Editorial commentary: What drives trends in inequalities of cardiovascular disease?

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Cardiovascular diseases (CVD) vary in almost any dimension whether it be time, place, person and not least socioeconomic position. High-income countries have experienced a long-lasting declining trend in CVD mortality over several decades, one of the most remarkable events in population health for decades. Now, there are signs in the US that this rate of decline in CVD mortality has decelerated [1]. This is happening in several age groups and is thus not likely to be an artifact of increasing median age of CVD and shifting underlying cause of death. It is still a bit early to conclude if this signals a lasting change in the US or elsewhere, but together with reports of increasing inequalities in mortality [2], one might wonder if a worsening of the socioeconomic environment is responsible for this flattening trend in CVD as suggested by Havranek. in this issue of the Journal [3]. But since CVD mortality tends to vary so much among multiple dimensions, are we likely to come up with one single explanation for these trends?

To answer this, we need to understand both determinants of declines of rates in CVD in general in the population and trends in the patterning of CVD risk between social groups. Since the 1970 s the trends in CVD in high-income countries have most likely been driven by declines in important behavioral risk factors (such as smoking, physical inactivity, unhealthy diet and excessive alcohol use), physiological risk factors (such as blood pressure and cholesterol both of which are partly determined by healthy behavior) and pharmacological treatments for hypertension and dyslipidemia [4]. In addition, improved medical care has contributed to this decline (estimates from 30–50%) with shortening of time taken to reach hospital, advances in hospital treatment, rehabilitation and post-acute secondary prevention. The evidence for their causal role among individuals is firm and it is likely that their effects also translate to population level trends.

However, a clear understanding of their specific role at population level in high-income countries is complicated by the fact that most of the determinants of CVD incidence and survival have changed during the same period when the CVD mortality decline took place. Prevalence of risk factors has changed dramatically with trends correlating and not correlating in the same direction. CVD morbidity and mortality has become more common among the elderly and there is an increasing proportion of women developing disease. The clinical definition and treatment of myocardial infarction has changed. This includes more sensitive biomarkers to detect minor events that previously would not have been recognized with symptoms or by electrocardiogram. And, there has been increased uptake of effective new treatment both at hospital and primary care level that may have contributed. The number of correlated changes that have taken place and the lack of high-quality data mean that a detailed understanding of what drives the decline and the relative impact of treatment and prevention will have to be speculative.

A key question when trying to relate general trend rates in CVD to changes in the social environment is to what extent social inequalities in incident cases of CVD are mediated by established cardiovascular risk factors or if there are additional factors to look for [5]. For a long time these risk factors only seemed to explain a modest share of the observed inequalities, around 50%. This further suggested that other factors, such as psychosocial stress or novel biomarkers might be involved and explain the remaining part. This was for a long time considered a paradox since the INTERHEART and other studies showed that exposure to several potentially modifiable risk factors accounts for at least 90% of the population attributable risk (PAR) for first myocardial infarction.

However, recent studies have shown that the established risk factors explain more when multiple measurements of these over time is used rather than only once at baseline, which has been the traditional way in epidemiological studies [6]. This regression dilution bias is analogous to the well-known measurement error of blood pressure at the doctor's office, only that it acknowledges that the causal effect of risk factors is best reflected by their life-long influence. Researchers taking a life course approach have documented how socioeconomic disadvantage adds up over time through a person's life in a cumulative manner where social determinants and intermediate risk factors work in tandem longitudinally. CVD has been a model disease for this approach.

Additionally, the risk factors seem to explain more or even most (80–90%) of the inequalities when absolute rather than relative measures of inequalities are used [7]. The difference between relative and absolute measures may arise in populations where inequalities in conventional risk factors between social groups are low, relative to the high levels of conventional risk factors within every social group [8]. This has implications for our understanding of trends in inequalities in CVD. When documenting trends, most often absolute measures are used. Additionally, if

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conventional risk factors account for most excess cases between social groups, these are also most likely involved in trends of CVD events between social groups. This does not imply other factors including psychosocial are unimportant as they are often related to both social factors and risk factors, only that they are not likely to have a role independent of these risk factors in explaining the excess risk between social groups in the population when we study trends.

Where does this lead us? We have to closely monitor not only the rates but also the social distribution in rates and the key factors that contribute to incidence and survival [9]. Clinicians and public health professionals have a further need to make their voices heard and require better data on the key determinants if these data are lacking. While interpreting trends we should also keep in mind the complex nature of trends. The life course origin of CVD challenges us in making quick conclusions about observed changes in trends, as we need to bear in mind that these may be the consequence of both recent and distant changes that took place several decades ago. Another complicating feature is that the social patterning itself is context specific. The changes in rate of CVD and changes in the social determinants are not uniform across time and place. Social factors that are related to increased risk in one place or time period may be related to decreased risk in another [5].

Finally, there is a question if general preventive measures lead to increased inequalities or not [10]. Because socially deprived people experience more of the CVD burden, preventive measures that reach everyone will in principle both lead to decreased mortality rates and decreased inequalities – if the uptake of these measures is equitable. A typical example is banning trans-fat in industrial food, an invisible intervention to most people. However, risk of CVD is grounded on health behavior and social context. For this reason, health policy makers need to pay attention to whether success of prevention relies too much on psychological and financial resources among individuals. The importance of monitoring the social distribution of key determinants is not a trivial issue. For example, Sweden and Norway have much in common, as they have both developed a very similar welfare-state model. But in Euro-pean comparative studies the educational inequalities in smoking related causes of death has for a long time been larger in Norway compared to Sweden, probably due to a longer tradition of chewing tobacco in Sweden and increasing inequalities in tobacco smoking in Norway [11]. These studies have also shown that inequalities can still exist even with progressive social policies. This suggests that explanations of inequalities and actions against these will not be found in one dimension alone, but rather across several sectors ranging from economic and social policies to diet, life style and most parts of health care.

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