The relative contributions of hostility and depressive symptoms to the income gradient in hospital-based incidence of ischaemic heart disease: 12-Year follow-up findings from the GLOBE study[☆]

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ABSTRACT

There is evidence to support the view that both hostility and depressive symptoms are psychological risk factors for ischaemic heart disease (IHD), additional to the effects of lifestyle and biomedical risk factors. Both are also more common in lower socioeconomic groups. Studies to find out how socioeconomic status (SES) gets under the skin have not yet determined the relative contributions of hostility and depression to the income gradient in IHD. This has been examined in a Dutch prospective population-based cohort study (GLOBE study), with participants aged 15–74 years ($n = 2374$). Self-reported data at baseline (1991) and in 1997 provided detailed information on income and on psychological, lifestyle and biomedical factors, which were linked to hospital admissions due to incident IHD over a period of 12 years since baseline. Cox proportional hazard models were used to study the contributions of hostility and depressive symptoms to the association between income and time to incident IHD. The relative risk of incident IHD was highest in the lowest income group, with a hazard ratio of 2.71. Men on the lowest incomes reported more adverse lifestyles and biomedical factors, which contributed to their higher risk of incident IHD. An unhealthy psychological profile, particularly hostility, contributed to the income differences in incident IHD among women. The low number of IHD incidents in the women however, warrants additional research in larger samples.

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Introduction

Ischaemic heart disease (IHD) is the number one cause of death worldwide (Murray & Lopez, 1997; WHO, 2003). There is a strong socioeconomic gradient in IHD morbidity and mortality in the Western European countries disfavouring the lower socioeconomic groups (Dalstra et al., 2005; Huisman et al., 2005; Mackenbach et al., 2003). There may be gender differences in this gradient, although these differences seem to depend on the outcome as the gradient for cardiac morbidity seems to be steeper in women (Loucks, Rehkopf, Thurston, & Kawachi, 2007; Thurston & Kubzansky, 2007), and that for cardiac mortality has been found to be steeper in men (Mackenbach et al., 2003).

In order to allow interventions aimed at reducing heart disease inequalities to be tailored, research has focused on explaining this gradient for several decades. Evidence points in the direction of classical risk factors for heart disease, such as lifestyle factors (smoking, alcohol consumption and physical inactivity) and biomedical factors (obesity, hypertension and diabetes), mediating the socioeconomic gradient in heart disease. However substantial the contribution of these classical risk factors may be (reported contributions vary from 16% to as much as 60%) (Ferrie, Martikainen, Shipley, & Marmot, 2005; Lynch, Kaplan, Cohen, Tuomilehto, & Salonen, 1996; Van Lenthe, Gevers, Joung, Bosma, & Mackenbach, 2002), a moderate part of the gradient remains unexplained. Psychological risk factors, which have been the subject of numerous studies in the last decade, might shed further light upon the pathways by which socioeconomic status gets under the skin.

Specifically, hostility and depressive symptoms have emerged as potential contributing factors to the socioeconomic gradient in IHD. Both are considered important psychological risk factors for incident heart disease, although the evidence is stronger for depressive symptoms and depression than for hostility (Kuper, Marmot, & Hemingway, 2002; Miller, Smith, Turner, Guijarro, & Hallet, 1996; Penninx et al., 1998; Rugulies, 2002). Also, both depressive symptoms and hostility are more prevalent in lower than in higher socioeconomic groups (Carroll, Davey Smith, Sheffield, Shipley, & Marmot, 1997; Lorant et al., 2003; Scherwitz, Perkins, Chesney, & Hughes, 1991; Stansfeld, Head, Fuhrer, Wardle, & Cattell, 2003), perhaps due to a long-term exposure to adverse circumstances.

Few studies have investigated the influence of depressive symptoms on the socioeconomic gradient in heart disease and results have so far been inconclusive. Whereas Lynch and colleagues (Lynch et al., 1996) found that psychological and social risk factors, including depression, attenuated the association between income and cardiovascular mortality in a population of middle-aged Finnish men, Thurston and colleagues (Thurston, Kubzansky, Kawachi, & Berkman, 2006) concluded that depression did not appear to mediate the relation between educational attainment and incident CHD. The contribution of hostility in a general population has, to our knowledge, only been examined longitudinally by Schrijvers and colleagues (Schrijvers, Bosma, & Mackenbach, 2002), who found that a substantial part of the educational gradient in general perceived health could be ascribed to the intermediary effects of hostility in both men and women.

