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Understanding the intergenerational impact of migration: An adult mortality advantage for the children of forced migrants?

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Background: Children of immigrants often have excess mortality rates, in contrast to the low mortality typically exhibited by their parents' generation. However, prior research has studied children of immigrants who were selected into migration, and who move to a different context, thereby rendering it difficult to isolate the intergenerational impact of migration on adult mortality.

Methods: We use semi-parametric survival analysis to analyse all-cause and cause-specific mortality among all adult men and women who were aged 17-67 and resident in Finland from 1970-2020. We compare children of forced migrants from ceded Karelia—an area of Finland that was ceded to Russia during the Second World War—with the children of parents born in present-day Finland.

Results: Children with two parents who were forced migrants have higher mortality than children with two parents born in Northern, Southern and Western Finland, but lower mortality than the subpopulation of children whose parents were born in the more comparable areas that border ceded Karelia. For women and men, this mortality advantage is largest for external causes and persists after controlling for socio-economic factors.

Conclusions: Our findings suggest that forced migration has a beneficial impact on the mortality of later generations, at least in the case where forced migrants are able to move to contextually similar locations that offer opportunities for rapid integration and social mobility. The findings highlight the importance of making appropriate comparisons when evaluating the impact of forced migration.

Keywords: *Second generation, adult mortality, forced migration, cause of death, Finland*

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Introduction

Many high-income societies have witnessed considerable growth in the share of the resident population who are second-generation [G2] children of immigrants, defined here as native-born individuals with *at least* one foreign-born parent.[1] The average share of the adult G2 across the European Union (EU) is 7%, but shares are much larger in countries such as Belgium (13%), France (13%), and Sweden (11%).[2] With respect to mortality, research has shown that G2 children of immigrants often exhibit elevated mortality compared with children of two native-born parents (i.e., the ancestral native-born population).[3–11] This stands in contrast with the lower mortality typically exhibited by their parents—the first generation (G1).[12,13]

Despite what we know about mortality for G2 children of immigrants, prior research is based on studies of children born to immigrants who were selected into migration and who moved to a fundamentally different context.[4,14] This makes it hard to isolate the intergenerational impact of migration on adult mortality for G2 because it is likely to be confounded by *selection into migration* of the G1—more specifically factors relating to this selection process that have an impact on their G2 children—as well as factors relating to the *change of context* that have an impact on the G2.[3,5,12,15] Migration scholars theorise that G1 immigrants experience an ongoing process of *adaptation* after arrival that encompasses factors such as language, acculturation and discrimination.[16] They also theorise that this process is intergenerational, impacting the G2 directly, as well as indirectly via their parents' adaptation.[15,16] Selection and adaptation are therefore likely to confound most studies of mortality for the G2 children of immigrants.

Here we address this issue by investigating a unique case of forced migration that effectively eliminates selection and adaptation as the mechanisms driving the mortality of G1 and G2. Specifically, we exploit the forced displacement of an entire population during the Second World War, from *ceded Karelia* – an area in Northern Europe of historical significance for Finland and Russia – to present-day Finland.[17–19] We study the children of those immigrants who were forced to migrate.

Crucial to the design of this study, the circumstances surrounding forced migration from ceded Karelia means that individuals were not selected on observed or unobserved characteristics.[20] Furthermore, there were negligible differences between ceded Karelia and the rest of Finland in terms of language, culture, and society. Nevertheless, it *is* true that forced migrants from ceded Karelia could be considered *more* similar to the population of eastern Finland, particularly those people closest to the border shared with ceded Karelia.[19]

We are not aware of prior research on the mortality of children of forced migrants who were born after their parents were forced to migrate.[21,22] In general, research has been limited by a paucity of data, notably data with adequate statistical power to be able to analyse mortality.[23] Among the G1, evidence suggests that forced migration can have a negative impact on all-cause mortality for migrants arriving as adults,[24] but a negligible impact for migrants arriving as children.[25] With respect to forced migrants from ceded Karelia, prior research shows that all-cause and cause-specific mortality among the G1 is higher than the population of present-day Finland.[17,18] Yet, this negative mortality differential disappears when forced migrants are instead compared to the populations of eastern Finland, close to the border with ceded Karelia.[18,19]

Here, we aim to establish whether the children of Karelian forced migrants experience elevated mortality compared with a population of present-day Finland whose parents were not forced to migrate. By studying the children of forced migrants from Karelia it is possible to establish whether excess mortality exists for a G2 population whose parents were not a selective subgroup of the origin population, and who would have required limited adaptation in order to settle due to the vast similarity between their origin and destination. In doing so, we are not only able to make conclusions about the intergenerational impact of forced migration, but also to draw inferences about the role of selection and adaptation in determining G2 mortality more generally.

