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The spillover influence of partner's education on myocardial infarction incidence and survival

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ABSTRACT

Background

Education is believed to have positive spillover effects across network connections. Partner's education may be an important resource preventing the incidence of disease and helping patients cope with illness. We examined how partner's education predicted myocardial infarction (MI) incidence and survival net of own education and other socioeconomic resources in Finland.

Methods

A sample of adults aged 40-69 at baseline in Finland in 1990 was followed up for MI incidence and mortality during the period 1991-2007 (n=354,100).

Results

Lower own and spousal education both contributed independently to a higher risk of MI incidence and fatality when mutually adjusted. Having a partner with basic education was particularly strongly associated with long-term fatality in women with 53% higher hazards (95% confidence interval 22, 92%) compared to women with tertiary level educated partners. There was some evidence that the incidence risk associated with basic spousal education was weaker in those with own basic education. The highest risks of MI incidence and fatality were consistently found in those without a partner, whereas the most favorable outcomes were in households where both partners had a tertiary level of education.

Conclusions

Accounting for spousal education demonstrates how health-enhancing resources accumulate to some households. Marital homogamy may therefore contribute to the widening of educational differences in MI incidence and survival.

Abbreviations: CHD, coronary heart disease; MI, myocardial infarction

There is increasing recognition that education is not only an individual-level resource but can have spillover health effects on other household members. For example, there is a robust connection between higher maternal education and improved child health.¹ More educated adult children have also been found to be associated with improved health outcomes for parents.²⁻⁴ Within married couples, a more educated spouse has been associated with better health.⁵⁻¹⁶

The married enjoy better health in general^{17, 6} and given that socioeconomic characteristics such as education influence selection into marriage, they may contribute to this advantage. However, the socioeconomic resources at the level of the household can also impact health by influencing access to vital material and psychosocial resources.^{12, 15} Examining the extent to which the educational attainment of partners confers protection against heart attack incidence and survival is of interest for understanding the mechanisms behind social inequalities in heart disease. Only a few studies have recently examined the association between partner education and coronary heart disease (CHD), and none have separated disease onset from disease progress. A Norwegian study found that higher educational attainment of wives was associated with lower risk of CHD mortality and lower levels of CHD risk factors in married men, and this association was particularly strong for men with higher education.⁸ Research from Lithuania and the Netherlands also found a protective effect of wives' higher education for men.⁵ The consequences of husbands' education on women's CHD risk have been less studied. Earlier research on mortality indicates that the impact of spousal education may be weaker in women than in men in studies conducted in Israel, Norway and Sweden.^{10, 11, 13, 14} Wives' education may in fact be more influential for men's health and mortality than men's own education.^{5-8, 10, 11, 13} A possible explanation is the greater influence that the wife and her education exert on the adoption of healthier behaviors in the household.¹⁸ This could delay the onset of cardiovascular diseases in both partners.

In addition to influencing the onset of cardiovascular disease, spousal education may also have a significant influence on survival chances. For example, the partner's high educational level may contribute to earlier detection of disease and access to care. A more educated partner may be better equipped to support the partner's recovery, treatment adherence and lifestyle changes. Despite the key importance of the stage after onset of disease for overall patterns of population health, to our knowledge, no prior study has examined how spousal education is associated with fatality after myocardial infarction (MI).

In contrast to the evidence of education as a positive resource, several studies reported an adverse impact of wives having a higher level of education relative to their spouses. Studies conducted in the US in the 1960s and 70s reported that being married to a more educated wife increased the risk of CHD at least for some subgroups of men such as those with Type A personality.¹⁹⁻²⁴ A few studies also suggested elevated risks associated with the higher education of the husband relative to the woman's own education.^{19, 25, 26} These findings garnered considerable interest and debate on the potentially adverse impact of 'status discrepancy' between partners on health through role conflict and stress.^{27, 28}

