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The ethno-linguistic community and premature death:

A register based study of working-aged men in Finland

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Abstract. One of the most striking features of premature death in Finland is the ethno-linguistic mortality gradient in working-aged men. Finnish speakers have a notably higher mortality risk than Swedish speakers. The underlying reasons are not fully clear, but one suggested explanation has been that the level of social integration is lower in the Finnish-speaking community than in the Swedish-speaking, as people in the former are geographically less rooted at the local level. In this paper we derive a proxy for the influence of the ethno-linguistic community as a contextual factor on the Finnish-Swedish mortality gradient. The strategy is based on a unique setup that makes it possible to identify people not only by their ethno-linguistic background and ethno-linguistic affiliation, but we indirectly know also in which community a person has been raised. Results of Cox regressions provide poor support for the contextual hypothesis, however, and rather suggest that latent individual characteristics such as hereditary factors might be important, hence illuminating the complexity behind the excess mortality of Finnish speakers.

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1. Introduction

One of the most striking features of premature death in Finland is the ethno-linguistic mortality gradient in working-aged men (Saarela & Finnäs, 2006, 2009a). At the national level, the standardised death risk of Finnish-speaking men aged 18-50 years is 1.67 that of Swedish-speaking men (Table 1). In municipalities with both Swedish- and Finnish-speaking settlement in Southern and Western Finland, where overall mortality is lower than elsewhere, the corresponding ratio is 1.56. One third of the male deaths are due to alcohol related causes or accidents, whereas one fifth each can be attributed to suicides, cardiovascular diseases, and other diseases. For all main causes, there is excess mortality of Finnish-speaking men as compared with Swedish-speaking men, but the difference is largest for alcohol related deaths. The situation in women is notably different. The annual number of deaths in women is less than half of that in men, approximately 40 per cent of all female deaths are due to non-cardiovascular diseases, mostly cancer, and the all-cause ethno-linguistic mortality gradient is smaller than in men. This paper is concerned with all-cause mortality, and since premature death is a predominantly male phenomenon, the focus is on men.

(Table 1 here)

Socioeconomic status and family position, as well as social and familial background, have been found strongly related to mortality at these ages, but they only partly contribute to the difference between the two ethno-linguistic groups (Saarela & Finnäs, 2008a, 2009a). A considerable difference remains also if various area-level variables, such as urbanisation, unemployment and ethnic-group concentration, are being controlled for (Blomgren et al., 2004; Sipilä & Martikainen, 2009). Yet we know that the between-group mortality difference is particularly marked within the socially vulnerable group of unemployed single men (Saarela & Finnäs, 2005), which signals that some latent individual factors might be important.

As a consequence, two competing hypotheses have been put forward. One relates to the growing body of literature on the association between social capital and health (Kawachi & Berkman, 2000; Kawachi, Subramanian, & Kim, 2008; Kawachi, Takao, & Subramanian, 2013). Studies in this area suggest that social cohesion in terms of interpersonal trust, reciprocity, density of membership of associations, strengths of mutual aid, and other community-related factors might promote health and thus in the long run reduce mortality. In the case of Finland, it has been argued that the level of social integration is lower in the Finnish-speaking community (Hyyppä & Mäki, 2001a, 2001b; Nyqvist et al., 2008), since Finnish speakers have higher internal migration rates than Swedish speakers and are thus less rooted at the local level (Saarela & Finnäs, 2004, 2008b). Swedish speakers, on the other hand, constitute a small and geographically concentrated minority with own networks, and this difference as compared with Finnish speakers might promote health and reduce the mortality risk. There exists no unequivocal evidence in support of this contextual hypothesis, however.

The other hypothesis relates to the fact that, due to the history of the country's population settlement, people in each group differ in genotype (Saarela & Finnäs, 2010, 2011). Differences in genetically related disease susceptibility, and the interaction between hereditary and environmental factors, might consequently be an explanation to the mortality gradient. The argument is supported by several studies in demography, medicine and genetics; see Saarela and Finnäs (2009b, 2010, 2011) for an overview of the literature. The evidence must nevertheless be considered only indirectly anchored, because available population registers and death statistics do not contain any link to genetical or biological data.

