Income change at retirement, neighbourhood-based social support, and ischaemic heart disease: Results from the prospective cohort study "Men born in 1914"

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Abstract

Retirement from active life often leads to decreased finances and reduced social contact, which may increase ischaemic heart disease (IHD) risk in individuals. We examined whether income evolution during the decade before retirement has an impact on subsequent IHD, and explored the mediating effect of common risk factors and social support from different sources (marriage/cohabitation, support from friends/relatives, and neighbourhood-based social support). We analyzed data from the prospective cohort study “Men born in 1914” (n = 498, follow-up period = 10 years) conducted in Malmö, Sweden, merged with yearly income data for 14 years preceding baseline.

Low income 10 years before retirement predicted both higher prevalence of IHD risk factors at retirement, and weaker neighbourhood-based social support. Income 10 years before retirement was a strong predictor of IHD incidence and mortality after retirement, but a significant downward income mobility at retirement did not increase IHD risk. After adjustment, low neighbourhood-based social support increased the risk of IHD incidence (HR = 1.87; 95% CI: 1.02–3.43) and mortality (HR = 2.50; 95% CI: 1.06–5.91), and mediated 7–8% of the income effect.

As a conclusion, income 10 years before retirement, but not the subsequent income evolution, was a strong predictor of IHD postretirement. This socioeconomic gradient was partly mediated by the protective effect of neighbourhood-based social support, which form of social support may be important among the elderly in compensating for social disruptions related to retirement.

Introduction

In developed countries, because of the global aging of populations, ischaemic heart disease (IHD) will be by far the major cause of death in 2020 (Murray & Lopez, 1997). The strong socioeconomic gradient in IHD (Kaplan & Keil, 1993) has urged researchers to investigate social mechanisms associated with the onset and course of the disease. Due to the changes introduced into individuals' lives at retirement, social processes deserve particular attention among the elderly (Blazer, 1982; Krumholz, Butler, Miller, Vaccarino, Williams, Mendes de Leon et al., 1998). Retirement may worsen the financial situation of individuals, and lead to a decrease in their social support resources (Bosse, Aldwin, Levenson, Workman-Daniels, & Ekerdt, 1990; Moen, 1996). These specific changes associated with retirement may affect IHD incidence and mortality.

Various studies have investigated the effects of individual socioeconomic trajectories over time on cardiovascular diseases (Davey Smith, Ben-Shlomo, & Lynch, 2002; Lamont, Parker, White, Unwin, Bennett, Cohen et al., 2000). However, to our knowledge only few studies have focused on the socioeconomic transition from active life to retirement (Wolfson, Rowe, Gentleman, & Tomiak, 1993). Using the Swedish prospective cohort study titled, "Men born in 1914" (Hanson, Isacsson, Janzon, & Lindell, 1989; Isacsson, 1972), we investigated whether income 10 years before retirement (which is by law at age 65 in Sweden) and subsequent income evolution until retirement were associated with (i) behavioural, clinical, biomedical, and social support risk factors of IHD measured at retirement, and (ii) subsequent IHD incidence and mortality over 10 years. Furthermore, we assessed the extent to which socioeconomic disparities in IHD were explained by the different risk factors (Marmot, Bosma, Hemingway, Brunner, & Stansfeld, 1997). Based on the literature, we considered social support from different sources to be a possible mediator of the income effect (Marmot, Fuhrer, Ettner, Marks, Bumpass, & Ryff, 1998). Beyond the well-known effects of marital status and support from friends/relatives (Berkman, Leo-Summers, & Horwitz, 1992; Krumholz, Butler, Miller et al., 1998; Orth-Gomer, Rosengren, & Wilhelmsen, 1993; Rosengren, Wilhelmsen, & Orth-Gomer, 2004; Rozanski, Blumenthal, Davidson, Saab, & Kubzansky, 2005; Rozanski, Blumenthal, & Kaplan, 1999), we expanded upon previous literature by examining whether the availability of neighbourhood-based social support at retirement had an additional protective effect. We hypothesized that neighbourhood-based social support, which may be important among the elderly in compensating for social disruptions related to retirement, may partly mediate the socioeconomic gradient in IHD after retirement.

Methods

Study population

"Men born in 1914" is a population based prospective cohort study conducted in Malmö, Sweden (Hanson, Isacsson, Janzon et al., 1989; Isacsson, 1972; Isacsson, Hanson, Janzon, Lindell, & Steen, 1987). All men born in 1914 and residing in the city of Malmö, i.e., 621 men, were invited to a baseline cross-sectional study in 1982–1983 at 68–69 years of age. Eighty-one percent of the men (500 out of 621) participated in this examination. The present study considers data from 498 of them who could be linked to the Population Register. A detailed study of the characteristics of non-participants has previously been published (Janzon, Hanson, Isacsson, Lindell, & Steen, 1986). A lower participation rate was observed among single men, especially if they were blue-collar workers. Men who did not feel well and/or had been admitted to the hospital during the last 12 months also had a lower participation rate.

The 1982–1983 survey comprised a structured home interview with questions on medical history and drug treatment, an evaluation of cardiovascular status made at the Laboratory of Clinical Physiology at Malmö University Hospital, and an assessment of social networks, smoking habit, alcohol intake, and physical activity (Hanson, Isacsson, Janzon et al., 1989).