The high level of gender equality in Finland provides an interesting context to examine the effects of both partners' education and possible educational discrepancy effects. In the early 1980s own and spousal education and occupation were more or less equally predictive of the mortality risks of both sexes.⁷ It is expected that with increasing female education, labor force participation and prevalence of dual-earner households the resources of both partners have become increasingly important for the general socioeconomic standing of the household, and

hence for the health experience of its members. We examine whether spousal education is protective for the incidence of and fatality from MI net of own education in more recent longitudinal Finnish register data. The data provides follow up data for a large nationally representative cohort both for the first incidence of MI and subsequent mortality. Both married and cohabiting individuals are included for the estimation of the effects of the partner's education net of the individual's own education and other socioeconomic resources. Importantly, we also compare their risk of MI incidence and fatality to that of individuals living without a partner, as it is an increasingly common type of living arrangement,²⁹ and often found to be associated with worse health and higher mortality.^{30, 31} A novel aspect of our study is our ability to separate the associations of spousal education with initial incidence of MI versus survival in the aftermath of MI. Uniquely, we also differentiate between short-term and long-term fatality, as the former may be more strongly influenced by access to care, whereas the latter may be influenced by the extent of life style modification after surviving a heart attack. Our main research questions are:

- (1) Is the partner's education associated with lower risks of MI incidence and fatality net of own education and other socioeconomic resources?
- (2) Does the association of partner's education with the risk of MI incidence and fatality vary according to own education?

METHODS

Data

The data originate from an 11% random sample of the registered adult population in Finland in 1987-2007 together with an 80% oversample of the population who died in the period. Sample weights were constructed from known sampling probabilities and were taken into account in all descriptive statistics and analyses. The data derive from several registers covering the whole Finnish population, including the labor market data file, cause of death records, registers on hospital discharges and special drug reimbursement rights. Data linkage was performed by Statistics Finland using unique personal identification numbers and then anonymized for research purposes. Permission to use the data for research was granted by Statistics Finland (TK-53-1519-09).

The sample for the study included 40-69 year old men and women who were living in private households at baseline in 1990 (weighted $n=378,001$). CHD status prior to, or at baseline, was identified by CHD diagnoses in hospital discharge records (International Classification of Diseases, 8th revision (ICD-8) and ICD-9 codes 410-414) or special rights to drug reimbursement for CHD between 1970 and 1990. Individuals with CHD (6%) were excluded to identify the first incidence of MI. MI incidence and mortality (ICD-9 code 410 for 1991-1995 and ICD-10 codes I21-I22 for 1996-2007) in the follow-up between 1991 and 2007 were identified from the hospital discharge records and the cause of death register. In addition to the first MI incidence (fatal or non-fatal), we examined two fatality outcomes: First, to capture short-term fatality from MI, we constructed the outcome of 28-day fatality, which includes MI deaths occurring before any hospitalization for MI as well as all-cause mortality in the first 28 days starting from the date of the MI hospitalization. Second, all-cause mortality during the follow-up of the MI patients who were alive after the 28-day period was examined as long-term fatality, which had an average of 1710 follow-up days. We focused on all-cause mortality as the outcome, as this provides an integral view of potential spillover effects, including deaths

from comorbidities related to heart disease. However, analyses on long-term fatality were repeated also by using CVD mortality as the outcome.

Variables

The socio-demographic characteristics of the sample were identified using register-based information. Information on the highest educational qualification of the individuals was grouped into categories of 1) tertiary (13 years or more), 2) secondary (up to 12 years) and 3) basic level (up to 9 years) education. The basic level category includes individuals who have not obtained qualifications beyond the basic level, but may also include those whose qualifications are unknown, e.g. recent immigrants. The group of non-registered higher educational qualifications is likely to be small, as Finland had not experienced high levels of immigration in the 1990. Education of the marital or cohabiting partner was constructed from yearly information on whether the person was living with a marital or cohabiting partner and that partner's education, and was categorized in the same manner as own education. Cohabitation was identified in the data when an individual was living together with another adult of the opposite sex who was not a sibling and who had an age difference of less than 16 years. In the main effect analyses, we included an additional category that identified those without a married or cohabiting partner. For interaction analyses, dummies were constructed for own and spousal basic level education.

