Socioeconomic gradients in mortality following heart failure hospitalization in a country with universal healthcare coverage

Short title: Education, income and mortality following first-time hospitalization due to heart failure

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ABSTRACT

OBJECTIVES: We explored the association between socioeconomic position (SEP) and long-term mortality following first heart failure (HF) hospitalization.

BACKGROUND: It is not clear to what extent education and income - individually or combined - influence mortality among HF patients.

METHODS: We analyzed 49 895 patients, age 35+ years, with a first HF hospitalization in Norway during 2000-2014 and followed them until death or December 31, 2014. The association between education, income and mortality was explored using Cox regression models, stratified by sex and age group (35-69 years and 70+ years).

RESULTS: Compared to patients with primary education, those with tertiary education had lower mortality (adjusted hazard ratio [HR]: 0.89; 95% confidence interval [CI]: 0.78 to 0.99 in younger men; HR: 0.57; 95% CI: 0.43 to 0.75 in younger women; HR: 0.90; 95% CI: 0.84 to 0.97 in older men and HR: 0.87; 95% CI: 0.81 to 0.93 in older women). After adjusting for educational differences, younger and older men and younger women in highest income quintile had lower mortality compared to those in the lowest income quintile (HR: 0.63; 95% CI: 0.55 to 0.72; HR: 0.78; 95% CI: 0.63 to 0.96 and HR: 0.91, 95% CI: 0.86 to 0.97, respectively). The association between income and mortality was almost linear. No association between income and mortality was observed in older women.

CONCLUSIONS: Despite the well-organized universal healthcare system in Norway, education and income are independently associated with mortality in HF patients in a clear sex and age group-specific pattern.

ABBREVIATION LIST

CI = confidence interval

CVD = cardiovascular disease

CVDNOR = "Cardiovascular disease in Norway"

COPD = chronic obstructive pulmonary disease

DM = diabetes mellitus

EF = ejection fraction

HF = heart failure

ICD = international classification of disease

IQR = interquartile range

HR = hazard ratio

SD = standard deviation

INTRODUCTION

The prevalence of heart failure (HF) has increased globally (1). This increase is expected to continue (2) due to aging of the population (3), improved survival following most cardiac conditions and increasing trends of obesity and diabetes mellitus (DM).

In 2012, Hawkins and al. (4) pointed to the existence of social gradients in HF incidence and prevalence while evidence on social gradients in mortality were less consistent, with some studies confirming (5-8) and others failing to show (6,9-11) their presence. Methodological issues that may have contributed to the lack of consistency include use of area-level (5,7,9,10,12-14) rather than individual-level measurements for socioeconomic position (SEP), small sample sizes (6), selected, high-risk cohorts (15,16), or narrow age groups (5,10,13). Most studies have analyzed short-term outcomes (30-day and up to one year) (5,10,11,16), not allowing enough time for SEP-related mechanisms to operate.

The health care system in Norway is characterized by universal coverage with predominantly public provision of services. All Norwegian residents are entitled to full access to medical care, regardless of their age, sex, race and employment status.

Copayments for health services are capped at 2460 NOK (approximately 246 US dollars) a year and additional measures are applied for people with permanent reduced health and work capacities.

Despite this universal coverage and low copayment for medical services, social gradients in health outcomes still exist in Norway (17,18).

Education and income are often used as indicators for SEP. Education captures the knowledge-related assets of a person, is established during early adulthood and remains relevant throughout life. Income on the other hand, relates to the material resources and can influence health through one’s ability to purchase health-enhancing commodities and services. The complex interplay between the two is poorly described, especially with regard to HF.

To advance knowledge on the issue, and analyzed the independent and combined effects of education and income on long term mortality in a nationwide cohort of patients hospitalized with an incident HF in Norway during 2000-2014.

METHODS

Design and settings

We used data from the CVDNOR project (19) to explore the association between education, personal income and mortality. We included in the study all patients age 35+ years, with an incident HF hospitalization between 1 January 2000 and 31 December 2014 (20).

