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Children's educational attainment, occupation, and income and their parents' mortality

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Short Abstract

There is a large literature on the positive *association* between one's own socioeconomic status (SES) and health and mortality and the *association* between parents' SES and offspring childhood and adult health. In contrast, very few studies have examined the relationship between adult children's SES and the health and mortality of their parents. In this paper, we contribute to this literature by using high quality census and death record data in which a large sample of families in Finland were followed from the 1950 Census of Population to subsequent Census (through 1995) and death records (through 2007) beginning in 1970. We expand previous research by including both the children's educational attainment, including whether this education included training in health professions, and two additional indicators of the children's SES, namely income and occupation. We find significant and robust results for children's educational attainment, occupational status and income, even in the presence of controls for parental characteristics. Higher level of education among the children is associated with significantly lower mortality of their parents, results that are consistent with prior studies. In addition, children's occupation and income remain robust predictors of the parents' mortality. Children's higher occupational status and the highest income quintile are associated with significantly lower mortality of their parents.

Introduction

There is a large literature on the positive *association* between one's own socioeconomic status (SES) (Elo 2009) and health and mortality and the *association* between parents' SES and offspring childhood and adult health (e.g., Case and Paxson 2010; Haas 2008). In contrast, very few studies have examined the relationship between adult children's SES and the health and mortality of their parents (e.g., Zimmer et al. 2002, 2007). Children could influence their parents' health through a number of different pathways, including *a)* exchange of knowledge about disease causation and symptom recognition; *b)* advice about dietary practices and health related behaviors; *c)* help in navigating health care systems and communicating with medical personnel; and *d)* provision of monetary and other forms of support. The few studies that have examined *associations* between adult children's education and parents' health have found the correlations to be significant and positive such that higher levels of children's schooling predict better health outcomes of elderly parents (Zimmer et al. 2002, 2007; Friedman and Mare 2010; Torssander 2011).

In this paper, we contribute to this literature by using high quality census and death record data in which a large sample of families in Finland were followed from the 1950 Census of Population to subsequent Census (through 1995) and death records (through 2007) beginning in 1970. Educational and employment opportunities in Finland improved rapidly during the second half of the 20th century such that the educational attainment of the children was far superior to that of their parents. At the same time, as the country industrialized rapidly following World War II, employment opportunities expanded in professional, service and manual occupations outside of agriculture. Thus, both the educational attainment and occupational mobility was far higher among the children than their parents, providing a unique opportunity to examine the associations between children's attained SES and the mortality of their elderly parents. We expand previous research by including both the children's educational attainment, including whether this education included training in health professions, and two additional indicators of the children's SES, namely income and occupation.

Data and Methods

The analyses are based on a data set that consists of a 10% sample of households drawn from the 1950 Finnish Census of Population (Statistics Finland 1997). All individuals have been linked to subsequent census records beginning in 1970 through 1995 and to death records through December 31, 2007 using unique person identifiers by Statistics Finland. Death records provide information on the date and cause of death based on the 8th, 9th or 10th revision of the International Classification of Diseases and Deaths (ICD) with coding of causes made comparable across the ICD revisions.

The 1950 data contain identifiers for families and households making it possible to identify members in the same family. We used unique family identifiers, ages of children, and family members' relationship to the household head in linking children to their parents. For more detail on linking the family members, see Elo et al. (2013).

For these analyses, we included adults (e.g., parents) who at the time of the 1950 census had children aged 0-14. Of the 34,011 such individuals, we excluded those who were not in the 1970 census because they were known to have died before 1970 or moved out of Finland before that time. Our final sample consisted of 29,264 parents who were aged 50-59 in 1970.

Socioeconomic characteristics for these parents were obtained from the 1970 census when they were aged 50-59. Corresponding characteristics for their children were also obtained from the 1970

census or subsequent censuses whichever provided the highest social standing in terms of educational attainment, occupation and income prior to the death of the parent.