To control for possible confounders of partnership status, we included three additional indicators of the index individuals' socioeconomic position at the baseline in 1990. Occupation was grouped into six categories: upper non-manual, lower non-manual, specialized manual, non-specialized manual, farmer or entrepreneur and other or unknown. Employment status was assessed by main activity in 1990 and differentiated between employment, unemployment, retirement, and other. The information was derived from previous censuses if not available for that year. Information on individual taxable income originated from the tax records and incorporated the wages, capital income, and taxable income transfers (no missing information). Income was divided into quintiles calculated for men and women separately. A covariate on the year of the first MI categorized into three-year groups was also included for the fatality analyses.

Statistical analysis

MI incidence was analyzed with Cox's proportional hazards regression models with age as the underlying time. The baseline date was set at December 31st 1990 with a follow-up until the end of the year 2007. Information on own and partner's education was updated for each year of follow-up from information from the previous year allowing for changes in education and partnership status. Censoring occurred at MI, death, emigration (when the individual is no longer in the annual records), whichever took place first. For fatality analyses, we used information on education from the year prior to MI incidence. 28-day fatality was examined with log binomial regression to estimate risk ratios. Long-term fatality was analyzed with Cox regression with the follow-up beginning on the 28th day after hospitalization and ending at the end of 2007, and censored for death or emigration.

The analyses were conducted separately for men and women, with the highest category used as the reference group in each socioeconomic variable. Model 1 shows total effects of own and partner's education by including each of these variables of interest separately with age at baseline (1990 or at incidence) in five-year age groups and the year of MI (for fatality). Model

2 incorporates both own education and partner's education to distinguish independent effects, and to control for factors that may influence partnership status, model 2 additionally adjusts for own occupation, employment status and individual taxable income. Analyses were performed using Stata 14.0 (StataCorp 2015, College Station, TX).

We examined whether the level of own education modified the effect of partner's education using the dummy variables for own and spousal basic education in the married and cohabiting population in model 2. Deviations from additivity were assessed in model 2 by calculating the relative excess risk due to interaction (RERI) using the method provided by Andersson and colleagues,³² with 95% confidence intervals (CI) computed using the delta method. In the RERI analyses, the null of 0 corresponds to exact additivity.

RESULTS

The majority of the sample was married (64% of women, 72% of men), and a small proportion was cohabiting (5% women, 6% men). More women had no partner (31%) than men (22%). Table 1 describes the distribution of the socioeconomic characteristics of the sample by gender and whether the person was in a married or cohabiting relationship at baseline or not. A greater proportion of men than women were tertiary educated. In general, those with partners had greater socioeconomic resources than those without partners, but the differences were greater in men. The correlation between an individual's own education and that of their partner was 0.43 in women and 0.41 in men. Table e1 (Supplemental Digital Content 1) describes the crude outcome rates by own and partner's education in 1990, which are higher in the lower educational categories, but highest for those living without a partner.

The results presented in Table 2 demonstrate that both own and partner's education had "dose response" associations with MI incidence (model 1). When mutually adjusted and controlled for other indicators of socioeconomic resources, the estimated effects of own and partner's education were quite similar in women (model 2). In men, MI incidence risk associated with partner's basic education was somewhat higher than that of own education. For both sexes, the hazard associated with having no partner was higher than having a partner with only basic level education.

Short-term fatality was examined in those who had an MI during follow up (Table 2). 29% of incident MI events in women and 32% in men were fatal in the first 28 days. In women, partner's education was as strong a predictor of 28-day fatality as own education, whereas in men own education was associated with greater risks of fatality (model 1). An increased fatality risk remained particularly for women with basic educated partners when adjusted for individual socioeconomic characteristics (model 2 RR 1.18, 95% CI 1.02, 1.36). However, having no partner was associated with the highest risk of fatality, with 39% (95% CI 21, 60%) and 46% (95% CI 34, 59%) increased risks compared to those with tertiary level educated partners in women and men respectively (model 2).