Exposure and other covariates

The information on highest attained education was retrieved from the National Education Database and categorized into primary (up to 10 years), secondary (high/vocational school) or tertiary education (college/university).

Information on patients' personal income in the last three years preceding the HF hospitalization was obtained from The National Registry for Personal Taxpayers. The personal income reflects income generated from wages, self-employment, capital income, pensions, and social benefits after tax deduction. The personal income for each year was adjusted for inflation using the consumer price index (https://www.ssb.no/en/kpi) for the year 2015. The three-year average of adjusted income was used in the analyses as i) categorical (applying sex and age-specific quintile cutoff points) and ii) continuous variables.

Information on relevant co-existing medical conditions during the HF hospitalization was obtained from the corresponding ICD-10 codes.

Study outcome

Information on date, underlying cause and place of death was obtained from the Cause of Death Registry. A personal, unique project-specific number assigned to each individual allowed us to follow study participants until death or end of follow up (31 December 2014).

Statistical Analyses

Continuous variables are presented as means and SD or median and IQR. Categorical variables are presented as proportions.

We used Cox proportional hazard regression models to explore the association of education and personal income with mortality. The analyses were conducted separately for i) men, 35-69 years, ii) women, 35-69 years, iii) men, 70+ years and iv) women, 70+ years.

First, we explored the association of education and income with mortality by introducing in the same model both education (primary education as reference category) and income in quintiles, (first quintile as reference category). Then, we explored the combined effect of education and income on mortality by combining education (primary/secondary versus tertiary) and income (< median versus ≥ median) into a four-category variable. The category 'primary/secondary education and income < median' was used as reference category in these analyses. Schoenfeld residuals were used to evaluate Cox proportionality assumptions and no significant deviation from proportionality was observed.

All analyses were only adjusted for age in 'Model 1') and for age, calendar year, civil status and ten most relevant medical conditions [atrial fibrillation (AF), valvular heart disease, coronary heart disease (CHD), DM, COPD, anemia, hypertension, neoplasms, renal failure (RF) and thyroid disease] in Model 2.

Lastly, we applied a Cox regression model with education (as three-category variable) and income (as continuous variable), using penalized cubic splines to allow for a non-linear association between income and mortality.

Additional analyses

To minimize the assumptive effect of spouse's income on the association between personal income and mortality among women, we repeated the analyses including only unmarried women.

Analyses were performed using Stata (Stata Corp LP, 4905 Lakeway Drive, College Station, Texas, USA) and the survival-package in R, version 3.6.0.

RESULTS

Study population characteristics

We included in the analyses 49 895 patients, age [mean (SD)] 78.1 (11.1) years (Table 1). Nearly half (49.8%) of patients had completed only primary education. The majority were either married (44.4%) or widow/widowed (36.2%). The proportion of comorbidities varied widely, from 1.6% for asthma up to 43.0% for AF.

Patients with primary education were older, more often women and had a longer hospitalization (in days) compared to those with higher education (Table 2). Lower education was associated with lower prevalence of AF, valvular heart disease and neoplasms and higher prevalence of CHD, COPD, anemia and mental disorders (Table 2).

Higher education was associated with higher income in both men and women. Within each education and age category, men earned more than women (Figure S1, online supplemental material).

Mortality

During a median follow up time of 27.8 months [interquartile range (IQR), 7.8 - 61.5 months; maximal, 180 months), 34 127 patients died (Table S1, online supplementary material). CVD deaths accounted for 58.1% of all deaths. Deaths occurring in hospitals and those occurring in nursing homes accounted for 45.3% and 40.4% of total deaths. The majority (91.2%) of patients survived the hospitalization for the incident HF.

Compared to patients who were alive at the end of follow up, those who died were older, more often men, less educated, earned less and had a greater burden of comorbidities (Table S2, online supplementary material).

The mortality (per 100 000) among HF patients was much higher than that observed in the general population (Table S3, online supplementary material).