Although hostility and depressive symptoms differ conceptually, in the sense that hostility is an outward-focused negative emotion, directed at others and therefore reactive by nature, whereas depressive symptoms are more inward-focused, directed at oneself (De Vogli, Brunner, & Marmot, 2007; Suarez, Kuhn, Schanberg, Williams, & Zimmermann, 1998), pathways by which they affect IHD might be similar. Both are responses to stressful circumstances, which are more common in lower SES groups, and both evoke a sustained physiological reactivity characterised by activation of the sympathetic nervous system and hypersecretion of the stress hormone cortisol (Rozanski, Blumenthal, & Kaplan, 1999). This, in turn, may have direct long-term adverse effects on the immune and cardiovascular systems (Adler & Ostrove, 1999; Kristenson, Eriksen, Sluiter, Starke, & Ursin, 2004). Depressive symptoms and hostility might also affect cardiovascular health indirectly through lifestyle as depressed and hostile individuals tend to engage in less healthy behaviours, such as smoking and heavy drinking (Laitinen, Ek, & Sovio, 2002).

Using 12-year longitudinal data from the Dutch GLOBE study, we examined the relative contributions of hostility and depressive symptoms to the income gradient in IHD (in addition to the contribution of the classical risk factors) and the possible gender differences therein. Given the above-mentioned associations, we hypothesised that individuals with lower incomes would be at higher risk of IHD, because they are more likely to suffer from depressive symptoms or to have hostile cognitions than their higher income counterparts. The aim of the study was to explore the complex pathways underlying socioeconomic inequalities in incident IHD and thereby to identify opportunities for prevention and intervention aimed at reducing these inequalities.

Methods

Design

Longitudinal data were gathered between 1991 and 2003 as part of the prospective cohort study called GLOBE, a Dutch acronym for 'Health and Living conditions of the Population of Eindhoven and Surroundings'. The GLOBE study aims to explain socioeconomic inequalities in health. The design and rationale of the study have been published elsewhere (Mackenbach, van de Mheen, & Stronks, 1994). Briefly, a postal survey was conducted in 1991 among 27,070 non-institutionalised individuals aged 15–74 years, with a Dutch nationality. With a response rate of 70.1%, 18,973 respondents completed this baseline questionnaire. There were no significant differences in non-response by socioeconomic position, age, sex, marital status or degree of urbanisation (Mackenbach et al., 1994). Two sub-samples were drawn to gather more detailed risk factor information by means of questionnaires and interviews between 1991 and 1997. One sub-sample was randomly drawn and consisted of 2802 respondents (response rate 79.4%) whereas in the other sub-sample, individuals with chronic diseases were oversampled ($n = 2867$, response rate 72.3%). Because the non-random sampling in the latter sample compromises its representativeness of the source population and possibly the estimation of effect sizes, weight factors were calculated for all respondents to re-establish the representativeness of the sample (Mackenbach, Simon, Looman, & Joung, 2002).

The interview and questionnaire data were linked to data from the municipal register on mortality and addresses (or changes of address), and with hospital admission data from five hospitals in the catchment area of the GLOBE study between 1991 and 2003. The catchment area of the hospitals was defined as the area around the city of Eindhoven, encompassing the villages where at least 90% of the population would be admitted to one of the five hospitals, when requiring hospital admission. Linkage was based on date of birth, gender and postal code. If identical combinations of these key variables were found, patient numbers, hospital codes and information on health insurance were checked to determine whether the admission was a re-admission or whether different individuals had been admitted. When re-admissions where found, only the first admissions were selected (Van Lenthe et al., 2002). Data on hospital admission were complete for all but 19 respondents.

Participants

The present study is based on the questionnaire and interview data from the two sub-samples. A total of 4109 (72.5%) respondents completed the 1991 baseline and 1997 follow-up measurements, which included detailed risk factor information. We excluded (a) individuals who were included in the sample because of known heart disease (chronic diseases were oversampled in one of the sub-samples) and those who reported heart disease at baseline or in the 5 years prior to baseline ($n = 962$), (b) respondents whose hospital admission data or municipal register data were missing ($n = 19$), (c) respondents with missing data for the risk factors under study ($n = 345$) and (d) respondents with missing income data ($n = 409$). The final sample comprised 2374 individuals.

Measures

Hospital-based incident ischaemic heart disease (referred to below as incident IHD) was determined according to ICD-9 classification codes 410–414. An incident IHD event was defined as a first hospital admission diagnosis of IHD after baseline. Fatal events were considered cases if death occurred after admission. Pre-hospital IHD deaths were not considered cases, since data on cause-specific mortality were not available. Incident IHD was measured continuously from baseline until 22 December 2003.

All other measures were assessed at baseline in 1991, except for hostility, which was measured in 1997 only.

Income and education were used to determine *SES*. Net household income was adjusted for the number of adults and children who were part of the household (Hagenaars, Vos, & Zaidi, 1994) and classified into thirds (based on tertiles). Three levels of education were distinguished: higher secondary education, higher