Method

Study context: The Soviet annexation of Finnish Karelia is described in detail elsewhere,[17–19] but can be summarised succinctly as follows. In a peace treaty of March 1940, Finland ceded roughly a tenth of its territory to the Soviet Union. The majority of this was in the south-east of Finland, as shown in Figure 1. The entire population of these areas was evacuated to the rest of the country in spring and summer 1940. In June 1941, the ceded areas were then re-occupied by Finland, and from the end of 1941, two thirds of those who had been displaced returned to their pre-war homes. However, in the summer of 1944, the entire population of the ceded areas was *again* forced to relocate to present-day Finland, with no opportunity to return since.

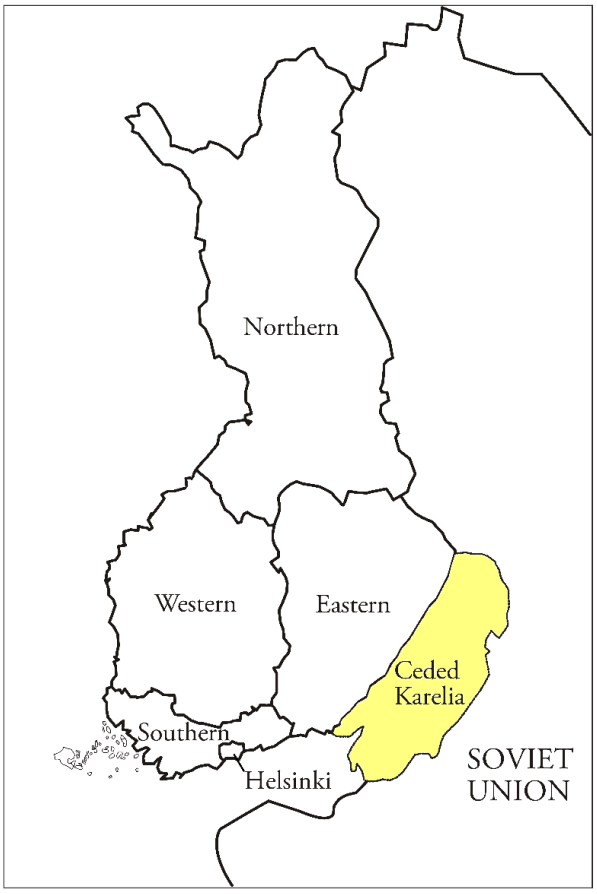

Figure 1: Map of Finland. This map shows present-day Finland separated into the regions of Northern Finland, Western Finland, Eastern Finland, Southern Finland and the Helsinki metropolitan area. The area that was formerly part of Finland and ceded to the (former) Soviet Union after the Winter War of 1939–40 is marked on the map as 'Ceded Karelia'. A much smaller part of Northern Finland was also ceded to the Soviet Union, but this is excluded from our study. As noted in the text, the supplementary materials include spatial information regarding our analysis of the border regions between Eastern Finland and Ceded Karelia.

Study design: We focus on children born in present-day Finland who have two parents born in ceded Karelia. In line with prior research, we assume that these are all the children of forced migrants, as justified by minimal levels of internal migration from ceded areas prior to 1940.[20] We compare these G2 children of forced migrants with the children of parents born in present-day Finland. In order to examine the intergenerational impact of forced migration, we vary the comparison group, which also serves as a means of controlling for observed and unobserved confounders. We compare the G2 children of two forced migrants with those whose parents were both born in the east of present-day Finland (the Eastern region in Figure 1), and those with both parents born in the rest of present-day Finland (the non-Eastern regions in Figure 1). We also make a more restrictive comparison between those whose parents were born in the neighbouring municipalities on either side of the new border (i.e. both parents born on one side of the border in ceded Karelia versus both parents born on the other side in present-day Finland). Taken together, this enables us to evaluate the intergenerational impact of forced migration.