The 1982–1983 survey data were merged with (i) yearly data on individual income from 1968 to 1982, obtained from the Population Register; (ii) mortality data collected from the National Register of Causes of Death; and (iii) data on cardiac events obtained from the Malmö Heart Infarction Register for the period 1982–1992 (Hedblad & Janzon, 1992) (see Figure 1). The study was approved by the Committee of Research Ethics at Lund University.

Measures

Incidence and mortality follow up

The men were followed from the baseline examination in 1982–1983 until a first cardiac event, until death, or until the end of an exact 10 year period if death had not occurred before. First, we considered the occurrence of ischaemic cardiac events, corresponding to diagnoses of fatal or non fatal acute myocardial infarction (code 410 of the International Classification of Diseases, 8th and 9th revision (ICD 8 and ICD 9)), or to death due to chronic IHD (ICD 8 and ICD 9 code 412). Second, in a separate analysis, we considered death from IHD, defined as ICD 8 and ICD 9 codes 410–414, for the underlying or contributing causes of death. Events were validated against medical records or necropsy reports (Hedblad & Janzon, 1992; Merlo, Ranstam, Liedholm, Hedblad, Lindberg, Lindblad et al., 1996).

Biomedical and clinical risk factors for ischaemic cardiac events

At the 1982–1983 examination, casual systolic and diastolic blood pressure (phase V) had been recorded to the nearest 5 mmHg. Measurements had been made on the right arm, after 15 minutes of supine rest, with a mercury manometer and a rubber cuff. Hypertension was coded in three categories: (i) no hypertension; (ii) hypertension: systolic blood pressure between 140 and 180 mmHg and/or diastolic blood pressure between 90 and 105 mmHg; (iii) severe hypertension: systolic blood pressure ≥ 180 mmHg and/or diastolic blood pressure ≥ 105 mmHg (Chobanian, Bakris, Black, Cushman, Green, Izzo et al., 2003; WHO/ISH, 1986). Men who had systolic and diastolic blood pressures under these cutoffs but were using antihypertensive medication were classified into the non-severe hypertension category.

For each leg, an ankle-brachial pressure index was calculated by dividing the ankle pressure by the highest upper arm pressure value. As described previously (Ogren, Hedblad, Jungquist, Isacsson, Lindell, & Janzon, 1993), peripheral arterial disease was defined as an ankle-brachial pressure index <0.90 in one or both legs.

Hyperlipidaemia was defined as serum cholesterol ≥6.5mmol/L, or serum triglyceride ≥2.3 mmol/L. Diabetes mellitus was defined as being treated for this disease, or as fasting blood glucose ≥7.0 mmol/L (1997). Creatinine concentration (Ritz, Dikow, & Ruilope, 2002) was rated as high if it was equal to or higher than the 95th percentile of the distribution among participants.

Episodes of ST segment depression had been assessed by 24 hour electrocardiographic ambulatory registration (Hedblad & Janzon, 1992). Symptoms of angina pectoris and intermittent claudication had been assessed with Rose's questionnaires (Rose & Blackburn, 1968).

Behavioural risk factors

The men were categorized as current smokers, ex-smokers (men who had ceased smoking at least 1 month previously), and never smokers. Smoking data had been validated by comparing them with blood concentrations of carbon monoxide (Hanson, Isacsson, Janzon, & Lindell, 1990). High alcohol consumption was defined as an intake of >250 g of alcohol per week (Isacsson, Hanson, Janzon et al., 1987). Based on a survey question, physical activity corresponded to activities such as walking or light gardening for a minimum of 4 hours a week, or running or swimming for at least 2–3 hours a week over the year. Participants with a body mass index ≥25 kg/m^2 were considered overweight.

Social support resources

Considering different sources of social support, we distinguished between marital status, support received from friends/relatives, and neighbourhood-based social support. By the latter support is meant the connections individuals had with their neighbours and whether they could receive some assistance from them, in case of sickness for example.

For marital status, we distinguished between married/cohabiting men and men who lived alone. To define the two other social support variables, we considered items in the survey questionnaire (see Table 1 for details). All those items consisted in a question with 5 possible response categories. For each item, we first determined a 3-category variable. As a rule, each time one of the 3 categories comprised less than 20% of the sample, the variable was recombined in a 2-category variable. For each social support index, as shown in Table 1, the variables were summed to construct the index. The internal consistency of the indexes was assessed with Cronbach's coefficient α (Cronbach, 1951), and proved to be acceptable, considering the low number of items combined in each index (α was 0.64 for support from friends/relatives, and 0.71 for neighbourhood-based social support).

Each index was divided into three classes, with cutoffs as close as possible to the tertiles of the distributions (the low, medium, and high classes comprised 46%, 22%, and 27% of individuals for support from friends/relatives, and 25%, 48%, and 24% for neighbourhood-based social support). To verify that our two composite indexes represent independent constructs, we computed the correlation between them. Expressing support from friends/relatives and neighbourhood-based social support as 3-category variables, a positive correlation was found between them (0.21, $p < 0.001$). Such a correlation was lower than that between educational attainment and income (with both variables coded in three categories), which was equal to 0.25 ($p < 0.001$). We, therefore, concluded that the two composite indicators of social support refer to different, but connected, constructs, and that the correlation between them was not too high to disentangle their effects.

