Social Science History (2023), **47**, 367–395
doi:10.1017/ssh.2023.11

SPECIAL ISSUE ARTICLE

Migration, Kinship and Child Mortality in Early Twentieth-Century North America

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Abstract
This article appraises kin availability and migration timing on French-Canadian child mortality in an early twentieth-century North American industrial city. The analysis is based on the exploitation of an original dataset constructed by linking the 1910 census data (IPUMS-Full Count) for Manchester, New Hampshire to Quebec Catholic marriage records (BALSAC) and geocoding census data at the household level (Sanborn Fire Insurance Maps). Our results suggest that the presence of maternal and paternal grandmothers in the city living in different households were associated with reduced child mortality and that French-Canadian women who arrived in the United States as children or young adults experienced higher child mortality compared to second-generation French Canadians and those who migrated at a later age.

Keywords: Child mortality; Kinship; migration; grandmother; French-Canadians; New England; industrial cities; data linkage; geocoded census data

The mortality transition, which began in the United States and Canada circa 1870–80, dramatically reduced the risk of death in childhood (Bourbeau and Légaré 1982; Hacker 2010; Preston and Haines 1991). The probability that a newborn infant in the United States died before reaching his or her fifth birthday, for example, fell from about 0.234 in the 1870s to 0.077 in 1929–31, a 67% decline (Condran and Preston 1994). Public health initiatives – particularly environmental sanitation projects to remove sewage and improve water supplies – played a major role in the decline, although many factors, including increases in living standards and growing knowledge of the germ theory and how to avoid exposure to infectious diseases were important as well (Haines 2000).

Despite its importance, the mortality transition in the United States and Canada is still poorly understood either generally or more specifically for different groups. Both countries lacked comprehensive vital registration systems until several decades into the twentieth century. Fortunately, the 1900 and 1910 censuses of the United States included questions on the number of children each ever-married woman had borne and the number of those children who were still living, making it possible for researchers to measure child mortality at the level of individual mothers and correlate that mortality with other individual-level, household-level, and geographic information captured by the census.[1] Preston and Haines' *Fatal Years: Child Mortality in Late Nineteenth-Century America* (1991) – which was based on a random sample of 1-in-750 households in the original manuscript returns of the 1900 census – was the first of several studies to use children ever born (CEB) and children surviving (CS) data to estimate child mortality and its correlates.

The mortality transition unfolded during a period of massive immigration and rapid urbanization, particularly in the Northeastern part of the United States. Overall, the population of immigrants and their children born in the United States made up a third of the American population in 1910 (Watkins 1994). Preston and Haines' *Fatal Years* showed large differentials in child mortality by race and ethnicity and a large urban penalty, but only modest differentials by education and socioeconomic status (SES). Subsequent research by Preston et al. (1994) based on the 1910 census yielded similar results.

One important ethnic group was French Canadians, who arrived by hundreds of thousands in the late nineteenth and early twentieth century, particularly in New England industrial cities. Preston and his colleagues (Preston and Haines, 1991; Preston et al. 1994) showed that French-Canadian children suffered significantly higher mortality rates, amounting in 1910 to a 39% greater risk of death compared to native-born white children of native parentage (NWNP), all else being equal. Although French-Canadian children shared the unenviable position of significantly higher than average child mortality with Polish and Italian children, they were the only ethnicity to display the same adverse mortality outcome after controlling for social, demographic, and economic factors. The persistence of such a large difference points to the role of other factors not included in empirical models using census data.

This article makes a detailed examination of French-Canadian child mortality in Manchester, New Hampshire, a mid-size industrial city in the Northeast United States with proportionately large populations of French Canadians and other immigrant groups. Its purpose is twofold. First, we appraise the impact of residential propinquity of kin on child mortality in this migratory context, particularly from the viewpoint of maternal and paternal grandmothers. Second, we analyze the impact of the timing of migration and some markers of social integration to the host society.