Data: We use population registers that cover the entire resident population of Finland from the end of 1970 until the end of 2020, in total 8,290,911 individuals. These registers allow us to identify people who were born in present-day Finland and in ceded Karelia by municipality of birth. The data also allow us to link people across generations, if children and their parents were alive and residing in the same household at the end of 1970, or if children were born after 1970.

Study population: Due to our interest in adult mortality and the relatively young age of the G2 children of forced migrants, we study all adult men and women who can be observed from age 17 years and were resident in Finland from 1970-2020, implying that the first cohort we study is children born in 1953. The last cohort we study is children born in 1972, essentially because later-born cohorts very rarely have parents who were born in ceded Karelia. We drop individuals with missing data on variables that are used in the analysis, which primarily means those for whom both parents cannot be identified (7.6% of all Finnish-born individuals in the cohorts born 1953-1972). The primary group of interest – G2 children of forced migrants – consists of persons born in Finland with both parents born in Ceded Karelia (9,454 men and 8,925 women). These are compared with individuals with two parents born in Eastern Finland

(122,556 men and 117,624 women), or in the rest of present-day Finland (369,915 men and 352,548 women). The more restrictive analysis compares individuals with two parents born in the municipalities of present-day Finland next to the new border (10,175 men and 9,747 women) with individuals with two parents born on the other side of the border, in neighbouring municipalities of ceded Karelia (2,310 men and 2,281 women). Results based on alternative categorisations for children with parents born in other areas are available in the *Supplementary materials*.

Variables and statistical analysis: We use semi-parametric survival analysis to analyse all-cause and cause-specific mortality. Time of death refers to calendar year of death. Cause of death is based on standard ICD classifications. For the cause-specific analysis, cause of death is grouped into established categories that relate to individual risk behaviour. People are right-censored at death, emigration, or at the end of 2020. Those who had lived abroad, and return migrated during the study period, are excluded, meaning that we study the stationary population. The exposure of interest and comparison groups are based on parental municipality of birth for both parents. Control variables include birth year (categories for each year), region of residence at age 17 (20 categories), mother's and father's educational level (categorised according to the ISCED 2011 classification as: primary, upper-secondary, post-secondary non-tertiary, short-cycle tertiary, bachelor's or equivalent, master's or equivalent, and doctoral or equivalent). For convenience, we present the results of our models using hazard ratios and 95% confidence intervals. However, we note that all analysis is based on total population data, meaning that there is no uncertainty regarding design-based inferences. Additional analysis that also incorporate children's own educational level (categorised in the same way as for parents), and observes them from age 35, instead of from age 17, is available in the *Supplementary materials*.

Ethics: Our analyses of these data were conducted under ethical approval from the Finnish ethics board, in coordination with Statistics Finland, who pseudo-anonymised the data for the analysis.

Results

Descriptive statistics and crude death rates for our study population are provided in Table 1. Prior to covariate adjustment, there are clear differences between the death rates of children of forced migrants—men and women aged 17-67 with two parents born in ceded Karelia—and the other reference groups. In short, for both men and women, the crude death rate is highest for individuals with two parents born in ceded Karelia, followed by those with two parents born in Eastern Finland and lowest for those with two parents born in the rest of present-day Finland.

	Person-time	Failures	Crude rate
Women 17-67			
Parents both born in ceded Karelia	358,110	543	0.0015
Parents both born in ceded Karelia: border areas	90,905	125	0.0014
Parents both born in Eastern Finland	4,509,404	5,875	0.0013
Parents both born in Eastern Finland: border areas	382,261	502	0.0013
Parents both born in rest of present-day Finland	13,101,233	14,377	0.0011
Men 17-67			
Parents both born in ceded Karelia	378,245	1,261	0.0033
Parents both born in ceded Karelia: border areas	93,637	292	0.0031
Parents both born in Eastern Finland	4,652,704	14,739	0.0032
Parents both born in Eastern Finland: border areas	394,886	1,224	0.0031
Parents both born in rest of present-day Finland	13,628,386	34,021	0.0025

Table 1: Descriptive statistics and crude death rates
The source for this table (and all tables and figures that follow) is administrative register data for the whole Finnish population.