Income

During exploratory analyses, education and occupation were not found to be associated with IHD, after adjustment for income; accordingly, those variables were not included into the models. To obtain comparable income values across years, for each calendar year from 1968 to 1980 (corresponding to ages 54–66), we computed the rank each male had among all males aged ≥25 years in the region of Scania (of which Malmö is the main city), i.e. among 310,000 males in 1968 and 340,000 in 1980. We expressed this rank as a percentile. To obtain more reliable measurements, we computed the mean income rank of each man for brackets of 3 successive years, at ages 54–56 years (i.e., 10 years before retirement), 59–61 years, and 64–66 years. We used the tertiles of the distributions to divide each mean income rank into three classes. These variables allowed us to examine the effect of income at different time points.

Descriptive information on the change in income rank between ages 54–56 years and ages 64–66 years was obtained by computing the *crude income rank difference*, i.e., income rank at 64–66 minus income rank at 54–56. However, to avoid problems during modelling due to the positive correlation between income rank at 54–56 and the crude income rank difference, we followed an approach described in previous literature (Merlo, Lynch, Gerdtham, & Rastam, 2003) to determine a *model-based income rank evolution variable.* We estimated a regression model with income rank at ages 64–66 years as the outcome and income rank at ages 54–56 as the only independent variable. The residuals of the model were used to define our model-based income rank evolution variable, which indicated whether a man had had a favourable or unfavourable income rank evolution as compared to that of the men with a similar income rank than him at ages 54–56 years. Two men with a very different income at ages 54–56 years could have had a similar subsequent income rank evolution, i.e., favourable or unfavourable. Individuals were categorized into three groups using the tertiles in the distribution of these residuals.

Statistical analysis

We used logistic regression models to investigate income effects on IHD risk factors. Cox proportional hazards models were used to estimate hazard ratios (HRs) and 95% confidence intervals (CIs) for 10-year IHD incidence and mortality. In step 1, we estimated Cox models including only income (income rank at the different ages was entered in separate models since the 3 income rank variables were highly correlated with each other – correlation between 0.80 and 0.86). We used the Akaike Information Criterion (AIC) to compare the fit of the models with the different income variables. Out of two models, the one whose AIC value is lower has a better fit (Burnham & Anderson, 1998). In step 2, we tested the impact of the model-based income rank evolution variable on IHD, after adjustment for income rank at ages 54–56. In step 3, we progressively introduced the different risk factors into the models. Forcing all behavioural, clinical, and biomedical risk factors into the models, we estimated the impact of social support variables. We retained only those social support indicators that were associated with the outcomes.

Finally, two additional analyses were performed. First, we reestimated the models after excluding individuals with IHD at baseline (identified either with a ST-segment depression at the electrocardiogram or with a positive angina pectoris questionnaire). Second, using the whole sample (498 men), we performed a backward selection, in order to retain only the statistically significant variables in the regression models (however, such results need to be cautiously interpreted, since in this approach the amount of measurement error for each factor may play a role in the selection of the variables to include in the final models).

Results

In our sample, 101 out of 498 individuals had had an ischaemic cardiac event during the 10-year follow-up period, and 66 had died from IHD (in the 101 incident events, the event considered corresponds to an IHD death for an individual for whom the first event is a fatal one, and otherwise to the first non-fatal coronary event). The median income rank of individuals at ages 54–56 years (among all men aged ≥25 years in Scania) was 70 on a scale ranging from 0 to 100, indicating a quite high income rank in our sample of urban residents who were well advanced in their working life. This median income rank dropped from 70 to 65 at ages 59–61, and to 55 at ages 64–66, indicating a substantial decrease in income rank at retirement.

Table 2 reports descriptive statistics separately for low-income and high-income men (as defined with income at ages 54–56 years divided in two categories comprising each 50% of the sample). Low-income men had a higher prevalence of angina pectoris, intermittent claudication, and diabetes mellitus, and were more frequently physically inactive. They were more likely to be non-married, and to report a low support from their neighbours.

In step 1, Cox models indicated that both IHD incidence and mortality increased as income decreased, though with a larger effect on mortality than on incidence (Table 3). Slightly stronger point estimates for the income-IHD association were found when using income 10 years before retirement than when using subsequent income measures; however, the difference was much too small and the 95% CIs much too wide to conclude that income 10 years before retirement had a stronger effect. Similarly, even if the AIC tended to favour the model with income 10 years before retirement, the difference in AIC between the models was much too small to be conclusive.

In step 2, we considered the evolution in income rank of the men over the 10-year period. First considering the crude difference between income rank at ages 64–66 years and income rank at ages 54–56, 77% of the men had a negative income rank evolution over the period (negative crude income rank difference). Fifty-nine percent of the men lost 5 ranks or more over the period (with income rank comprised between 1 and 100).