Education and mortality

Compared to primary education, tertiary education was associated with 11% (HR: 0.89; 95% CI: 0.78 to 0.99) lower mortality in younger men, 43% (HR: 0.57; 95% CI: 0.43 to 0.75) in younger women, 11% (HR: 0.89, 95% CI: 0.83 to 0.99) in older men and 10% (HR: 0.90; 95% CI: 0.84 to 0.97) in older women (Table 3).

Income (in quintiles) and mortality

The fifth income quintile was associated with lower mortality compared to the first income quintile (Table 3). The magnitude varied from 37% (HR: 0.63; 95% CI: 0.55 to 0.72) in younger men to 22% (HR: 0.78; 95% CI: 0.63 to 0.96) in younger women and 9% (HR: 0.91; 95% CI: 0.86 to 0.97) in older men. In older women, we observed no association between income and risk of dying following first HF hospitalization.

Additional analyses

When restricting the analyses to unmarried women, the highest income quintile was associated with lower mortality compared to the lowest income quintile only in older women (Table S4, online supplementary material).

Income (continuous variable) and mortality

Figure 1 depicts results of adjusted analyses where income was introduced as a continuous variable. Income was inversely and nearly linearly associated with mortality in all sex and age groups except for older women.

The combined effect of education and income (Figure 2)

Among men, higher income was associated with reduced mortality, regardless of education level (categories II and IV versus category I). In younger women, *either* highest education *or* higher income were associated with reduced mortality (categories II, III and IV versus category I). In older women, only highest education *and* higher income was associated with lower mortality (category IV versus category I)

DISCUSSION

Summary of findings

Our study is among the first to demonstrate an inverse association between education and mortality, which is stronger in women compared to men. Income was inversely and, nearly linearly associated with mortality in all men and younger women. When education and income were combined, the later appeared to override education with regard to mortality in men. In younger women, each component *per se* was associated with reduced mortality. In older women, we observed reduced mortality only when highest education was combined with higher income.

Published literature

A recent study from Denmark (16) using reported an association between family income and one-year mortality among 17 122 HF patients with reduced (≤ 40%) ejection fraction (EF). Median household income was inversely associated with 30-day mortality among 48 338 elderly with HF enrolled in 'Get With The Guidelines-HF' database (13) and longer-term (maximum follow up, 72 months) mortality among 1415 patients with incident HF enrolled in the ARIC community study (7).

Of note, education was not associated with one-year mortality in patients hospitalized with an incident episode of HF in the Danish study (16). No association between education and mortality was found either in two sub-analyses of RCTs; the first enrolling 541 ambulatory patients with chronic HF (6) and the second enrolling 2331 patients with chronic HF and reduced EF (15).

Potential mechanisms involved

HF represents the end-stage of various cardiac and metabolic conditions. Therefore, risk factor burden and configuration, clinical expression of the underlying conditions and delays in seeking medical assistance are crucial factors in the development and severity of HF, which in turn influence mortality. Studies point to the existence of socioeconomic gradients in lifestyle-related factors (21,22), including smoking habits (23). Further, low social status is associated with lower health literacy (24) and delayed help seeking (25). The net effect of these determinants operating outside heath system are likely to generate social gradients in disease severity of the underlying conditions (often being coronary heart disease) and its optimal treatment (26).

Little is known on other features through which health care systems themselves may contribute maintaining, or even perpetuating the observed social gradients in health outcomes. An optimal prescription (27) and adherence (28) the guideline-directed drug therapy for HF, improves patients' outcomes. Despite this evidence, real-world studies point to a suboptimal prescription and/or adherence to treatment among HF patients (29), even in countries with universal healthcare and low copayment such as the Netherlands (30), the UK (31) and Sweden (32). Factors influencing suboptimal drug prescription are not fully understood, but it has been suggested that these gradients can originate from more comorbidities and more severe HF among socially deprived patients (33).