Children's characteristics

Because for the majority of the families there are multiple children in the data set, in our preliminary analyses we based children's educational attainment, occupation and income on the highest level achieved by any child in the family, measured prior to the parent's death. We created these variables separately for fathers and mothers because the age at death varied among the parents. We code children's educational attainment as follows: basic or primary (9 years), lower secondary (10-11 years), upper secondary (12 years) and post-secondary (13+ years) education. We also examine whether it matters whether the highest educated child was a son or a daughter. In addition, we hypothesized that whether or not the children were educated in the healthcare field would have an independent association with the parents' mortality. Thus we also introduce a binary variable indicating whether any of the children had obtained education in a healthcare field (e.g., doctors, nurses, health aids et cetera). Children's occupation is grouped into five categories: upper white collar, lower white collar, farmer/self-employed, manual worker and other. Income was first classified into quintiles in each census used to code this variable (1970-1985), and the children's highest income quintile is used in the analysis. In addition, we control for the number of sons and daughters in the family who survived their parents.

Parents' characteristics

We control for several characteristics of the parents, including parent's education, occupation and marital status taken from the 1970 census, before the start of the mortality follow-up. Parents' educational attainment is coded as: "no schooling or unknown", "primary school", "past primary school" and "tertiary education." Parents' occupation is coded as: "upper white collar", "lower white collar", "manual worker", "farmer/self-employed" and "other/missing." Women who were housewives in 1970 and had not worked previously are coded in the "other/missing" category in the analysis reported here. We categorize marital status as "married," "divorced," "single" or "widowed". If information on marital status was missing in 1970 census, we replaced it with the value from the 1950 Census (n=398).

Mortality follow-up

The mortality follow-up starts on 1.1.1971 and extends to the end of 2007.We report preliminary results for all cause mortality. We will also analyzed mortality from cardiovascular diseases (CVD), alcohol-related causes, accidents and violence and lung cancer, and a residual group of causes. Alcohol-related causes, which include among others alcoholic liver disease, alcoholic diseases of the pancreas, alcoholic cardiomyopathy, alcohol dependence syndrome and other mental and behavioral disorders due to alcohol use, are important causes of middle age male mortality in Finland (Herttua, Mäkelä, & Martikainen, 2008). In addition many accidental and violent deaths in Finland are associated with excessive alcohol use (Herttua et al., 2008). Lung cancer, a cause of death closely associated with cigarette smoking, is an important cause of death, especially among men (Martikainen et al. 2013).

Statistical Methods

We use a Cox proportional hazards regression to estimate the associations between our independent variables and all-cause and cause-specific mortality. As noted above follow-up starts at the

beginning of 1971. Those who remained alive during the entire follow-up period are censored at the end of 2007. In the cause-specific analysis, individuals who died from causes other than the one under investigation will be censored at their date of death. We calculated cluster-robust standard errors to account for clustering of the observations in families.

We present preliminary results from three models. Model 1 controls for the parent's age in 1971 and sex and each of the explanatory variables in turn to examines the unadjusted associations between our explanatory variables and all-cause mortality. Model 2 further adjusts for the characteristic of the children, including education, occupation, and income. Model 3 controls all parental characteristics, and Model 4 includes both children's and parents' characteristics.

Results

The preliminary results of the analyses of all cause mortality are shown in Table 1. We find significant and robust results for children's educational attainment, occupational status and income, even in the presence of controls for parental characteristics. Higher level of education among the children is associated with significantly lower mortality of their parents, results that are consistent with prior studies. The magnitude of these protective associations range from about 5% to 25%. In addition, we further show that it matters whether any of the children were educated in the health care field. Parents of children with health care training have significantly lower mortality than parents of other children, controlling for children's overall level of education. We hypothesize that this result is likely to be due at least in part to greater health knowledge and better ability to negotiate the health care system. In addition, the results further suggest that having a highly educated daughter is beneficial.

In addition, children's occupation and income remain robust predictors of the parents' mortality in Model 4, when controlling for all parental and childhood characteristics. Children's higher occupational status and the highest income quintile are associated with significantly lower mortality of their parents. Parental educational attainment, occupation and marital status are also significant predictors of their own mortality, but only marital status remains significant when we control for the children's characteristics.

Next steps:

We will further explore alternative coding of the children's characteristics and examine possible interactions among the explanatory variables and whether these associations vary between mothers and fathers. In particular, we are interested in possible compensatory effects; e.g, for parents in the lower SES groups children's higher SES may be particularly protective, while for parents whose own SES is high relative to others children's higher SES may matter less.

As noted above, we will extend these analyses to cause-specific mortality. Our preliminary analysis suggest that at least children's educational attainment is a significant predictor of the parents' mortality from cardiovascular diseases and lung cancer and alcohol-related causes.

These analyses may help shed some light on the question of whether the children's characteristics influence parental mortality because the children's attained SES is determined by the parents.