To achieve these goals, we make use of a new dataset resulting from the linkage of complete-count 1910 census microdata (IPUMS-Full Count) with Quebec marriage records (BALSAC) and from the geocoding of census data at the household level (Sanborn Fire Insurance Maps). Our focus on one specific community allows us to add variables not included in the IPUMS public use version of the 1910 complete-count dataset, notably names, times married, and mother tongue. When French-Canadian individuals in the census were linked with their marriage record in Quebec, their kinship network could also be identified. Once located in Manchester,

[1]Similar children ever born and children surviving questions were asked in the 1911 censuses of England and Wales, Scotland, and Ireland (Connor 2017; Garrett et al. 2010) but not prior to 1941 in Canadian censuses (Charles, 1948; Gauvreau et al. 2000).

these kin provided us with a measure of the distance between French-Canadian families and their nearby kin.

In addition to corroborating the importance of socioeconomic status and other covariates identified in prior studies, our results suggest that kin propinquity as well as the experience and timing of migration were associated with child mortality. More specifically, the paper shows that (1) the presence of maternal and paternal grandmothers in the city living in different households were associated with reduced child mortality; and (2) French-Canadian women who arrived in the United States as children or young adults experienced higher child mortality compared to second-generation French Canadians and those who migrated at a later age.

French-Canadian migration and child mortality

More than 900,000 French Canadians migrated to the United States between 1840 and 1930, with the peak of this cross-border migration occurring during the last three decades of the nineteenth century (Lavoie, 1981). Chain migration, the process by which members of the same family, relatives or neighbors crossed the border later to join former migrants, was actively at play in this cross-border movement (Gauvreau and Harton 2023; Harton and Robichaud forthcoming; Ramirez 2001; Takai 2008). Family was central to their geographic mobility and integration to their new environments (Frenette 1998; Hareven 1982; Vermette 2018). Moreover, kin propinquity was common among French Canadians during the second half of the nineteenth and beginning of the twentieth century in Quebec (Gossage 1999; Olson and Thornton 2011a). In the United States, Hareven's research on Manchester (1982) and related research by Ramirez (2001) and Takai (2008) on family and chain migration suggest that most French-Canadian immigrants in the United States at the turn of the twentieth century had nearby kin that they could rely upon for various types of assistance.

No matter where they lived, French Canadians experienced among the highest child mortality rates. In Canada, aggregate data show that francophone districts suffered remarkably higher infant mortality rates than anglophone districts (McInnis 2000). Olson and Thornton's (2011a) detailed study of Montreal in the late nineteenth century indicated that French-Canadian infant mortality was 40 percent higher than among Protestants and Irish Catholics. Interestingly, Olson and Thornton found no difference in neonatal (2–28 days) mortality across the three groups, suggesting that biological factors were not at play. Their thorough analysis of the large post-neonatal differences suggests that cultural determinants, more than socioeconomic differences, had a powerful impact on French-Canadian mortality rates.

In both Canada and the United States, French-Canadian mothers did not breastfeed their children for as long as mothers from other groups, contributing to higher infant mortality rates (Olson and Thornton 2011a; Woodbury 1925). Working only with children who survived their first year of life, Olson and Thornton found shorter birth intervals among French-Canadian women compared to Irish Catholic and Protestant women, suggesting the earlier weaning of their children and shorter period of postpartum amenorrhea. They estimated that by 1899, 33% of French-Canadian infants were not breastfed at all compared to only

20% of children from the two other groups. Given this evidence, it is tempting to describe the French-Canadian urban penalty as "early weaning in an unsanitary urban environment" (Olson and Thornton 2011a: 103). The full story is more complex, however. French-Canadian women married at an earlier age than women from other groups. Early marriages were associated with disadvantageous strategies regarding child rearing and lower quality housing (Olson and Thornton 2011b). Combined with higher child mortality, this led to more pregnancies and stresses on mothers' health. All these factors put French-Canadian children at greater risk of death than other children in Montreal, and elsewhere most likely.