We then considered our model-based income rank evolution variable divided into three categories. Table 4 reports the crude difference in income rank corresponding to each tertile of income rank evolution. In the group with the most unfavourable income rank evolution, the median difference in income rank over the period was –25, corresponding to a decrease of 25 ranks between ages 54–56 and ages 64–66 years. Table 4 indicates that in the group with the most favourable evolution, the men just maintained their income rank over the period (median difference in income rank equal to 0). In our Cox models, after adjustment for income rank at ages 54–56 years, subsequent income rank evolution until ages 64–66 (as assessed with the model-based income rank evolution variable) was not associated with IHD incidence and mortality (HR = 0.99; 95% CI: 0.60–1.62, and HR = 1.04; 95% CI: 0.56–1.95, for incidence and mortality, respectively, for an unfavourable vs. a favourable income evolution). Therefore, in the following analyses of our men born in 1914, we only considered their income at ages 54–56 years.

Investigating mediators of the income–IHD association, we first examined whether income 10 years before retirement was associated with IHD risk factors at retirement. Separate logistic regression models indicated that men with low income rank at ages 54–56 years had a higher risk of angina pectoris, ST segment depression, peripheral arterial disease as assessed by the ankle-brachial index, intermittent claudication, and diabetes mellitus at age 68 (Table 5). Low income men showed reduced prevalence of hyperlipidaemia, but a higher risk of low physical activity. They were more likely to be non married and had reported lower neighbourhood-based social support, but not lower levels of support from friends/relatives, compared with high income men.

In step 3, we included risk factors into the models for incidence and mortality, and found that severe hypertension, a low ankle-brachial index, angina pectoris, claudication, diabetes mellitus, and smoking increased IHD incidence and/or mortality (Table 6). After full adjustment, marital status was associated neither with incidence (HR = 1.23; 95% CI: 0.75–2.03) nor with mortality (HR = 1.45; 95% CI: 0.79–2.66). Low neighbourhood-based social support, but not low support from friends/relatives (HR = 1.28; 95% CI: 0.75–2.19), was associated with increased IHD incidence (Table 6). After adjustment, both a low support from friends/relatives and a low neighbourhood-based social support significantly increased IHD mortality.

Including all risk factors into the models led to a 38% and 39% decrease in income effect on incidence and mortality, respectively (Figure 2). Including neighbourhood-based social support in the models already containing all other factors led to an additional 7% and 8% decrease in income effect on IHD incidence and mortality. Of the income differences in incidence and mortality that were explained by the different risk factors, 16% and 14%, respectively, were explained solely by neighbourhood-based social support.

We reestimated the models after excluding the 149 out of 498 men (30% of the sample) with IHD at baseline. After adjustment for all other factors, the effect of neighbourhood-based social support was still observed on IHD incidence (HR = 1.50, 95% CI: 0.70–3.20 and HR = 2.15, 95% CI: 0.99, 4.68 for a medium and low vs. high support) and on IHD mortality (HR =2.22, 95% CI: 0.57–8.62 and HR = 3.79, 95% CI: 1.00, 14.39 for a medium and low vs. high support).

Finally, considering the whole sample (498 men), we performed a backward selection. The following variables were retained in the model for IHD incidence: income, hypertension, angina pectoris, claudication, creatinine, and neighbourhood-based social support; and in the model for IHD mortality: income, hypertension, ankle-brachial index, claudication, diabetes, support from friends/relatives, and neighbourhood-based social support. In those models, a low neighbourhood-based social support was significantly associated with an increased IHD incidence (HR =1.94, 95% CI: 1.08–3.50) and mortality (HR = 2.38, 95% CI: 1.04–5.48).

Discussion

In our cohort, income 10 years before retirement, but not subsequent income evolution, was a strong predictor of IHD incidence and mortality postretirement. After adjustment for common risk factors and other sources of social support, a low neighbourhood-based social support was associated with an increased IHD incidence and mortality.

A strength of our study consists in the linkage of longitudinal income data, precise information on risk factors, and validated data on IHD incidence and mortality. However, there were limitations to our study. First, socioeconomic transition at retirement was assessed with data on income changes between ages 54–56 and ages 64–66 years. We had no data on the exact occupational history of individuals (Wolfson, Rowe, Gentleman et al., 1993). For example, we did not know the exact date of retirement of the men (by law, retirement was at age 65 years and most of the time occurred at that age, but could occur between ages 60 and 70 years in case of a specific agreement with the employer). We also ignored whether or not retirement was due to health problems. Moreover, we did not know the impact retirement had on the various sources of social support of individuals.

Second, our social support composite indicators were based on a questionnaire that had not been initially conceived to test our own hypotheses. As a consequence, we were constrained by the existing survey items. Moreover, we only considered the marital status of the men, but did not assess marital support in itself. Finally, other limitations of the study include the small sample size (which resulted in wide CIs), and the use of self-reported data on health-damaging behaviour.

A result was that income 10 years before retirement was strongly associated with IHD postretirement. A Canadian analysis of the effect of preretirement earnings histories on mortality after age 65 reported a long-term effect of earnings on mortality, with lagged associations of as much as a decade or two (Wolfson, Rowe, Gentleman et al., 1993). One may argue that the association between income and IHD could result from a process of reverse causality (if the disease leads to a decrease in income): in Sweden, people in poor health often benefit from a disability pension, which only corresponds to a fraction of the salary. However, the effect of income on IHD was strongly adjusted for several cardiovascular disease indicators measured at baseline, probably neutralising a large part of possible reverse causality effects.