The interaction between health care providers and HF patients is not to be neglected either. The observed social gradients in participation in rehabilitation programs (34) risk behavior modification (35), follow up rates (36), or even access to specialized care (37) could be narrowed if closer follow with more dedicated time were to be offered to socioeconomically-deprived patients.

Lastly, due to its complexity, HF is a costly disease. While direct expenses related to treatment are capped, other indirect costs (such as those related to transportation arrangements, interventions and lifestyle modification, including diet) may accumulate and become a burden for patients with low income. Moreover, lack of sufficient material resources may induce stress which is linked to poor outcomes. Lastly, low income is often associated with poor social network and social support.

Differences between previously published studies and our study

Previous publications (6,15,16) did not find an association between education and mortality among HF patients. These discrepancies could stem from a number of factors, including differences in study populations' structure and size, length of follow up, time period and study settings and data analyses.

To illustrate, study population in the other studies comprised patients with reduced EF (6,15,16) and previous HF hospitalizations (6,15) while in our study we included individuals with no previous HF hospitalizations and a mixture of reduced and preserved EF. Both reduced EF and previous hospitalizations for HF increase the odds of dying.

The Danish study included 17 122 participants, but restricted the follow up time to one year (16). The number of participants and subsequently events of interest were much smaller in the two other studies; 2331 (15) and 571 (6) participants, respectively.

The Danish study (16) was observational, with no active follow up of study participants. The second largest study (15) was a post hoc analysis of HF-ACTION (a randomized controlled clinical trial), including patients with moderate to severe HF receiving either i) education or ii) education plus supervised exercise training program. Optimized therapy prior to study enrollment was a requirement. Further, both income and education was self-reported. The third study (6) was a propensity score matched analysis of a small sample of HF patients enrolled in DIG (Digitalis Investigation Group) trial in 1995. Information on education was self-reported and included the participants or spouses' education level. We believe that shorter follow up time, severity of HF and study settings (in the two RCTs) may have implied closer medical follow up of patients (often in hospitals or other specialized care structures) and optimization of therapies, leaving thus little room for education-related mechanisms to operate and display educational gradients in mortality.

Sex and age group-specific patterns

Income was more strongly associated with mortality among men while education among women. Although our study cannot fully explain the observed patterns, we believe they are influenced by multiple, non-mutually exclusive potential factors.

The effect of using personal rather than household income

Generally, women earn less than men. Further, women married to partners with high earnings may in some cases choose to work part-time. Hence, the personal income in married women would underestimate the household income, dominated by partners' income. As a result, the observed association between personal income and mortality in women would underestimate the true association we would observed among them, had we been able to adjust for partner's income.

Income distribution in men and women

The difference [in Norwegian Kroner (NOK)] from one income quintile to another is greater in men compared to women. To illustrate, younger men in the fifth income quintile earned 292 000 NOK (approximately 29 200 US dollars) more than younger men in the first income quintile while. In younger women, the difference between the corresponding income quintiles was 195 000 NOK (approximately 19 500 US dollars). Hence, a stronger association between income and mortality in men compared to women (when using income quintiles) may reflect the absolute differences in earnings between income quintiles in men versus women.

Sex differences in etiology, clinical expression and type of HF

In men, HF is more often of ischemic origin, with reduced EF, and often more with more typical symptoms. In women, HF's underlying conditions include more often slowly-evolving and less fulminant conditions such as hypertension (38), obesity, diabetes (39) or anemia. The dominant HF form in women is the diastolic, with preserved EF. Women are often underrepresented in clinical trials (40), leading to insufficient understanding of mechanisms involved and HF treatment efficacy among them. This is also reflected in the lack of sex-specific treatment strategies for HF in international guidelines. The challenges in recognizing symptoms and timely diagnosing HF in women, as well as uncertainties with regard to treatment efficiency among them, may leave more room to knowledge-related assets of patients, which, in a universal health care setting, are captured by education.