As an attempt to test whether the contextual explanation holds true, this paper takes a novel approach. We use multigenerational register data linked to mortality records, which makes it possible to observe not only the ethno-linguistic affiliation of the individual himself, as done

by previous studies, but also to account for each person's ethno-linguistic family background. This approach provides a previously unexplored way for analysing the ethno-linguistic mortality gradient. People who come from ethno-linguistically mixed families are similar with respect to background, but they can be separated according to if they were raised within the Finnish or Swedish community. This division has the advantage that we can study the potential influence of the ethno-linguistic community as a contextual factor on the ethno-linguistic mortality gradient. Comparing people with homogamous Finnish and homogamous Swedish background, on the other hand, would suffer from the methodological problem that those in the former group are supposed to be disadvantaged on both contextual and non-contextual factors associated with mortality. With such an approach only, it would consequently not be possible to distinguish the contextual influence.

In the population register in Finland, every individual has a unique notation for ethno-linguistic affiliation, which here means either Finnish or Swedish. An important prerequisite for our analyses is that in the cohorts studied, born 1953-1970, being classified as a Swedish speaker (Finnish speaker) means that a person has been raised within the Swedish (Finnish) community in terms of education, friendship cliques, military service, church attendance, and participation in private, public and third sector associations. The reason is that until the 1970s, the dominant view in Finland was that children could not learn two languages simultaneously (Lojander-Visapää, 2001). As a result, the vast majority of families in which the parents had different ethno-linguistic affiliation became monolingual in practice (Finnäs & O'Leary, 2003; Saarela & Finnäs, 2013). Hence, even if people in the cohorts studied here were born into mixed unions, they were raised within the ethno-linguistic community as reflected by their classification in the population register.

Using a unique setup, we will consequently shed light onto the broader issue of whether the ethno-linguistic community as a contextual factor might influence health and thus

mortality at the individual level. If this contextual factor underlies the ethno-linguistic mortality gradient in Finland, we expect to see two things. First, persons with mixed background and Finnish affiliation should have a higher mortality risk than those with mixed background and Swedish affiliation, because they were raised in a less beneficial community. Second, persons with mixed background and Finnish (Swedish) affiliation should have the same mortality risk as those with homogamous Finnish (Swedish) background, since people in both these groups were raised within the same community. Our aim is to study if any empirical support for these two mutually supporting research questions can be found.

2. Data and methods

The data used (with Statistics Finland's permission TK-53-186-09) come from the population register files known as 'Palapeli'. They were formed by combining information from Statistics Finland's longitudinal population census file, the longitudinal employment statistics file, the register of completed education and degrees, marriages and divorces, moves between dwellings, and birth of children. For a random sample of reference persons born between 1920 and 1988, we have linkage to a corresponding file with all their co-residential partners and to another file with each reference person's children. For persons born after 1953, there is an additional file with information about the reference persons' both parents. Thus for all persons the data include two generations, and for some segments even three generations. Information on births, all-cause mortality, marriages, union entry, separations, and migration is at the annual level. For each reference person, the partner, and the children there are data from each quinquennial census during the period 1970-2000, and from the year 2003. Unfortunately there is no information about the cause of death in these data.

We have access to an eight per cent sample of all Finnish speakers, plus an identically constructed 50 per cent sample of all Swedish speakers. We follow persons born 1953-1970

over time and estimate their all-cause mortality risk in ages 18-50 years, adjusting for effects of socioeconomic and demographic confounders.

To refine comparisons, the data are delimited in two ways. First, since the separation risk is higher in ethnically mixed families than in homogamous ones and mortality is elevated among people who come from broken families (Saarela & Finnäs, 2009a, 2014), we study only persons who lived with both parents in the census prior to their 18th birthday. Analysed are thus people raised within intact families, which will help us to assess the potential influence of the ethno-linguistic community as a contextual factor on mortality, rather than being concerned with overall mortality variation.