Did the fact that French Canadians were Catholic play a role in this adverse situation? In their discussion of the large differences in child mortality rates between French Canadians (39% higher than NWNP) and Jews (45% *lower* than NWNP) in the early twentieth-century U.S., Condran and Preston (1994) concluded that the mortality differences were primarily the result of behavioral differences not closely tied to religion, including differences in women's labor force participation, the length of time children were breastfed, and children's school attendance and work participation. Jewish children may have benefitted from religious strictures about food purchasing and preparation and adherence to traditional laws regarding cleanliness (Preston et al. 1994: 64–69). Not all Catholic groups suffered the same extreme child mortality disadvantage as French Canadians, for example the Irish in Montreal, the Polish and Italians in the US. Following Kevin McQuillan (2004), who discussed the impact of religion on fertility in the province of Quebec, we believe that this impact might have been more pervasive for French Canadians in a context where the Catholic Church was such a key element in defining their identity. This may explain the longer route to eradicate the strong beliefs that "fatality and fate" were responsible for children's death (Olson and Thornton 2011a; Praz 2012).

Correlates of child mortality

Prior research found higher mortality among children whose parents were illiterate, Black, foreign-born, rented their places of residence, had lower income occupations, and lived in densely-populated urban areas compared to children whose parents were literate, White, native-born, owned their own homes, had higher income occupations, and lived in rural areas (Dribe et al. 2020; Gagné 2005; Gossage 1999; Hacker and Haines 2005; Hacker et al. 2021; Mercier and Boone 2002; Olson and Thornton 2011a; Preston and Haines 1991; Preston et al. 1994). Although poverty and low SES increased the risk of death of infants and children, this effect was not as pronounced as the impact of cultural factors, proxied by race, ethnicity, and nativity. Dribe, Hacker and Scalone's recent study of child mortality in 1910 (2020), for example, found that while large differentials in child mortality among 14 immigrant groups in the United States were reduced in models controlling for SES and contextual variables, nativity differentials remained substantial. Group differences were also especially large in Canadian urban settings, as shown for Montreal (Olson and Thornton 2011b) and Ottawa (Mercier and Boone 2002). New England mill towns had negative demographic consequences, including a delayed onset of the mortality transition that resulted from crowding and unsanitary conditions, especially in neighborhoods with high concentrations of recent immigrants and high levels of wealth inequality (Hautaniemi et al. 1999; Leonard et al. 2012).

Kin play a positive role in the reproductive success of childbearing couples through a variety of pathways (Beise 2005; Dillon et al. 2023; Engelhardt et al. 2019; Gagné 2005; Hacker and Roberts 2017; Hacker et al. 2021; Harton et al. 2019; Jennings et al. 2012; Rotering and Bras 2015; Willführ et al. 2021). Kin, particularly female relatives, are more likely than others to provide childbearing women with assistance, either physically or economically (e.g., grandmothers can look after their grandchildren while the mother works). Grandmothers and other kin have also been shown to transmit pro-natal attitudes, resulting in higher fertility, and greater know-how about household and childcare, resulting in lower child mortality and greater reproductive success (Sear and Coall 2011).

Kin proximity and historical context mattered. Whether kin coresided with reproductive couples, lived nearby, or resided at greater distances likely influenced their frequency of interaction and level of assistance. In western societies where the nuclear family model dominated, such as in Sweden and the United States at the turn of the twentieth century, coresidence of grandparents with grandchildren was associated with lower fertility and higher child mortality (Hacker and Roberts 2017, 2019; Hacker et al. 2021; Willführ et al. 2021;). Although direct evidence is lacking, researchers have speculated that multigenerational households in these contexts were negatively selected in terms of health and socioeconomic conditions leading to resource competition. Similar results recently reported for preindustrial Finland (Chapman et al. 2023) suggest that multigenerational households may have been sites of greater competition between grandparents and grandchildren for parental care and resources. Furthermore, geographical proximity of kin outside the household had a positive impact on couples' reproductive success in both preindustrial and industrializing contexts (Chapman et al. 2023; Hacker and Roberts 2017, 2019; Hacker et al. 2021; Harton et al. 2019; Willführ et al. 2021).