The results from models controlling for observed confounders are shown in Figure 2. The all-cause mortality of children of forced migrants remains higher than children of parents born in the rest of present-day Finland (excluding the Eastern region). This is true for women and men, and for all three model specifications. The most detailed specification (model 3) controls for year of birth, mother's and father's education level, and region of residence at age 17. It generates estimated hazard ratios (HRs) of 1.11 for women (95% CI: 1.02; 1.21) and 1.11 for men (95% CI: 1.05; 1.18). There is almost no difference between female children of forced migrants and the female children of parents born in Eastern Finland. The same comparison for men shows that children of forced migrants have slightly lower mortality. For this comparison, model 3 gives HR=0.97 for women (95% CI: 0.89; 1.07), and 0.92 for men (95% CI: 0.86; 0.98).

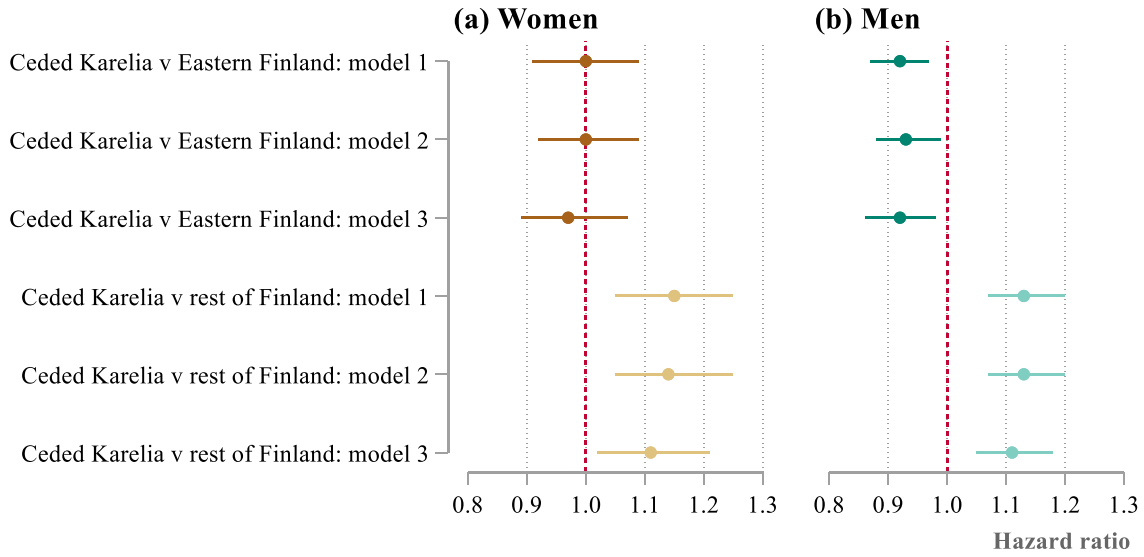

Figure 2: The all-cause mortality of women and men with both parents born in ceded Karelia, relative to different reference populations. The figure shows hazard ratios, and accompanying 95% confidence intervals, from semi-parametric survival models of all-cause mortality. Hazard ratios in the first three rows (marked 'Ceded Karelia v Eastern Finland') are for women and men with two parents born in ceded Karelia relative to those with two parents born in Eastern Finland. The bottom three rows (marked 'Ceded Karelia v rest of Finland') are for women and men with two parents born in ceded Karelia relative to those with two parents born in rest of present-day Finland (the Northern, Southern and Western regions). Models 1-3 refer to alternative specifications of the survival model. Model 1 includes birth year. Model 2 includes birth year, father's education and mother's education. Model 3 includes all the covariates in model 2 as well as region of residence at age 17.