Second, we want to include only people who were raised in a monolingual environment. The variable of central interest on this account is ethno-linguistic affiliation, which is based on each parent's and the study person's own registered language as observed from the censuses. In the data from 1970 and 1975, this information is from the 1970 census, where the question refers to a person's *main language*, which basically means the most common language used. Since 1980, the information stems from the Central population register and refers to a person's *mother tongue*, which in practice is understood as ethnicity. The vast majority of people is naturally categorised in the same manner irrespective of the criterion applied. Only about 21,300 persons, or less than 0.5 per cent of the country's total population, had different notations (Finnäs, 2000). The proportion is naturally higher among people with an ethnically mixed background, or 12.5 per cent in the data used here. These shifts in ethno-linguistic categorisation might be a reflection of multi-ethnic affiliation and bilingualism. In order to achieve homogenous and comparable study groups, these persons are therefore excluded from analysis. All persons with mixed background studied here were consequently classified as either a Swedish speaker or a Finnish speaker according to both criteria. The parents' affiliation is according to the situation in 1970 and hence refers to the main language.

The multigenerational structure of the data makes it possible to sample study persons in two ways. First, we include individuals born 1953-1970 who were categorised as children of the reference persons. The other parent was identified among the reference person's partners by utilising information about the timing of unions and data from the censuses. Second, we include also people who appear as reference persons, born 1953-1970. The twofold sampling implies that some individuals appear more than once in the data, but we were able to identify multiple occurrences and therefore weight each person accordingly. The entire data set of unique unweighted observations includes 83 per cent of all Swedish speakers and 21 per cent of all Finnish speakers in the birth cohorts studied. The total population in each of the two mixed groups is nevertheless small, which naturally will lead to fairly wide variation around the point estimates. Since 95 per cent of all Swedish speakers in the country live in bilingual or monolingual Swedish municipalities, we restrict our analyses to this region in Southern and Western Finland. Approximately 30 per cent of all Finnish speakers in the country live in this area, whereas Swedish speakers amount to about 18 per cent of the population in the area. The total number of unique unweighted observations is 65,186 and the number of deaths is 1,976.

Using Cox regressions, we compare mortality risks of persons belonging to four mutually exclusive groups. They consist of people with (1) homogamous Finnish background, (2) mixed background and Finnish affiliation, (3) mixed background and Swedish affiliation, and (4) homogamous Swedish background. Persons with mixed background are consequently separated on basis of their own ethno-linguistic affiliation. Control variables used are each person's age (the duration variable), birth year, educational level (the highest attained), region of residence (the most recent), mother's birth year, and father's socioeconomic position. Table 2 provides a description of the variables distribution in each of the four groups. Most importantly we see that persons with mixed background and Swedish affiliation are less likely to be lower educated than those with mixed background and Finnish affiliation. This is

because the intergenerational transmission of ethno-linguistic affiliation is related to social position. Swedish-speaking parents with a higher socioeconomic status are less likely to intermarry than those with lower socioeconomic position (O'Leary and Finnäs, 2002), but if they do so, they are more likely to pass on their Swedish affiliation to their children (Finnäs & O'Leary, 2003). Self-employment is also more likely to be transmitted over generations in the Swedish-speaking community than in the Finnish-speaking one (Saarela, 2003). The reason behind this behaviour might be that higher-positioned Swedish speakers are more aware and responsive to the advantages of passing on their group affiliation, and more knowledgeable about their group identity (Finnäs & O'Leary, 2003). By all means, the Swedish speakers have managed to perpetuate their societal standing over many generations, and the decisions of the higher positioned members must have played an important role in this respect.

(Table 2 here)

4. Results

For men born 1953-1970, raised in two-parent families, and living in the area with both Swedish-speaking and Finnish-speaking settlement, the Finnish-Swedish mortality risk ratio in ages 18-50 years is 1.28. Since only 2.4 per cent of the Finnish speakers and 12.4 per cent of the Swedish speakers in the cohorts studied have a mixed background, a corresponding comparison of people with homogamous Finnish and homogamous Swedish background yield a similar ratio (the inverse of 0.78 in Model 1 in Table 3).

From a model which adjusts for birth year and mother's birth year only (Model 1 in Table 3), we proceed by stepwise adding region of residence, father's socioeconomic position, and own educational level, and finally exclude father's socioeconomic position. People with homogamous Finnish background constitute the reference group, against which each of the other three ethno-linguistic categories are being compared.