The examination of kinship ties poses great methodological challenges for researchers because nominal censuses contain no information about relationships beyond the household. Several recent large-scale studies about the role of nearby kin in demographic behavior have relied on indirect estimation methods to identify "potential" paternal relatives from surnames. For example, Nelson's study (2020) of the long-term decline in patrilineal kin propinquity between 1790 and 1940 was based on the proportion of household heads sharing the same surname within three households on the manuscript census returns. Because enumerators traveled door to door, he reasoned that households enumerated close to one another were physically close to each other. Other recent articles on the United States have also relied on surnames to estimate the influence of kin outside the household on fertility (Hacker and Roberts 2017; Hacker et al. 2021). Unfortunately, such indirect estimates include an unknown but potentially large margin of error. More importantly, they ignore the possible role of maternal kin outside the household, who were likely more important for mothers of young children. As Harton and colleagues (2019) did in their study of fertility outcomes in Quebec City, we use the BALSAC database and geocoded census data to determine the number of maternal kin present in Manchester and pay special attention to the presence and specific location of both grandmothers.

Data

Our primary dataset is the 1910 population census for Manchester, New Hampshire. The city was founded on behalf of the Amoskeag Manufacturing Company in 1837 and modeled on the nearby factory town of Lowell, Massachusetts. With the success of the company – in the early twentieth century the Amoskeag Manufacturing Company was the largest cotton textile plant in the world with more than 17,000 employees – Manchester's population grew and diversified (Hareven and Langenbach 1978: 10; Hareven 1982). Prior to 1870, most foreign-born residents were Irish. Historians Hareven and Langenbach, however, contended that the company "soon concluded that the French Canadians were the ideal labor force and proceeded to recruit them systematically" (1978: 19). French Canadians moved from nearby Quebec to Manchester in large numbers in the 1870s and soon outnumbered other groups, including native-born whites of native-born parentage (NBNP). In 1880 there were 7,753 French Canadians living in Manchester, composing 23.8% of the population. Three decades later 23,815 French Canadians lived in 4,579 distinct households and amounted to more than one-third of the population (Harton 2017). Family and kinship ties were not only an asset for industrial work, they also facilitated French-Canadian adaptation to U.S. urban life (Hareven and Langenbach 1978) as did Manchester's Little Canada, one of the most dynamic French-Canadian neighborhoods in New England (Roby 2000).

We rely on a complete transcription of all Manchester households and individuals in the 1910 census, including names and addresses.[2] In total, the transcription included 70,077 individuals living in 14,160 households. Ever married women living in Manchester in 1910 reported having given birth to 52,407 children, 36,614 of whom were still living at the time of the census. French Canadians were the largest group, representing 33.9% of the population, followed by the NBNP (21.7%) and then the Irish (13.8%).

We attempted to link all households containing a French-Canadian individual to Quebec marriage records using a semi-automated procedure developed by the BALSAC Project at University of Quebec at Chicoutimi (Vézina and Bournival 2020). Although the linking program was developed to match Canadian censuses to Quebec civil records, U.S. and Canadian censuses share many similarities (Dillon 2000; Dillon 2008; Harton 2017). Details of the linking methods are provided elsewhere (Vézina et al. 2018). Our dataset contained 4,108 French-Canadian households of which we were able to link 2,884 (70.2%) to the BALSAC database.[3]

Finally, we geocoded all addresses recorded in the census using Sanborn Fire Insurance Plans for 1915, available at the Dartmouth Digital Library Collection, which provide detailed information about building locations (Sanborn Map Company 1915). Although enumeration errors resulted in some loss of information,

[2]Approximately one-third of this dataset comes from the first full count data version released by IPUMS (Minnesota Population Center, Minnesota University) in 2013 and two thirds from the Centre interuniversitaire d'études québécoises (CIEQ – Université Laval). Data entry in this last case was carried out as part of Marie-Ève Harton's doctoral thesis (Harton 2017).