Other potential explanations include the fact that income and education may capture health-relevant behaviors to different extents in men and women, or that the set of risk factors operating along with education and income are different across sexes.

The lack of an association between income and mortality among older women may be further related a higher burden of comorbidities and the fact that they reside more often in nursing homes, where, due to collective arrangements, personal income may not play an important role.

Strengths and limitations

We measured exposure at the individual level in a well-defined nationwide cohort of HF patients, thus minimizing the risk of selection bias. The long (up to 15 years) and complete follow up of study participants add to the value of our study. Further, we analyzed the individual and combined effects of education and income on mortality, describing for the first time sex and age group patterns characterizing this relationship.

Some limitations inherent to the structure and content of administrative data need to be kept in mind when interpreting the findings such as lack of information on lifestyle factors including smoking, physical activity, body mass index or family history of disease. Further, no information on medication taken during or after discharge and participation in rehabilitation programs was available. We could not stratify the analyses on EF (preserved vs.

reduced EF) as such information was not available. Information on comorbidities was collected during the incident HF hospitalization.

Income measured at the personal level carries the risk of underestimating the true financial resources of a family, especially among women and diluting the association between personal income and mortality among them. We addressed this issue by conducting separate analyses among unmarried women and found an association between personal income and mortality. However, the 'unmarried' category may include a fraction of population who live with a partner without being formally married. Further, the personal income measured a few years ahead of the first HF episode may not represent well the real lifelong financial situation of individuals as it may be influenced by declining health prior to HF hospitalization (41).

Lastly, as in all observation studies, potential residual confounding cannot be completely ruled out.

Conclusions: Using an unselected population of patients hospitalized with incident HF, we found that education and income were independently and inversely associated with long-term mortality. When combined, income was decisive among men. Among younger women, *either* higher education *or* higher income was associated with lower mortality. In older women, lower mortality was observed only among those with higher education *and* higher income. The observed mortality gradients in a country with universal healthcare and low copayments such as Norway should encourage more studies in order to identify factors responsible for these gradients.

Perspectives

Competency in medical knowledge: Our results point to a significant mortality following the first HF hospitalization and identify education and income as two independent, yet complementary SEP dimensions involved in this process.

Translational outlook: We need more studies focusing on i) identifying mechanisms through which education and income operate, ii) providing evidence on the best possible way to reduce the observed SEP gradients in mortality following HF.

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Disclaimers

Data from the Norwegian Patient Registry and the Norwegian Cause of Death Registry have been used in this publication. The interpretation and reporting of these data are the sole responsibility of the authors, and no endorsement by these registries is intended, nor should be inferred.

Conflict of interest

None declared

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Figure Legends

Figure 1: Penalized cubic spline plot for the association between income and mortality among patients hospitalized with an incident heart failure in Norway, 2000-2014: the CVDNOR project

Figure 2: Combined educational and income-related gradients in mortality among patients hospitalized with an incident heart failure episode in Norway, 2000-2014: the CVDNOR project

Table 1. Baseline characteristics of patients hospitalized with incident heart failure in Norway, 2000-2014: the CVDNOR project