The estimated effects of the control variables are in line with previous research (Saarela and Finnäs, 2009a) and will therefore not be discussed at length. Mortality falls with own birth year and slightly with mother's birth year. When having controlled for socioeconomic variables, mortality is lowest in Pohjanmaa and highest in the Helsinki area. People whose fathers had a high socioeconomic position have notably lower mortality risk than those whose fathers had a low socioeconomic position, but the variable loses its importance when own education is being controlled for. Mortality at these ages is strongly concentrated to people with low education. Consequently, people with lower secondary education have a mortality risk that is only 0.34 that of people with primary education, whereas the risk ratio is only 0.15 for those with upper secondary education, and 0.08 for those with tertiary education. Substituting father's socioeconomic position with father's education did not affect the other estimates.

With no adjustment for own education (Models 1 to 3), the mortality risk of people with mixed background and Finnish affiliation is higher than that of people with mixed background and Swedish affiliation. Also, people with same affiliation have similar mortality risks, independent of whether they come from mixed or homogamous families. This might be considered a support for the contextual hypothesis. However, it is essential to account for own educational level, because it strongly associates with mortality, and ethno-linguistic affiliation and social position are interrelated. When doing so, we see that the conclusion alters. Persons with mixed background and Finnish affiliation have approximately the same mortality risk as those with mixed background and Swedish affiliation (0.85 vs. 0.81 in Model 4). Also, persons with mixed background and Finnish affiliation have a lower mortality risk than those with homogamous Finnish background (0.85 vs. 1). Hence, within-education estimates provide poor support for the contextual explanation to the Finnish-Swedish mortality gradient. Rather we see that mortality of people with one Finnish-speaking parent (independent of own

ethno-linguistic affiliation) tend to lie in between that of people with homogamous Finnish background and that of people with homogamous Swedish background. Excluding father's socioeconomic position, since it has poor explanatory power once own educational level is controlled for, does not affect the estimates (Model 5).

(Table 3 here)

5. Discussion

Numerous studies have found that the social context in which the individual is embedded predicts individual health and well-being (Helliwell & Putnam, 2004; Rostila, 2013; Herian et al., 2014; Prins et al., 2014). This is because it defines the resources that are available to all members of a community (Kawachi, Subramanian, & Kim, 2008), common norms, behavioural reciprocity and mutual trust (Kawachi, 1999; Putnam, 2000; Lindström, 2008), and because people learn from other persons' behaviours (Bandura, 1986). The mechanisms linking the social context to health are nevertheless complex. The observed association might be due to the fact that the structural components already are in place in a society, thus providing the institutions and social networks that promote the health of individuals at that locality (Kawachi & Berkman, 2000; Szreter & Woolcock, 2004). Or they might be indicative of cognitive components or individual-level perceptions of being connected to other members of the community, meaning that it is the actual experience of social connectedness that are associated with improved health (Harpham, Grant, & Thomas, 2002; Subramanian, Kim, & Kawachi, 2002). Hence while there has been disagreement about the mechanisms, most research has identified the importance of social environment factors on health.

These are arguments that seem to fit well onto the Swedish- and Finnish-speaking ethno-linguistic groups in Finland as constituting two separate communities (Hyyppä & Mäki, 2001a, 2001b; Nyqvist et al., 2008). This paper has extended research on the contextual

predictors of health by utilising the unique prerequisites constituted by the specific situation of the cohorts in Finland born in the 1950s and 1960s. Using multigenerational population register data linked to mortality records, we could separate people according to both ethno-linguistic background and own ethno-linguistic affiliation.

The approach used here for people born 1953-1970 is hardly applicable for later born cohorts. This is because since the early 1980s, parents have been much more active in their linguistic strategies and choice for the children's ethno-linguistic affiliation (Finnäs & O'Leary, 2003; Saarela & Finnäs, 2013), which means that an increasing number of families and children have become bilingual in practice and thus take part in both communities.