To further control for unobserved heterogeneity, Table 2 makes an additional comparison. It compares those with two parents born in the border municipalities of ceded Karelia versus those with two parents born in the border municipalities of Eastern Finland. Although this comparison has less statistical power, it can be argued that it comes closer to evaluating the intergenerational impact of forced migration, primarily due to the similarities (prior to the war) between municipalities that are either side of the border with respect to potential unobserved confounders. In this case, model 3 (which controls for the same variables as model 3 before) generates a HR of 0.90 for women (95% CI: 0.72; 1.11), and 0.96 for men (95% CI: 0.83; 1.10).

		ceded Karelia versus Eastern Finland				
Women		HR	CI: 95%		Deaths	Population
Model 1	whole population	1.00	0.91	1.09	6,418	4,867,513
Model 2	whole population	1.00	0.92	1.09		
Model 3	whole population	0.97	0.89	1.07		
Model 1	border municipalities	0.94	0.77	1.14	627	473,165
Model 2	border municipalities	0.94	0.78	1.15		
Model 3	border municipalities	0.90	0.72	1.11		
Men		HR	CI: 95%		Deaths	Population
Model 1	whole population	0.92	0.87	0.97	16,000	5,030,949
Model 2	whole population	0.93	0.88	0.99		
Model 3	whole population	0.92	0.86	0.98		
Model 1	border municipalities	0.89	0.79	1.01	1,516	488,523
Model 2	border municipalities	0.93	0.82	1.05		
Model 3	border municipalities	0.96	0.83	1.10		

Table 2: The all-cause mortality of women and men with both parents born in ceded Karelia, relative to different reference populations. The figure shows hazard ratios, and accompanying 95% confidence intervals, from semi-parametric survival models of all-cause mortality. Results are for two different comparisons: all those with two parents born in ceded Karelia versus all those with two parents born in Eastern Finland (whole population), and all those with two parents born in the border municipalities of ceded Karelia versus all those with two parents born in the border municipalities of Eastern Finland (border municipalities). Note that we exclude those municipalities that include(d) territory on both sides of the border. Model 1 includes birth year. Model 2 includes birth year, father's education and mother's education. Model 3 includes all the covariates in model 2 as well as region of residence at age 17.