Interestingly, men who had faced the strongest decrease in income rank between ages 54–56 and ages 64–66 years did not have a higher IHD risk than men who had maintained their income rank over the period. However, before conclusions can be drawn on the absence of an effect of income change, our study needs to be replicated in other settings, especially in countries in which retirement from occupation leads to a more significant drop in income than in Sweden.

We considered three distinct social support variables (marriage/cohabitation, support from friends/relatives, and neighbourhood-based social support). The absence of a protective effect of the marital relationship in our study may be due to the fact that such a relationship may be stressful rather than supportive in certain circumstances (Orth-Gomer, Wamala, Horsten, Schenck-Gustafsson, Schneiderman, & Mittleman, 2000). Support from friends/relatives and neighbourhood-based social support were independent predictors of IHD mortality. Conversely, only neighbourhood-based social support was associated with incidence. Besides the widely investigated effect of support from friends/relatives (Berkman, Leo-Summers, & Horwitz, 1992; Rozanski, Blumenthal, & Kaplan, 1999), our study is, to our knowledge, the first to report an increased risk of both IHD incidence and mortality for individuals with low neighbourhood-based social support.

Therefore, the residential neighbourhood may constitute an important source of support among other sources. Since low income men had a weaker neighbourhood-based social support, this specific social support resource had an appreciable mediating effect in the income–IHD association. Future research should examine whether neighbourhood-based social support is also important among adults at working age, or whether this resource is more critical among the elderly, to compensate for the disruptions and changes associated with retirement.

Considering the different sources of support (friends and family, and the neighbourhood), social support effects were weaker for incidence than for mortality. This finding is coherent with previous literature (Berkman & Glass, 2000). The explanation may be that social support is particularly useful in the post-acute myocardial infarction period, playing a stronger role in enhancing survival after a cardiac event than in preventing the first incidence of the disease (Chaix, Rosvall, & Merlo, 2006; Vogt, Mullooly, Ernst, Pope, & Hollis, 1992).

Regarding mechanisms of the effect of neighbourhood-based social support, first, people integrated in a network of neighbours may have access to instrumental support in case of need, i.e., help to perform daily tasks or fulfil basic needs (emergency assistance, transportation to the doctor, etc.). Two of the four items of our neighbourhood-based social support index were related to the material assistance individuals could receive from their neighbours. Moreover, involvement in a network of neighbours is a source of informational support (Stafford, Bartley, Wilkinson, Boreham, Thomas, Sacker et al., 2003), i.e., knowledge on cardiovascular diseases and risk factors, advice on what to do in case of acute problems, and information on healthcare resources available in the vicinity. Third, the neighbourhood community may provide individuals with emotional support. By enhancing psychological well-being, such a support may help individuals focus on health preservation and comply with medical recommendations when needed (Berkman, Leo-Summers, & Horwitz, 1992; Krumholz, Butler, Miller et al., 1998). Finally, insertion in a neighbourhood network may result in the control of neighbours encouraging one to avoid health-damaging behaviour and adhere to prescribed treatments (Johnell, Rastam, Lithman, Sundquist, & Merlo, 2005; Mookadam & Arthur, 2004; Reed, McGee, Yano, & Feinleib, 1983). Future studies of the effect of neighbourhood-based social support will have to better distinguish between the different forms of support.

Some authors have argued that direct psychophysiological mechanisms may play a part in the increased IHD incidence and mortality observed among individuals with low social support (Christenfeld & Gerin, 2000; McEwen, 1998; Orth-Gomer, Horsten, Wamala, Mittleman, Kirkeeide, Svane et al., 1998; Rozanski, Blumenthal, & Kaplan, 1999; Wang, Mittleman, & Orth-Gomer, 2005). Such processes may play a part, but no study to date, to our knowledge, has examined the extent to which the effect of social support persists after correct adjustment for informational and instrumental assistance, healthcare utilization, and compliance with treatments (Reed, McGee, Yano et al., 1983).

In our future research, neighbourhood-based social support will have to be considered in the broader context of the neighbourhood, since the availability of such a support may be shaped by the structural characteristics of the neighbourhood. Indeed, the structural forces of the neighbourhoods (socioeconomic level, family structure, residential stability, ethnic composition, and population density) may shape the internal dynamic of communities, constituting favourable or detrimental milieus for local friendship ties, acquaintanceships, and associational networks (Chaix, Rosvall, & Merlo, 2006; Sampson, 1999; Sampson, Raudenbush, & Earls, 1997).

In conclusion, in our study, income 10 years before retirement, but not subsequent income evolution, was a strong predictor of IHD incidence and mortality postretirement. The study also demonstrates that the protective effect of neighbourhood-based social support, a form of material, instrumental, and social support that may be of particular importance among the elderly, partly mediates the socioeconomic gradient of IHD found among this population.

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Figure 1

The study database consisted of (i) data from the baseline examination in 1982–1983; (ii) data on yearly income during 14 years before baseline; and (iii) information on follow-up of ischaemic cardiac events and ischaemic heart disease mortality during 10 years after baseline examination.