Unlike previous studies, we could consequently derive a proxy for the presumed influence of the ethno-linguistic community as a contextual factor on the Finnish-Swedish mortality gradient in working-aged men. If the contextual explanation is legitimate, the excess mortality of Finnish speakers is because they are members of a less health beneficial community. At first glance, this seems to be true. However, since the intergenerational transmission of ethno-linguistic affiliation is related to social position, it is essential to account for educational differences. When doing so, we find poor support for the contextual explanation. In the group of people with mixed background, those raised within the Finnish community have a similar mortality risk as those raised within the Swedish community, whereas the mortality risk of people with homogamous Finnish background is higher. The estimates obtained are associated with a considerable level of uncertainty because of small study populations, however.

When considering that in low-mortality countries like Finland, the epidemiological transition has led to a situation in which genetic disorders account for an increasing share of all deaths (Bittles, 1994), the potential role of hereditary factors cannot be disregarded. Swedish speakers and Finnish speakers lived geographically until only a century ago (Saarela

and Finnäs, 2013, 2014), during periods of times when remote consanguinities were inevitable (Norio, 2003). Hence, between-group differences in mortality risks as observed at the contemporary population level might be due to the fact that the inter-community gene flow has been restricted because of reduced partner options enforced by geographic division (Bittles, 2008; Bittles & Black, 2010). Accordingly, we know that having a parent born in a high-mortality area in Finland is strongly associated with elevated mortality, in spite that the person himself was born and raised within a low-mortality area (Saarela & Finnäs, 2011).

During the past decades an increasing number of Swedish speakers and Finnish speakers have intermarried or formed cohabiting unions (Saarela and Finnäs, 2014). As a consequence, the number of newborn children with mixed background is currently equally many as those with homogamous Swedish background (Saarela and Finnäs, 2013). Since an increasing number of the mixed families also are bilingual in practice, one might expect that the mortality difference between registered Finnish speakers and registered Swedish speakers has diminished, but it rather seems stable over time (Saarela and Finnäs, 2006). Hence within the context of Finland, more research is evidently needed to understand the complexity behind the ethno-linguistic mortality gradient.

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Table 1. Distribution of main causes of death (%) and mortality rate ratio between Finnish speakers and Swedish speakers (MRR) aged 18-50 years, by sex, in municipalities with both Swedish- and Finnish-speaking settlement and in whole Finland, respectively

	Bilingual area				Whole Finland			
	Men		Women		Men		Women	
	%	MRR	%	MRR	%	MRR	%	MRR
Main cause of death								
Alcohol related causes	12.8	2.71	6.6	3.54	11.9	2.62	6.6	3.49
Cardiovascular diseases	19.4	1.74	15.9	1.88	21.4	1.99	18.3	1.99
Other diseases	20.5	1.23	39.4	0.87	17.8	1.18	42.0	0.97
Suicide	20.7	1.36	19.9	4.09	22.9	1.64	16.4	3.09
Accidents	21.7	1.50	14.4	1.52	21.3	1.58	12.5	1.27
Other external causes	4.9	1.96	3.8	1.98	4.6	1.94	4.2	2.21
Total	100.0	1.56	100.0	1.45	100.0	1.67	100.0	1.42
Mean annual number of deaths								
Finnish speakers	966		373		2,843		956	
Swedish speakers	101		44		106		46	

The description refers to the period 1971-2004.
The rate ratios are standardised for effects of age and period.
The calculations are based on data from Statistics Finland (not published online), representing a 50 per cent random sample of Swedish speakers and a 5 per cent random sample of Finnish speakers.