Both own and partner's education were associated with long-term fatality when adjusted for age at incidence and year of MI (Table 2, model 1). When additionally adjusted for other socioeconomic characteristics, women with partners with secondary or basic level education continued to show greater hazards compared to those with tertiary educated partners (model 2). For men, the estimated effect of partner's education was smaller. The strongest association with fatality was found in having no partner in both women (HR 1.82, 95% CI 1.46, 2.27) and men (HR 1.68, 95% CI 1.46, 1.95) even after controlling for other socioeconomic

characteristics. Supplementary analyses of long-term mortality focusing exclusively on cardiovascular deaths showed similar or slightly higher effect estimates (see eTable 2, Supplemental Digital Content 2). Similar results were expected, as 65% in the long fatality period were CVD deaths.

Figures 1-3 describe the results for the interactions for dummy variables of own and partner's basic education focusing exclusively on individuals with a partner. The individuals with both basic education themselves and basic educated partners have the highest risks of MI incidence, and short- and long-term fatality. However, the confidence intervals overlap with couples in which only one has basic education. The MI risks for those who have basic education themselves, but more highly educated partners, and vice versa, appear similar. For MI incidence, there was evidence for a deviation from the additive effects of own and partner's low education for men, which indicated that the hazard associated with partner's basic education was less strong than expected in men with basic education (RERI for men -0.13, 95% CI -0.24, -0.02; for women -0.04, 95% CI -0.20, 0.12). The RERIs for short- and long-term fatality did not indicate substantial deviations from additivity (short-term fatality RERI for men -0.01, 95% CI -0.13, 0.10; for women -0.07, 95% CI -0.32, 0.18; long-term fatality RERI for men -0.07, 9% CI -0.63, 0.49; for women 0.03, -0.36, 0.41), but the estimates for the interactions had low precision.

DISCUSSION

This study examined how the level of education of the marital or cohabiting partner – the closest and most intimate social connection that many people will have in their lives – was associated with MI incidence and survival. The results suggest important spillover benefits of high educational levels within couple dyads. In the Finnish context of the study, we found that a high educational level of a partner was associated with significant health advantages irrespective of the level of own education. The partner's lack of qualification beyond basic education was associated with higher MI incidence and fatality risk net of an individual's own education and other socioeconomic characteristics. Those without a partner had, however, even greater risks of MI incidence and shorter survival, a finding that emphasizes the public health needs of this population group.

An advantage of the large sample size of the study was that it enabled studying educationally heterogamous couples. There is a strong tendency towards educational homogamy (i.e. the tendency for people to marry others with similar educational backgrounds) in most societies including Finland.^{30, 31} In our sample 42% of individuals at baseline had incongruent education relative to their partner, translating to relatively few couples in specific combinations of different educational levels. The results indicated that there was some variation in the effects of partner's education according to level of own education. For MI incidence, there was evidence of deviation from additive effects, which revealed that the gradient by partner's education was greater particularly for men with higher education, similar to findings for CHD mortality in a Norwegian study.⁸ However, the effect in our study was small. Thus the educational discrepancy hypothesis¹⁹⁻²⁸ received some weak support in our data, but the effects of own and spouse's education seemed to be mostly additive. On the whole, the advantages of greater household-level educational capital seem to outweigh possible negative effects. The results are consistent with findings from other recent studies of CHD incidence^{5, 35} and mortality.¹⁰⁻¹⁴ Earlier studies indicating status discrepancy effects were situated in 1960-70s US when having a more educated wife was more unusual²⁸ and more traditional gender role

attitudes are likely to have prevailed. The cultural significance of differing educational levels within couples can be expected to have changed as women's educational levels have begun to surpass those of men in many countries.