Figure 2

Effects of income at 54–56 years of age on incidence of ischaemic cardiac events (top part) and ischaemic heart disease mortality (bottom part), estimated using successive Cox regression models, into which the factors listed in Table 6 were progressively introduced, namely: (i) behavioural risk factors; (ii) clinical and biomedical risk factors; and (iii) social support variables retained in each model (i.e., neighbourhood-based social support in the model for incidence, and support from friends/relatives and neighbourhood-based social support in the model for mortality). The percentage decrease in the parameter for low vs. high income in each model, as compared with the model only including income, is also shown (and computed as $[\beta 1 - \beta 2] / \beta 1$, where $\beta 1$ is the income parameter in the model including only income, and $\beta 2$ is the income parameter in the model including additional variables).

Table 1 List of items used to construct indexes of support from friends/relatives and neighbourhood-based social support, "Men born in 1914" study, Malmö, Sweden

Support from friends/relatives	
How often do you feel lonely?	Never: 0. Rarely: 1. Sometimes or often: 2
Do you have the feeling that people appreciate what you do?	Yes: 0. Not really: 1. Definitely not: 2
When you have personal problems of any kind, do you have any close friend or relative to whom you can turn to, to discuss your problems with?	Yes: 0. To a certain extent: 1. Not really; no: 2
Do you have any friends or relatives whom you like very much and who like you very much?	Yes: 0. Not really; no: 1
Do you have enough good friends to be with?	Yes: 0. Not really; not at all: 1
Do you think you have more, or less, company than other people do?	More: 0. Same as other people: 1. Less: 2
Neighbourhood-based social support	
Is there anyone in your neighbourhood, from/with whom you can borrow things/exchange services?	Yes, several: 0. Yes, one person: 1. No: 2
Is there anyone in your neighbourhood from whom you can get help if you fall ill?	Yes: 0. No: 1
How often do you have a conversation or discussion with neighbours when you meet them?	Often: 0. Sometimes: 1. Rarely; never: 2
How often do you meet neighbours at your/their homes?	Frequently; sometimes: 0. Rarely; never: 1

Table 2 Descriptive statistics for low-income and high-income men (as defined with income at ages 54–56 years divided in two categories, each comprising 50% of the sample), "Men born in 1914" study, Malmö, Sweden: observed percentages and estimated 95% confidence intervals

	Low-income men % (95% CI)	High-income men % (95% CI)
Clinical and biomedical risk factors		
Severe hypertension (%)	35% (29%–40%)	40% (34%–45%)
Angina pectoris (%)	18% (13%–21%)	9% (5%–11%)
ST segment depression (%)	28% (21%–33%)	23% (17%–27%)
Low ankle-brachial index (%)	17% (12%–20%)	11% (8%–14%)
Intermittent claudication (%)	6% (4%–8%)	2% (1%–3%)
High creatinine (%)	5% (2%–6%)	5% (3%–7%)
Hyperlipidaemia (%)	32% (26%–37%)	39% (33%–44%)
Diabetes mellitus (%)	8% (5%–9%)	3% (1%–4%)
Behavioural risk factors		
Being a current smoker (%)	40% (33%–45%)	32% (26%–36%)
Low physical activity (%)	8% (5%–10%)	3% (1%–4%)
High alcohol consumption (%)	9% (6%–11%)	8% (5%–10%)
Overweight (%)	52% (45%–58%)	43% (36%–48%)
Social support risk factors		
Being a non married individual (%)	27% (22%–31%)	14% (10%–17%)
Low support from friends/relatives (%)	54% (47%–60%)	45% (38%–50%)
Low neighbourhood social support (%)	31% (25%–36%)	20% (15%–24%)

Notes: CI, confidence interval.

Table 3 Effects of individual income, measured, in separate Cox regression models, at 54–56, 59–61, 64–66 years of age, on incidence of cardiovascular events and on mortality from ischaemic heart disease, "Men born in 1914" study, Malmö, Sweden

	Incidence of cardiovascular events		Mortality from ischaemic heart disease	
	HR	95% CI	HR	95% CI
Income at 54–56 years[a]				
Third tertile (high income)	1.00		1.00	
Second tertile	1.65	(0.95–2.85)	2.44	(1.12–5.32)
First tertile (low income)	2.64	(1.58–4.42)	4.67	(2.25–9.70)
Akaike Information Criterion[b]	1,198		776	
Income at 59–61 years[a]				
Third tertile (high income)	1.00		1.00	
Second tertile	1.19	(0.70–2.01)	1.35	(0.66–2.78)
First tertile (low income)	2.02	(1.24–3.27)	3.20	(1.70–6.04)
Akaike Information Criterion[b]	1,203		781	
Income at 64–66 years[a]				
Third tertile (high income)	1.00		1.00	
Second tertile	1.57	(0.93–2.65)	1.79	(0.88–3.67)
First tertile (low income)	2.06	(1.25–3.40)	3.22	(1.66–6.21)
Akaike Information Criterion[b]	1,204		784	

Notes: CI, confidence interval; HR, hazard ratio.

[a] The different income variables (measured at different ages) were included in separate models.

[b] The lower the Akaike Information Criterion value, the better the fit of the model.