Table 2. Characteristics of the study population by ethno-linguistic background

	Homo-gamous Finnish	Mixed with Finnish affiliation	Mixed with Swedish affiliation	Homo-gamous Swedish
Educational level, %				
Primary	18.6	25.6	21.7	22.0
Lower secondary	42.5	40.5	38.4	40.0
Upper secondary	23.0	21.4	22.7	23.9
Tertiary	15.9	12.6	17.3	14.0
Birth year, %				
1953-1958	33.1	31.2	30.8	36.5
1959-1964	34.5	34.5	34.4	32.7
1965-1970	32.4	34.4	34.9	30.8
Region of residence, %				
Helsinki area	47.6	48.1	29.4	18.2
Uusimaa excluding Helsinki area	22.4	24.7	25.8	25.8
Turunmaa	22.6	14.7	15.8	18.5
Pohjanmaa	7.4	12.5	29.0	37.4
Mother's birth year, %				
-1929	27.4	26.0	25.7	33.2
1930-1934	22.9	21.0	21.5	22.9
1935-1939	22.6	23.7	23.8	21.3
1940-	27.2	29.3	28.9	22.5
Father's socioeconomic position, %				
Blue-collar worker	41.4	37.4	31.4	29.8
Lower-level white collar worker	16.6	19.6	20.4	15.4
Upper-level white collar worker	18.0	24.6	23.5	19.5
Self-employed (farmer)	16.9	12.1	17.7	29.7
Other	7.1	6.3	6.9	5.6
Deaths, weighted % of all	87.7	2.0	1.3	9.1
Observations, weighted % of all	85.0	2.1	1.6	11.4
Deaths, unweighted number	1,300	79	64	533
Observations, unweighted number	39,548	2,446	2,455	20,737

Table 3. Hazard ratios of mortality with 95% confidence intervals in alternative models

	Model 1	Model 2	Model 3	Model 4	Model 5
Ethno-linguistic background					
Homogamous Finnish	1	1	1	1	1
Mixed with Finnish affiliation	0.98 (0.77-1.24)	0.98 (0.77-1.25)	1.01 (0.79-1.28)	0.85 (0.67-1.08)	0.86 (0.68-1.09)
Mixed with Swedish affiliation	0.82 (0.70-0.95)	0.82 (0.71-0.96)	0.86 (0.74-1.00)	0.81 (0.69-0.95)	0.82 (0.70-0.96)
Homogamous Swedish	0.78 (0.73-0.83)	0.79 (0.73-0.85)	0.82 (0.76-0.89)	0.77 (0.72-0.84)	0.78 (0.72-0.84)
Birth year					
1953-1958	1	1	1	1	1
1959-1964	0.78 (0.69-0.89)	0.79 (0.69-0.89)	0.78 (0.69-0.89)	0.88 (0.78-1.00)	0.90 (0.79-1.02)
1965-1970	0.71 (0.59-0.84)	0.71 (0.59-0.85)	0.71 (0.60-0.85)	0.87 (0.73-1.03)	0.89 (0.75-1.06)
Mother's birth year					
-1929	1	1	1	1	1
1930-1934	0.97 (0.86-1.09)	0.97 (0.86-1.09)	0.99 (0.88-1.10)	0.96 (0.86-1.08)	0.95 (0.85-1.07)
1935-1939	0.89 (0.77-1.02)	0.88 (0.77-1.02)	0.91 (0.79-1.05)	0.85 (0.74-0.98)	0.84 (0.73-0.96)
1940-	0.98 (0.81-1.17)	0.97 (0.81-1.17)	1.00 (0.83-1.20)	0.90 (0.75-1.09)	0.88 (0.74-1.06)
Region of residence					
Helsinki area		1	1	1	1
Uusimaa excluding Helsinki area		1.05 (0.93-1.18)	1.00 (0.89-1.13)	0.91 (0.81-1.02)	0.89 (0.79-1.00)
Turunmaa		1.04 (0.92-1.17)	0.99 (0.88-1.12)	0.90 (0.80-1.02)	0.88 (0.78-1.00)
Pohjanmaa		0.96 (0.82-1.12)	0.91 (0.77-1.06)	0.80 (0.68-0.94)	0.78 (0.67-0.91)
Father's socioeconomic position					
Blue-collar worker			1	1	
Lower-level white collar worker			0.80 (0.69-0.92)	1.05 (0.91-1.21)	
Upper-level white collar worker			0.68 (0.58-0.78)	1.22 (1.05-1.42)	
Self-employed (farmer)			0.87 (0.77-0.99)	1.00 (0.88-1.14)	
Other			1.28 (1.08-1.52)	1.23 (1.03-1.46)	
Educational level					
Primary				1	1
Lower secondary				0.33 (0.30-0.37)	0.34 (0.30-0.37)
Upper secondary				0.15 (0.12-0.17)	0.15 (0.13-0.18)
Tertiary				0.08 (0.06-0.10)	0.08 (0.07-0.11)

The number of unweighted observations in each model is 65,186 and the number of of unweighted deaths is 1,976.