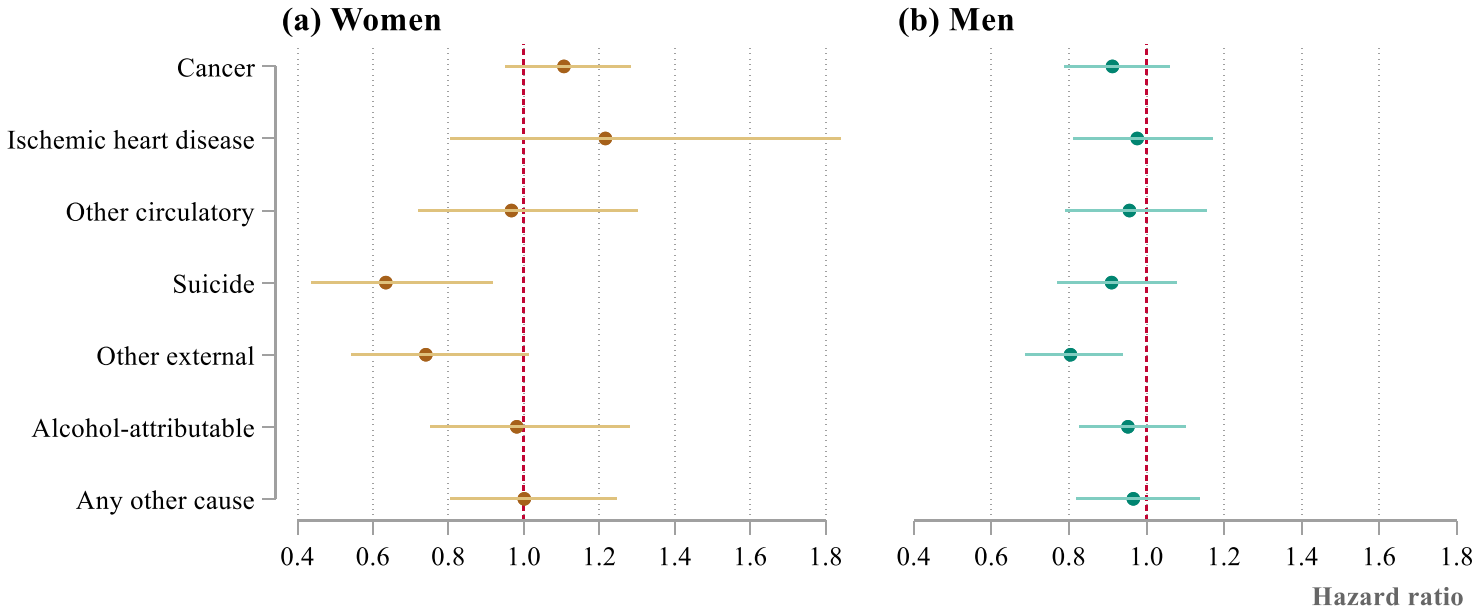

Figure 3: The cause-specific mortality of women and men with two parents born in ceded Karelia, relative to those with two parents born in Eastern Finland. The figure shows hazard ratios, and accompanying 95% confidence intervals, from semi-parametric survival models of cause-specific mortality, adjusted for effects of birth year, father's education, mother's education, and region of residence at age 17.

Women	All ceded Karelia versus all Eastern Finland						Border municipalities only					
	Model 1			Model 2			Model 1			Model 2		
	HR	CI: 95%		HR	CI: 95%		HR	CI: 95%		HR	CI: 95%	
Cancer	1.07	0.93	1.23	1.11	0.95	1.28	1.12	0.83	1.51	0.99	0.71	1.38
Ischemic heart disease	1.26	0.86	1.85	1.22	0.80	1.84	1.04	0.42	2.58	0.71	0.25	2.01
Other circulatory	1.02	0.77	1.34	0.97	0.72	1.30	1.00	0.54	1.85	0.87	0.44	1.74
Suicide	0.70	0.49	1.00	0.63	0.44	0.92	0.58	0.26	1.27	0.53	0.23	1.24
Other external	0.79	0.59	1.07	0.74	0.54	1.01	0.32	0.13	0.78	0.28	0.11	0.71
Alcohol-attributable	1.06	0.82	1.36	0.98	0.75	1.28	1.41	0.83	2.38	1.50	0.82	2.73
Any other cause	1.01	0.82	1.24	1.00	0.80	1.25	0.84	0.51	1.38	1.07	0.62	1.83
Men	All ceded Karelia versus all Eastern Finland						Border municipalities only					
	Model 1			Model 2			Model 1			Model 2		
	HR	CI: 95%		HR	CI: 95%		HR	CI: 95%		HR	CI: 95%	
Cancer	0.98	0.85	1.12	0.91	0.79	1.06	0.89	0.65	1.21	0.89	0.62	1.26
Ischemic heart disease	0.93	0.78	1.10	0.98	0.81	1.17	1.00	0.69	1.47	1.14	0.74	1.77
Other circulatory	1.01	0.85	1.21	0.96	0.79	1.16	0.96	0.65	1.42	1.02	0.65	1.60
Suicide	0.83	0.71	0.97	0.91	0.77	1.08	0.82	0.58	1.14	0.99	0.68	1.43
Other external	0.78	0.68	0.91	0.80	0.69	0.94	0.87	0.64	1.18	0.95	0.67	1.33
Alcohol-attributable	0.98	0.86	1.12	0.95	0.83	1.10	1.04	0.77	1.41	1.08	0.77	1.52
Any other cause	0.99	0.85	1.15	0.97	0.82	1.14	0.74	0.50	1.07	0.74	0.49	1.12

Table 3: The cause-specific mortality of women and men whose parents were both born in ceded Karelia, relative to different reference populations. The figure shows hazard ratios, and accompanying 95% confidence intervals, from semi-parametric survival models of cause-specific mortality. Results are for two different comparisons: (i) all those with two parents born in ceded Karelia versus all those with two parents born in Eastern Finland, and (ii) all those with two parents born in the border municipalities of ceded Karelia versus all those with two parents born in the border municipalities of Eastern Finland (border municipalities only). Note that we exclude those municipalities that include(d) territory on both sides of the border. Model 1 includes birth year. Model 2 includes birth year, father's education, mother's education, and region of residence at age 17.