Table 4 Descriptive information on the evolution of income rank[a] of the 498 men between ages 54–56 years and ages 64–66 years, "Men born in 1914" study, Malmö, Sweden

Model-based indicator of income rank evolution	Crude difference between income ranks at ages 64–66 and at ages 54–56 (median value)
First tertile (unfavourable evolution)	-25
Second tertile (intermediate evolution)	-8
Third tertile (favourable evolution)	0

[a] Income rank ranges between 1 and 100, and was determined as compared to the whole male population of Scania aged 25 years or over.

Table 5 Effects of individual income, measured at 54–56 years of age, on clinical and biomedical, behavioural, and social support risk factors for ischaemic cardiac events, "Men born in 1914" study, Malmö, Sweden[a]

	Second income tertile[b]		First income tertile[b]	
	OR	95% CI	OR	95% CI
Clinical and biomedical risk factors				
Severe hypertension	0.94	(0.60–1.47)	0.80	(0.51–1.26)
Angina pectoris	0.99	(0.47–2.09)	2.71	(1.41–5.21)
ST segment depression	1.17	(0.67–2.05)	1.87	(1.06–3.28)
Low ankle-brachial index	1.58	(0.79–3.15)	2.17	(1.11–4.24)
Intermittent claudication	3.08	(0.61–15.46)	6.97	(1.55–31.38)
High creatinine	0.72	(0.28–1.83)	0.47	(0.16–1.40)
Hyperlipidaemia	1.14	(0.74–1.79)	0.61	(0.38–0.98)
Diabetes mellitus	3.12	(0.83–11.7)	5.40	(1.53–19.01)
Behavioural risk factors				
Being a current smoker	1.13	(0.71–1.79)	1.45	(0.91–2.30)
Low physical activity	1.27	(0.33–4.80)	5.04	(1.66–15.35)
High alcohol consumption	0.78	(0.34–1.76)	1.26	(0.59–2.68)
Overweight	1.12	(0.72–1.73)	1.28	(0.82–2.00)
Social support risk factors				
Being a non married individual	0.75	(0.40–1.45)	3.19	(1.86–5.47)
Low support from friends/relatives	1.00	(0.62–1.60)	1.28	(0.79–2.05)
Low neighbourhood social support	1.76	(1.04–3.02)	2.32	(1.37–3.93)

Notes: CI, confidence interval; OR, odds ratio.

[a] Each line in the Table corresponds to a different logistic model, with the variable as the outcome and income as the explanatory variable.

[b] The reference category was the third income tertile (i.e., high income).

Table 6 Effects[a] of income, and of biomedical, behavioural, and social support[b] risk factors on incidence of cardiovascular events and mortality from ischaemic heart disease, “Men born in 1914” study, Malmö, Sweden

	Incidence of cardiovascular events		Mortality from ischaemic heart disease	
	HR	95% CI	HR	95% CI
Income at 54–56 years				
Second tertile	1.57	(0.90–2.75)	2.08	(0.92–4.67)
First tertile	1.86	(1.06–3.28)	2.58	(1.15–5.76)
Hypertension				
Hypertension	1.27	(0.70–2.31)	1.15	(0.52–2.57)
Severe hypertension	2.18	(1.24–3.82)	2.40	(1.15–5.03)
Angina pectoris	1.74	(1.03–2.95)	1.63	(0.86–3.07)
Low ankle-brachial index	1.47	(0.86–2.50)	2.30	(1.19–4.44)
Intermittent claudication	2.14	(1.03–4.43)	3.11	(1.36–7.13)
High creatinine	2.06	(0.95–4.44)	2.09	(0.80–5.45)
Hyperlipidaemia	0.88	(0.56–1.38)	0.68	(0.38–1.24)
Diabetes mellitus	1.66	(0.83–3.32)	2.21	(1.02–4.79)
Smoking				
Ex-smokers	2.16	(1.04–4.48)	2.13	(0.79–5.74)
Current smokers	2.40	(1.12–5.16)	2.78	(1.00–7.74)
Low physical activity	1.42	(0.70–2.88)	1.29	(0.56–2.95)
High alcohol consumption	1.11	(0.51–2.43)	1.44	(0.56–3.66)
Overweight	1.20	(0.79–1.84)	1.10	(0.64–1.89)
Support from friends/relatives[b]				
Medium	—		1.29	(0.52–3.24)
Low	—		2.15	(1.03–4.51)
Neighbourhood social support[b]				
Medium	1.60	(0.89–2.86)	1.66	(0.70–3.93)
Low	1.87	(1.02–3.43)	2.50	(1.06–5.91)

Notes: CI, confidence interval; HR, hazard ratio.

[a] All effects were adjusted for each other in a multiple model.

[b] Only neighbourhood-based social support was retained in the model for incidence; support from friends/relatives and neighbourhood-based social support were retained for mortality.