That a partner's education – as well as having a partner at all – was more clearly associated with long-term than short-term fatality may suggest that a partner's resources are of greater importance for general life style modification and support, rather than accessing healthcare in the immediate aftermath of the MI. The results also suggested that partner's education was more influential than own education for women's long-term fatality. These findings run somewhat contrary to the suggestion that women have a greater role in shaping health-related behaviors within the household.¹⁸ The man's educational resources may be associated with other mechanisms beneficial for the health of the female partner after MI incidence, which we could not study directly. Greater educational capital in the household may increase the instrumental support available for navigating the healthcare system and following medical treatments. It is possible that a highly educated man is in a better position to provide greater social support and exert more social control for making necessary behavioral adjustments. The man's socioeconomic resources, such as income, may also be an important factor for women's health due to disadvantages that women face in the labor market.^{6, 14, 36} This effect may be amplified if illness precludes participation in the labor market, as the partner's high income can improve the financial stability of the household. We adjusted for the study subject's own socioeconomic resources at baseline as a potential confounder of the association between partner's education and the outcomes, but not the partner's income, which may be a significant mechanism.

The educational resources of both partners' are hypothesized to influence the shared environment of the couple, and the material and psychosocial resources available in the household, which may in turn shape the health-related behaviors of both partners. A limitation of the study was that the specific psychosocial or behavioral mechanisms explaining differentials in MI incidence or post-MI survival could not be investigated. Further research is needed to understand the hypothesized mechanisms in detail. The greatest threat to causal inference is the unobserved factors preceding socioeconomic attainment that result in partner selection based on health-related behaviors or cognitive characteristics. Furthermore, the analyses of fatality had to be restricted to those in the sample who experienced a MI in the follow up and as such, there may be a risk of collider stratification bias compromising the identification of true causal effects of education for fatality.³⁷

The tendency to educational homogamy and assortative partner selection is, however, likely to reinforce health inequalities. On the one hand, the resources of those closely socially connected can provide additional advantages for health, whereas lacking close social contacts is likely to put a person at a distinct disadvantage. Individuals living alone may experience cumulative disadvantage as they are excluded from the health enhancing effects of marital and cohabiting relationships as well as access to the additional socioeconomic resources of partners¹⁸ and possibly those of adult offspring, who may provide additional material and non-material resources.^{3, 4} Intergenerational transmission of education from parents to offspring would be a relevant pathway in this respect and deserves attention in future studies. On the other hand, partnered households with low socioeconomic resources may also lack health-enhancing resources, and possibly experience a diffusion of risk behaviors and strain from health problems of other household members.³⁸ In our study, the gradient of MI incidence when comparing educationally homogamous couples was around twice the size of that when only using own education, which echoes findings for self-rated health in Norway³⁹ and the

Netherlands.⁹ The strong accumulation of advantage in some households and disadvantage in others is likely to lead to diverging socioeconomic and health trajectories, and greater population level social inequalities in health.

The strengths of the study lie in the data, with which we could follow large nationally representative cohorts for first MI incidence and the survival thereafter both in the short-term and the long-term. The Finnish hospitalization data for MIs has been found to be of good quality.⁴⁰ Registers provide reliable information on socioeconomic characteristics with a low level of missing information. The strong correlation of own education and spousal education needs to be borne in mind when interpreting the mutually adjusted models as their collinearity can inflate standard errors and make estimates unstable. However, our estimates do not fluctuate much from the more simple models to the fully adjusted model and the confidence intervals remain quite narrow. We also calculated Cramér's V's and variance inflation factors (VIF) and found that their values were acceptable. Nevertheless, these models do not account for the effects of own and spousal education that are shared. The possibility to use detailed time-varying measures of partnership status and education and take into account changes in partnership situation was, however, an advantage. We were also able to include a measure of the partner's education among individuals who were identified as cohabiting partners within the registers. However, as the proportion of cohabiters in these cohorts is still relatively small, we were not able to examine whether the effects of partner's education differed between the married and the unmarried cohabiters. Nor was it possible to consider whether partnership duration modified the effects. We also could not identify same-sex couples in the data.

Overall, the study shows that partners and their educational resources are associated with health advantages that delay heart disease onset and improve survival. Moreover, due to increasing tendencies to marital homogamy particularly by characteristics such as education^{33, 34} these education spillover effects may be contributing to the widening of socioeconomic gaps in CHD incidence and survival.

