamic life course perspective into research, policy and practice concerned with equity in health.

1. Introduction

Sweden and Europe have seen an alarming development with entrenched or even increased socioeconomic inequalities in cardiovascular disease (CVD) and other forms of health during the last couple of decades (Mackenbach, 2006; Socialstyrelsen and Statens Folkhälsoinstitut, 2013). To meet this challenge, research has begun to explore the determinants of not only health but of health inequalities at the population level. However, the majority of this small body of research is based on cross-sectional designs in which the changing circumstances across the life course are not considered. The present study therefore seeks to contribute to the literature by prospectively examining how both socioeconomic inequalities in health, as well as their social determinants, develop over the course of 20 years in a Northern Swedish cohort followed from middle-aged to old age.

To tackle the challenge of increased health inequities while continuing to improve population health, a key first step is to understand the determinants of health inequities (Dahlgren and Whitehead, 2006). To this end, public health research has in recent years begun to utilize measures such as the concentration index, which quantify the degree of socioeconomic related inequality in a health variable (O'Donnell and Wagstaff, 2008), and decomposition analysis, a technique which allows separating, quantifying and comparing the independent contribution of

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different determinants to the population-level distribution of health (O'Donnell and Wagstaff, 2008). Although, to the authors knowledge, no study has decomposed socioeconomic inequalities in manifest CVD, a few studies (Alaba and Chola, 2014; Combes et al., 2011; Fateh et al., 2014; Goli et al., 2014; Hajizadeh et al., 2014; Hudson et al., 2014; Ljungvall and Gerdtham, 2010; Mcgill, 2014) have examined inequalities in CVD risk factors by this technique. However, they are with a few exceptions (Ljungvall and Gerdtham, 2010) based on cross-sectional analysis or comparison over the time of repeated cross-sectional measures.

In addition to the methodological limitations of cross-sectional designs, such approaches are unable to take into consideration that health inequalities can change not only with changing societal trends, but also along the life course. In a wider sense, by using cross-sectional designs health inequalities are construed as a static phenomenon, or merely a reflection of secular changes in society. As such, despite life course and aging approaches are well-established when within social epidemiological research on CVD (Pollitt et al., 2005), they have practically been absent in the study of health inequalities. Particularly in the context of an aging population, understanding health inequalities from a life course perspective is essential information for the development of life course sensitive interventions against the increasing health inequalities (Islam et al., 2010).

1.1. The present study in a life course, secular and geographical intersection

The point of departure of the present study is that socioeconomic inequality in health is a dynamic phenomenon, which is situated and develops in a particular temporal-geographical setting. The study was conducted in a certain intersection comprising the complexities of the individual life course from middle-age to old age, the historical and secular context of Sweden through the 1990s and 2000s, and the specific geographical setting of the county of Västerbotten. All of these dimensions may be important to understand how health inequalities and their determinants develop over time, in general and in the present study.

First, with regard to the life course period under study, middle-age to old age is a period in life in which manifest CVD start to be wide-spread, and as such is a period in which following a population may be particularly relevant to understand developments of socioeconomic inequalities in CVD (WHO Commission on Social Determinants of Health (2010)). Moreover, during this period in life people retire (in Sweden typically around age 65 years), and as such this period reflects marked changes in the financial and occupational situation (Islam et al., 2010).

Second, the secular trends in Sweden during the study period can be exemplified by increased income inequalities since the early-mid 1990s (OECD, 2011), and the country was also hit by the global economic crisis in the late 2000s. During the same period welfare systems have undergone changes, involving e.g. cut-backs in social assistance and employment benefits, and an increased focus on private health care providers (Raphael, 2014). These developments remodel the context for population health in Sweden and can therefore be expected to influence population patterns of health and health inequalities.

Third, the county of Västerbotten comprises both the more populous and economically active coastal areas with cities such as Umeå and Skellefteå, as well as the large and sparsely populated inland areas. The county has also been target for the implementation of the population-wide Västerbotten Intervention Program (VIP) since 1990 (Norberg et al., 2010b). The VIP was developed in the mid-1980s, in response to high myocardial infarction mortality rates in the county. The VIP model includes population-based and individual prevention strategies, directed at those 40, 50 and 60 years old. The presence of a population-wide intervention against CVD may shape the prerequisites for population patterns of health, and ideally may counteract the secular development toward greater health inequalities (Norberg et al., 2010b).

With this specific setting as the empirical point of departure, the present study seeks to contribute to the literature by examining the social determinants of socioeconomic inequalities in CVD by following a middle-aged Swedish cohort, aged 40–60 years at baseline, across two decades. The specific aims are to 1) examine how income-related inequalities in CVD change over two decades (four periods) of the mid-late life course, and 2) identify the key social determinants of the inequalities at each time period.

2. Methods

2.1. Population and data

The cohort (N = 44,039) comprised all individuals aged 40–60 years in 1990 who during 1990–2010 were enrolled in the county-wide preventive effort "Västerbotten Intervention Program" (VIP). Since 1990, all individuals aged 30 (only until 1995), 40, 50, and 60 years who live in the county are invited to participate in a health examination at their local health care centers. The response rate to this invitation has increased from 59% in 1995 to 69% in 2010 (Norberg et al., 2010b) and number of participants per year vary between n = 3000 and n = 7000 (Norberg et al., 2012).

The cohort was followed from 1990 to 2010 by Swedish population register data linked within the Umeå SIMSAM Lab micro data infrastructure. Demographic and socioeconomic data of the individuals originated from registers of Statistics Sweden (e.g. Income and Taxation Register, Integrated Database for Labor Market Research, and Register of the Total Population) while information about CVD was obtained from the National Patient Register of the National Board of Health and Welfare.

To operationalize the outcome (income-related inequalities in CVD), the entire study period 1990–2010 was divided into four periods: period 1 (1990–1994), period 2 (1995–1999), period 3 (2000–2004), and period 4 (2005–2010). These time periods were selected to give an overall picture over the two decades of follow-up over the aging process: ages 40–60 years at starting point to 44–64 years (period 1), ages 45–65 to 49–69 years (period 2), age 50–70 to 54–74 years (period 3) and ages 55–75 to 60–80 years at ending point (period 4). The time periods correspond to a successively increasing proportion of individual and population-oriented activities from the Västerbotten Intervention Program and matches the secular changes of increased socioeconomic inequalities in Sweden, here measured as income inequality: stable-low (period 1), increasing-moderate (Period 2), stable-moderate (Period 3), and increasing-high (Period 4) (OECD, 2011).

2.2. Variables

2.2.1. Health outcome

The outcome of interest was CVD events between the years 1990 and 2010. CVD events were defined as first time hospitalization with main diagnosis of circulatory disease (ICD-10 codes I00–I99, and ICD-9 codes 390–459). Registers from 1987 to 1989 were used to exclude patients with a prior hospitalization for CVD. Those who were hospitalized for first time with a main diagnosis of CVD were categorized as having an incident event (1) while those who were never hospitalized or hospitalized by other conditions were categorized as not having a CVD incident event (0). Cause-of death register was not available in the Umeå SIMSAM Lab database, therefore deaths due to first event of CVD in non-hospitalized