Figure 1

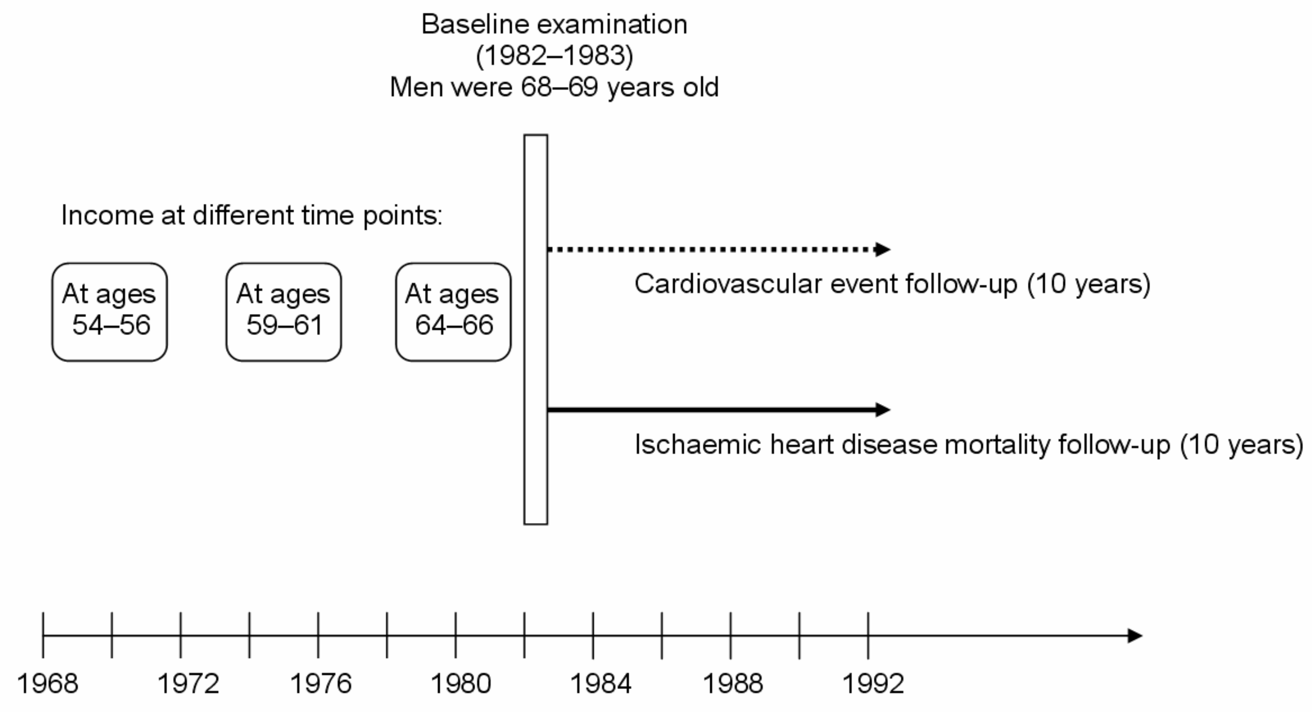
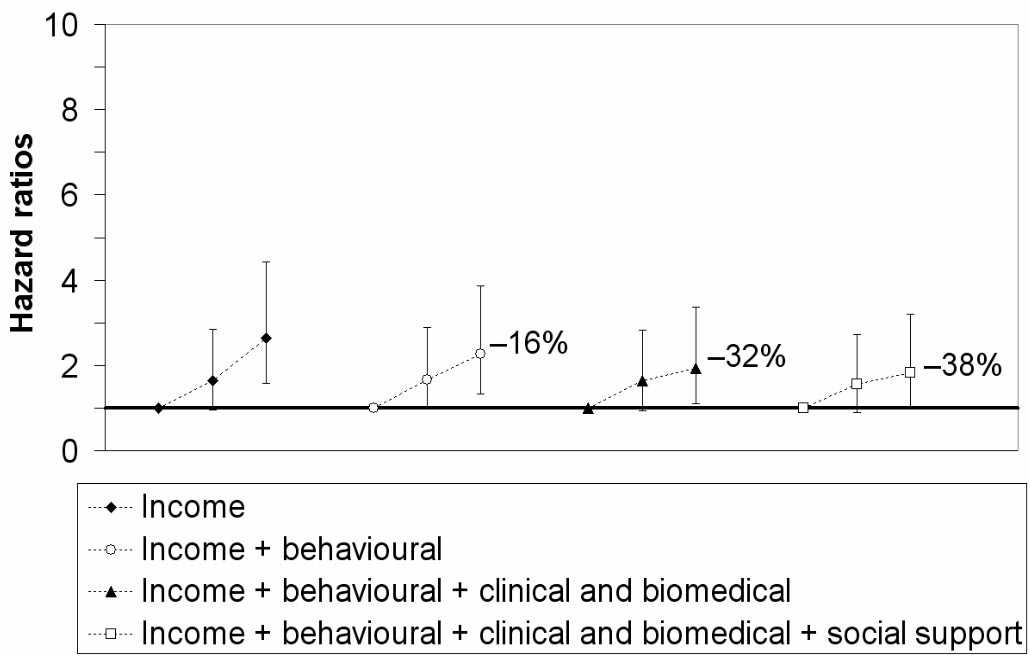

Baseline examination
(1982–1983)
Men were 68–69 years old
Income at different time points:
At ages 54–56
At ages 59–61
At ages 64–66
Cardiovascular event follow-up (10 years)
Ischaemic heart disease mortality follow-up (10 years)
1968
1972
1976
1980
1984
1988
1992

Figure 2

Incidence of ischaemic cardiac events



Ischaemic heart disease mortality