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Table 1. Baseline Descriptive Characteristics by Gender and Partnership Status of Sample of Adults Aged 40-69 in 1990

Characteristic		Women		Men	
		With partner	No partner	With partner	No partner
		(n=128,835) %	(n=57,120) %	(n=130,912) %	(n=37,193) %
Own education	Tertiary	17	16	23	12
	Secondary	26	23	24	24
	Basic	56	61	52	63
Partner's education	Tertiary	23		19	
	Secondary	22		29	
	Basic	55		52	
Individual taxable income quintile	Highest	19	22	23	9
	2.	21	18	22	14
	3.	21	18	21	18
	4.	18	24	19	22
	Lowest	21	18	15	37
Occupation	Upper white-collar	11	10	17	9
	Lower white-collar	38	37	18	12
	Worker, specialized	12	14	28	31
	Worker, non-specialized	20	24	15	27
	Farmer/self-employed	17	12	21	19
	Other/unknown	1	2	1	2
Employment status	Employed	68	52	74	58
	Unemployed	2	2	1	5
	Retired	24	42	23	33
	Other	6	4	2	4
		100 %	100 %	100 %	100 %

Table 2. Main Effects of Own and Partner's Education for Myocardial Infarction Incidence, and Post-Myocardial Infarction Short-term and Long-term Fatality in 1991-2007

		MI INCIDENCE				SHORT-TERM FATALITY				LONG-TERM FATALITY			
		Model 1 ^a		Model 2 ^b		Model 1 ^c		Model 2 ^d		Model 1 ^c		Model 2 ^d	
		HR	95% CI	HR	95% CI	RR	95% CI	RR	95% CI	HR	95% CI	HR	95% CI
Women (n=185,995, events=8,490)						(n=8,473, events=2,481)				(n=5,968, events=2,057)			
Own education	Tertiary	1.00	Referent	1.00	Referent	1.00	Referent	1.00	Referent	1.00	Referent	1.00	Referent
	Secondary	1.43	1.28, 1.59	1.11	0.99, 1.26	1.11	0.97, 1.26	1.02	0.88, 1.18	1.17	0.96, 1.42	0.99	0.78, 1.25
	Basic	1.76	1.59, 1.93	1.26	1.12, 1.41	1.27	1.13, 1.43	1.09	0.95, 1.26	1.43	1.20, 1.70	1.11	0.89, 1.38
Partner's education	Tertiary	1.00	Referent	1.00	Referent	1.00	Referent	1.00	Referent	1.00	Referent	1.00	Referent
	Secondary	1.35	1.17, 1.55	1.13	0.98, 1.31	1.13	0.95, 1.34	1.10	0.92, 1.31	1.51	1.16, 1.97	1.44	1.10, 1.90
	Basic	1.63	1.45, 1.83	1.27	1.12, 1.43	1.29	1.12, 1.48	1.18	1.02, 1.36	1.76	1.42, 2.17	1.53	1.22, 1.92
	No partner	1.79	1.60, 2.00	1.50	1.34, 1.69	1.48	1.29, 1.69	1.39	1.21, 1.60	2.01	1.63, 2.48	1.82	1.46, 2.27
Men (n=168,105, events=15,626)						(n=15,597, events=5,052)				(n=10,511, events=3,329)			
Own education	Tertiary	1.00	Referent	1.00	Referent	1.00	Referent	1.00	Referent	1.00	Referent	1.00	Referent
	Secondary	1.40	1.32, 1.50	1.09	1.01, 1.18	1.11	1.03, 1.19	1.00	0.92, 1.08	1.26	1.12, 1.43	1.03	0.89, 1.19
	Basic	1.54	1.46, 1.63	1.12	1.04, 1.20	1.27	1.19, 1.35	1.08	1.00, 1.16	1.57	1.42, 1.74	1.17	1.02, 1.35
Partner's education	Tertiary	1.00	Referent	1.00	Referent	1.00	Referent	1.00	Referent	1.00	Referent	1.00	Referent
	Secondary	1.36	1.26, 1.47	1.16	1.07, 1.25	1.08	0.98, 1.18	1.02	0.93, 1.12	1.19	1.03, 1.38	1.02	0.88, 1.19
	Basic	1.50	1.40, 1.61	1.21	1.12, 1.31	1.19	1.10, 1.29	1.09	1.00, 1.18	1.45	1.28, 1.65	1.15	1.00, 1.33
	No partner	1.80	1.68, 1.93	1.38	1.28, 1.49	1.69	1.56, 1.83	1.46	1.34, 1.59	2.25	1.96, 2.57	1.68	1.46, 1.95

Note: MI incidence and long-term fatality were analyzed with Cox regression to estimate hazard ratios. Short-term fatality was examined with log binomial regression to estimate risk ratios.