	Total	35-69 years			70+ years		
	(n=49 895)	Men (n=7642)	Women (n=3105)	P value	Men (n=17 987)	Women (n=24 266)	P value
Age, *mean (SD)*	78.1 (11.1)	60.7 (7.8)	61.3 (7.9)	<0.001	81.5 (5.8)	83.9 (5.8)	<0.001
Mode of hospitalization				0.522			<0.001
Emergency	92.4	86.6	87.4		92.5	95.2	
Planned	7.6	13.4	12.6		7.4	4.7	
Education				<0.001			<0.001
Primary	49.8	35.5	45.7		45.3	59.6	
Secondary	40.0	48.6	42.2		42.6	34.2	
Tertiary	10.2	15.9	12.1		12.1	6.3	
Income (in 1000 NOK), *median (IQR)*	188 (147-244)	258 (201-336)	192 (141-245)	<0.001	204 (162-254)	159 (132-197)	<0.001
Civil status, %				<0.001			<0.001
Unmarried/Cohabitants	9.7	19.7	12.0		8.2	6.9	
Married	44.4	55.1	51.9		62.4	24.0	
Widow	36.2	3.3	12.4		22.8	63.1	
Divorced	9.7	21.9	23.7		6.6	6.0	
Readmission due to HF	29.6	35.2	29.4	<0.001	30.9	28.8	<0.001
HF hospitalization (days), *median (IQR)*	6 (3-9)	6 (3-10)	6 (3-10)	0.007	5 (3-9)	6 (3-9)	0.002
Medical conditions, %							
Atrial fibrillation	43.0	37.4	27.6	<0.001	46.4	44.5	<0.001
Valvular heart disease	17.8	13.8	15.8	0.009	16.3	20.9	<0.001
Coronary heart disease	34.5	41.3	32.6	<0.001	38.9	28.6	<0.001
Hypertension	26.5	27.6	27.8	0.801	22.7	29.2	<0.001
Diabetes mellitus	14.8	19.1	18.5	0.408	14.0	13.4	0.055
Renal failure	10.0	6.8	5.4	0.006	13.9	8.6	<0.001
Chronic obstructive pulmonary disease	11.5	11.2	17.0	<0.001	13.2	9.5	<0.001
Neoplasms	5.4	3.7	6.1	<0.001	7.8	3.9	<0.001
Anemia	4.9	2.1	3.5	<0.001	5.1	5.9	<0.001
Thyroid disease	3.2	0.9	5.0	<0.001	1.4	5.3	<0.001
Mental disorders	3.8	1.9	2.2	0.572	3.8	4.1	0.118
Asthma	1.6	1.3	3.2	<0.001	1.0	2.1	<0.001
Pulmonary hypertension	2.2	1.7	3.6	<0.001	1.9	2.4	0.003

SD = standard deviation; IQR = interquartile range; NOK = Norwegian kroner (0.11 EU or 0.12 USD in 2015).

Table 2. Characteristics of the study participants by education: the CVDNOR project

	Primary (n=24 881)	Secondary (n=19 914)	Tertiary (n=5100)	P for trend
Age, *mean (SD)*	79.5 (10.3)	77.0 (11.3)	75.3 (12.5)	<0.001
Sex, (male)	43.6	57.1	66.6	<0.001
Mode of hospitalization				<0.001
Emergency	93.6	91.8	90.4	
Planned	6.4	8.2	7.6	
Income (in 1000 NOK), *median (IQR)*	166 (135-203)	206 (160-261)	294 (235-367)	<0.001
Length of hospitalization, *median (IQR)*	6 (3-9)	6 (3-9)	5 (3-9)	<0.001
Civil status				<0.001
Married	37.5	49.5	57.1	
Unmarried	10.3	8.9	9.8	
Widow	43.5	31.1	21.3	
Divorced	8.7	10.5	11.8	
Readmission due to HF, %	32.4	32.8	32.0	0.063
Medical conditions, %				
Atrial fibrillation	41.2	44.5	46.8	<0.001
Valvular heart disease	17.7	17.7	19.9	<0.001
Coronary heart disease	34.0	35.3	33.8	<0.001
Hypertension	26.2	26.7	27.3	0.002
Diabetes mellitus	15.6	14.3	12.5	<0.001
Renal failure	10.2	10.0	9.4	0.091
Chronic obstructive pulmonary disease	12.7	11.1	7.6	<0.001
Neoplasms	5.0	5.8	6.1	0.010
Anemia	5.5	4.4	3.7	<0.001
Thyroid diseases	3.5	2.9	2.7	0.803
Mental conditions	8.4	7.3	6.5	0.004
Asthma	1.8	1.5	1.6	0.571
Pulmonary hypertension	2.3	2.1	2.1	0.152

SD = standard deviation; NOK = Norwegian kroner (0.11 EU or 0.12 USD in 2015); IQR =interquartile range.