To expand upon these results, a similar analysis was carried out for cause-specific mortality (Figure 3 and Table 3). Compared with children of parents who were born in Eastern Finland, children of forced migrants have lower mortality with respect to suicide and other external causes of death. This remains the case in models that control for birth year, parental education and region of residence at age 17, where HRs for suicide are 0.63 for women (95% CI: 0.44; 0.92) and 0.91 for men (95% CI: 0.77; 1.08), and HRs for other external causes are 0.74 for women (95% CI: 0.54; 1.01) and 0.80 for men (95% CI: 0.69; 0.94). There are other manifest differences, but they are smaller than for suicides and other external causes and come with less statistical power. The most notable excess mortality from ischemic heart disease for the female children of forced migrants as compared to women with both parents born in Eastern Finland. When restricting the analysis to municipalities next to the border, there is also some evidence of excess alcohol-attributable mortality among the female children of forced migrants.

Discussion

In this study, we examined all-cause and cause-specific adult mortality among the children of forced migrants. We capitalised on a unique case of forced migration—from ceded Karelia to present-day Finland—that essentially eliminated two of the primary explanations—selection and adaptation—of the unique mortality patterns of G1 and G2 immigrant populations. We aimed to establish whether or not the children of Karelian forced migrants experience elevated mortality compared with a population of present-day Finland whose parents were not forced to migrate. Contrary to prior research showing that the children of immigrants exhibit excess mortality, we find that this is not the case for children of forced migrants in a context where their parents were not selected into migration to a materially different destination context. Children with two parents born in ceded Karelia have lower mortality than children with two parents born in the areas of present-day Finland next to ceded Karelia. In the absence of any potential influence of parental selection effects or substantive adaptation, this suggests that the children of immigrants are more likely to experience a mortality advantage, rather than any disadvantage.

Our findings imply that both selection and adaptation are central to explaining the mortality disadvantages that have been observed among the G2 in other high-income contexts (typically for those whose parents were born in low- and middle-income countries).[3–11] Selection includes many aspects of life that determine who migrates, such as education, health or family

ties. Likewise, adaptation incorporates many mechanisms including barriers to adaptation such as language, discrimination and racism, and institutional knowledge. Nevertheless, they are distinct from the impact of parental (forced) migration as an event that has potential intergenerational consequences for health. We show that there is no negative intergenerational impact of migration, net of selection and adaptation, at least in this context.

With respect to cause of death, we find a mortality advantage that is largest for external causes of death, for both women and men. Like for all-cause mortality, this advantage persists after controlling for various socio-economic factors. It was beyond the scope of our study to establish why the children of forced migrants have lower mortality risks. However, our analysis suggests that the forced migration of parents may have a protective effect on their children via mechanisms that determine external causes, for example mental health or the practice of risky behaviours. It would therefore be useful for future research to examine these mechanisms, focussing on suicide and other external causes, which are the causes in which lower mortality is most clearly evident.

Our findings also highlight the importance of making appropriate comparisons when seeking to evaluate the impact of forced migration on immigrants or their children. Eastern Finland is a more appropriate counterfactual for ceded Karelia when evaluating the impact of forced migration because the two areas were far more similar prior to the Second World War. We show that a comparison with other areas of present-day Finland produces very different results. It is also reassuring that our results are similar when we compare municipalities next to the border.

A strength of our study is that we use individual-level data on the whole population, including all children of forced migrants (who are resident in Finland), and linkages to data on their parents. We go beyond prior research on the mortality of children of immigrants to examine cause-specific mortality, in addition to all-cause mortality. However, despite the ability of our study design to isolate the intergenerational impact of forced migration, it does have several weaknesses. Various potential confounders are unobserved, including the health of parents prior to forced migration. We also include only those people who are resident in Finland from 1970, therefore excluding those who have emigrated prior to that year (although we anticipate that the number of people is small and would not have much impact on our results). Added to

this, it may be that our results do not generalise beyond our study population, including to other contexts. We have focussed on adult mortality, and yet patterns may be different for child mortality among the children of immigrants.

Conclusions

Our findings suggest that, if anything, forced migration has a beneficial impact on the adult mortality of subsequent generations, at least in the case where forced migrants are able to migrate to contextually similar locations that offer opportunities for rapid integration and social mobility. Further research is required to examine whether our results generalise to other migration contexts, and to isolate selection and adaptation in order to see whether they can explain the mortality disadvantage that is experienced by many children of immigrants in other contexts.

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