Abbreviations: 95% CI=95% confidence interval; HR=hazard ratio; MI=myocardial infarction; RR= risk ratio

^a adjusts for age and own education or partner's education

^b adjusts for age, own education, partner's education, individual income, occupation, and employment status

^c adjusts for age, year of MI and own education or partner's education

^d adjusts for age, year of MI, own education, partner's education, individual income, occupation, and employment status

Figure 1. Myocardial Infarction Incidence by Own and Partner's Education

Note: Analyses in partnered individuals, and model additionally adjusted for age, individual income, occupation, and employment status

Figure 2. Post-Myocardial Infarction Short-term Fatality by Own and Partner's Education

Note: Analyses in partnered individuals, and model additionally adjusted for age, year of MI, individual income, occupation, and employment status

Figure 3. Post-Myocardial Infarction Long-term Fatality by Own and Partner's Education

Note: Analyses in partnered individuals, and model additionally adjusted for age, year of MI, individual income, occupation, and employment status

Supplemental Digital Content 1

eTable 1. Myocardial Infarction Incidence and Long-term Fatality Rates Per 10,000 Person Years and Short-term Fatality Percentages in 1991-2007

		MI incidence rate per 10,000	28-day fatality %	Long-term fatality rate per 10,000
Women	All	29	29	638
Own education	Tertiary	12	21	400
	Secondary	18	24	460
	Basic	39	31	709
Partner's education	Tertiary	11	19	293
	Secondary	13	21	384
	Basic	27	27	548
No partner		44	33	824
Men	All	63	32	501
Own education	Tertiary	39	26	321
	Secondary	49	27	349
	Basic	80	35	603
Partner's education	Tertiary	33	23	263
	Secondary	47	25	312
	Basic	75	31	532
No partner		78	42	738

Supplementary Digital Content 2

eTable 2. Post-Myocardial Infarction Long-term Cardiovascular Fatality by Own and Partner's Education in Women and Men in 1991-2007

		Model 1 ^a		Model 2 ^b	
		HR	95% CI	HR	95% CI
Women (n=5,968, events=1,407)					
Own education	Tertiary	1.00		1.00	
	Secondary	1.38	1.10,1.72	1.08	0.83,1.41
	Basic	1.70	1.40,2.07	1.21	0.94,1.56
Partner's education	Tertiary	1.00		1.00	
	Secondary	1.65	1.23,2.20	1.50	1.11,2.04
	Basic	1.86	1.47,2.36	1.53	1.19,1.97
	No partner	2.18	1.73,2.75	1.88	1.47,2.41
Interaction	RERI ^{c,d}			0.09	-0.32,0.50
Men (n=10,511, events=2,107)					
Own education	Tertiary	1.00		1.00	
	Secondary	1.31	1.14,1.50	1.06	0.90,1.24
	Basic	1.61	1.44,1.81	1.19	1.02,1.38
Partner's education	Tertiary	1.00		1.00	
	Secondary	1.19	1.01,1.39	1.01	0.86,1.20
	Basic	1.45	1.26,1.68	1.15	0.98,1.34
	No partner	2.35	2.02,2.72	1.74	1.48,2.04
Interaction	RERI ^{c,d}			-0.04	-0.27, 0.20

Abbreviations: 95% CI=95% confidence interval; HR=hazard ratio; RERI=relative excess risk due to interaction

^a adjusts for age, year of MI and own education or partner's education

^b adjusts for age, year of MI, own education, partner's education, individual income, occupation, and employment status

^c in partnered individuals using dummy indicators of own and partner's basic education

^d the null of 0 corresponds to exact additivity