Table 3. Educational and income-related gradients in mortality among patients hospitalized with incident heart failure in Norway, 2000-2014: the CVDNOR project

	Men			Women		
	Deaths / Person - Years	Hazard ratio (95% CI)		Deaths / Person - Years	Hazard ratio (95% CI)	
		Model 1	Model 2		Model 1	Model 2
Age group, 35-69 years						
Education						
Primary	1217 / 13 989	1[reference]	1[reference]	648 / 7311	1 reference	1[reference]
Secondary	1346 / 19 963	0.88 (0.82 - 0.96)	0.95 (0.88 - 1.03)	461 / 6904	0.79 (0.70 - 0.90)	0.84 (0.74 - 0.94)
Tertiary	351 / 6826	0.82 (0.72 - 0.93)	0.89 (0.78 - 0.99)	68 / 2045	0.46 (0.36 - 0.60)	0.57 (0.43 - 0.75)
Income						
1^{st} quintile	744 / 7709	1[reference]	1[reference]	271 / 3551	1[reference]	1[reference]
2^{nd} quintile	654 / 7727	0.90 (0.81 - 1.00)	0.92 (0.81 - 1.01)	268 / 3155	1.09 (0.92 - 1.29)	0.99 (0.85 - 1.17)
3^{d} quintile	582 / 8018	0.78 (0.70 - 0.87)	0.84 (0.74 - 0.93)	245 / 3180	1.01 (0.85 - 1.20)	0.88 (0.75 - 1.06)
4^{th} quintile	503 / 8617	0.64 (0.57 - 0.72)	0.72 (0.64 - 0.81)	225 / 3205	0.98 (0.82 - 1.17)	0.85 (0.73 - 1.03)
5^{th} quintile	431 / 8707	0.55 (0.48 - 0.62)	0.63 (0.55 - 0.72)	168 / 3168	0.84 (0.69 - 1.03)	0.78 (0.63 - 0.96)
Age group, 70+ years						
Education						
Primary	6546 / 22 048	1[reference]	1[reference]	10 110 / 36 612	1[reference]	1[reference]
Secondary	5705 / 21 680	0.94 (0.90 - 0.98)	0.96 (0.93 - 0.99)	5247 / 21 553	0.92 (0.89 - 0.96)	0.94 (0.90 - 0.98)
Tertiary	1497 / 6381	0.85 (0.80 - 0.91)	0.90 (0.84 - 0.97)	904 / 4025	0.83 (0.77 - 0.89)	0.87 (0.81 - 0.93)
Income						
1^{st} quintile	2914 / 9933	1[reference]	1[reference]	3334 / 13 144	1[reference]	1[reference]
2^{nd} quintile	2838 / 9568	1.01 (0.96 - 1.07)	1.01 (0.96 - 1.07)	3309 / 12 570	1.02 (0.97 - 1.07)	0.96 (0.92 - 1.02)
3^{d} quintile	2711 / 9930	0.95 (0.91 - 1.00)	0.94 (0.90 - 0.99)	3291 / 12 165	1.05 (1.00 - 1.10)	0.98 (0.93 - 1.04)
4^{th} quintile	2704 / 10 012	0.95 (0.90 - 1.00)	0.95 (0.90 - 0.99)	3227 / 12 163	1.04 (0.99 - 1.09)	0.97 (0.92 - 1.03)
5^{th} quintile	2581 / 10 595	0.91 (0.86 - 0.97)	0.91 (0.86 - 0.97)	3127 / 12 131	1.06 (1.01 - 1.12)	0.98 (0.93 - 1.04)

Model 1 includes education, income and age (continuous variable).
Model 2 includes education, income, age (continuous variable), calendar year, civil status, atrial fibrillation, valvular heart disease, coronary heart disease, hypertension, diabetes mellitus, renal failure, chronic obstructive pulmonary disease, neoplasms, anemia and thyroid diseases.
CI = confidence interval.