Table 1. Hazard ratios from Cox Proportional hazard models predicting all-cause mortality, Finland 1971-2007

		Model 1 (control for age and sex)			Model 2			Model 3			Model 4		
		HR	95% CI		HR	95% CI		HR	95% CI		HR	95% CI	
Parent age					**1.02**	1.01	1.02	**1.02**	1.01	1.02	**1.02**	1.01	1.02
Parent sex	male				**1**			**1**			**1**		
	female				**0.55**	0.54	0.57	**0.54**	0.52	0.55	**0.54**	0.52	0.55
Children's highest education	basic (9yrs)	**1**			**1**						**1**		
	lower second (10-11yrs)	**0.91**	0.88	0.94	**0.90**	0.87	0.93				**0.90**	0.87	0.94
	upper second (12yrs)	**0.82**	0.79	0.86	**0.87**	0.83	0.91				**0.89**	0.85	0.93
	post second (13+yrs)	**0.73**	0.70	0.75	**0.81**	0.77	0.86				**0.85**	0.80	0.89
Children's highest SES	upper white collar	**0.69**	0.66	0.72	**0.72**	0.68	0.76				**0.73**	0.69	0.77
	lower white collar	**0.83**	0.80	0.87	**0.82**	0.79	0.86				**0.83**	0.79	0.87
	farmer / self-employed	**0.85**	0.80	0.90	**0.83**	0.78	0.87				**0.86**	0.81	0.91
	manual worker	**1**			**1**						**1**		
	other	**1.43**	1.20	1.71	**1.55**	1.29	1.86				**1.57**	1.31	1.88
Children's highest income	1. decile (low)	**1.07**	1.02	1.12	**0.96**	0.90	1.02				**0.96**	0.90	1.02
	2. decile	**1.12**	1.07	1.17	**1.01**	0.96	1.06				**1.01**	0.96	1.07
	3. decile	**1.10**	1.06	1.14	**0.99**	0.95	1.03				**0.99**	0.95	1.03
	4. decile	**1.05**	1.02	1.08	**0.95**	0.92	0.99				**0.95**	0.92	0.99
	5. decile (high)	**1**			**1**						**1**		
Child educated in healthcare	no	**1**			**1**						**1**		
	yes	**0.86**	0.83	0.893	**0.94**	0.90	0.97				**0.94**	0.90	0.98
Sex of the highest educated child	boy	**1**			**1**						**1**		
	girl or same level	**0.93**	0.908	0.955	**0.95**	0.91	1.00				**0.96**	0.92	1.01
Number of children	(linear)	**1.05**	1.034	1.056	**1.07**	1.06	1.08				**1.07**	1.06	1.09
Has boys	(dummy)	**1.19**	1.16	1.22	**1.05**	1.00	1.09				**1.05**	1.01	1.09
Has girls	(dummy)	**1.10**	1.07	1.13	**1.07**	1.02	1.12				**1.06**	1.01	1.11
Parent's education 1970	no school, unknown	**1.13**	1.088	1.169				**1.12**	1.08	1.16	**1.07**	1.03	1.11
	primary school	**1**						**1**			**1**		
	past primary	**0.91**	0.865	0.959				**0.97**	0.92	1.03	**1.02**	0.96	1.08
	tertiary education	**0.79**	0.74	0.841				**0.90**	0.83	0.98	**0.97**	0.89	1.05
Parent's SES 1970	upper white collar	**0.74**	0.705	0.785				**0.81**	0.75	0.86	**0.88**	0.82	0.95
	lower white collar	**0.87**	0.841	0.906				**0.89**	0.86	0.93	**0.96**	0.92	1.00
	manual worker	**1**						**1**			**1**		
	farmer/self-employed	**0.92**	0.889	0.942				**0.92**	0.90	0.95	**0.92**	0.89	0.95
	other/missing	**1.00**	0.927	1.072				**0.97**	0.91	1.05	**0.96**	0.89	1.03
Parent's marital status 1970	married	**1**						**1**			**1**		
	divorced	**1.25**	1.171	1.329				**1.23**	1.16	1.32	**1.24**	1.16	1.32
	single	**1.23**	1.093	1.392				**1.20**	1.07	1.36	**1.17**	1.02	1.33
	widow	**1.10**	1.064	1.147				**1.09**	1.05	1.13	**1.08**	1.04	1.12

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