[3]First-generation women are over-represented in the data that was linked to the BALSAC database (84.1% compared to 72.1% among French-Canadian couples living in Manchester in 1910). This is not surprising since second-generation women likely married in the United States.

we were able to geocode most households (93.5%) with one or more French-Canadian members, which enables us to compute spatial distances between women and maternal or paternal grandmothers.

Dependent and independent variables

To measure child mortality, we rely on a mortality index standardized to Model West life table level 13.5, which approximates the mortality conditions in the United States in the early twentieth century (Coale and Demeney 1966; Dribe et al. 2020). The creation of the mortality index and its advantages over other measures is described in detail elsewhere (Haines and Preston 1997; United Nations 1983: 73–85). Briefly, the index is constructed by dividing the number of child deaths reported by each woman in the 1910 census to the expected number of deaths. The latter is based on the number of children each woman had borne, her children's length of exposure to the risk of dying (proxied by the woman's duration of marriage), the age pattern of fertility by birth cohort, and the model life table chosen as a standard. In contrast, crude measures, such as the proportion of women's children dying before the census, are biased by differences in the length and timing of children's exposure to risk and cannot be interpreted relative to a standard mortality schedule. Because we rely on women's marital durations to approximate their children's duration to the risk of dying, we use only mothers who were in their first marriages.

A mortality index value above 1.0 indicates that children born to a mother experienced mortality rates above the rates expected by the standard life table, while values below 1.0 indicate that the children experienced mortality rates below the standard. According to Model West level 13.5 (which we constructed by interpolating Model West life tables for levels 13 and 14), the infant mortality rate in the chosen standard life table for both sexes combined was 0.122 and the expectation of life was about 51 years. The proportion of children dying before age 5 was 0.179.

We show the mean child mortality index experienced by different groups of mothers in our descriptive statistics and use the index as the dependent variable in our linear regression models (Trussell and Preston 1982). We weight some of our descriptive statistics and all regression models by the number of children born to each mother to shift the unit of analysis from mothers to children, a standard approach in analyses of the child mortality index. Women with more children contribute more "observations" to child mortality, as they do in all analyses of mortality at the population level (see Preston and Haines 1991: 188–89). Because mortality was declining in the early twentieth-century United States, we include the mortality reference date, the midpoint of the period to which the mortality estimates referred to for each woman (expressed in years before 1910), as an independent variable in our models. A detailed description of the mortality reference date is provided elsewhere (United Nations 1983: 81–85).

Our analytical universe includes married women aged 20 to 49 enumerated in Manchester with at least one child ever born, currently in their first marriage, and whose spouse was present in the household at the time of the census.

There were 6,078 such women in Manchester in 1910, among whom 2,356 were French-Canadian women, defined as women born in Canada with French mother tongue or women with French-Canadian descent (mothers or fathers born in Canada with French mother tongue). French-Canadian women born in Canada were defined as "first-generation" French Canadians while women born in the United States to at least one French-Canadian parent were defined as "second-generation" French Canadians. We further divided the group of immigrant women according to their age at immigration (aged 35 years and over, 25–34, 13–24, and 12 years and younger).

Other independent variables include the husband's occupation, women's employment, and ownership of the home, which are used as socioeconomic determinants, while literacy and the ability to speak English are considered cultural attributes. Because the woman and her husband's information were strongly correlated, we aggregated the last two variables at the couple level for analysis. We also constructed an exogamy variable to reflect the strength of the French-Canadian culture in the couple's life. The variable "intermarriage" identifies three categories of couples: (1) "Endogamous (Husband G1)," a French-Canadian woman married to a first-generation French-Canadian; (2) "Endogamous (Husband G2)," a French-Canadian woman married to a second-generation French-Canadian; and (3) "Exogamous," a French-Canadian woman whose husband was of a different ethnic background. Finally, we made a distinction between French Canadians living in Little Canada, a neighborhood located very close to the mill in which French Canadians were particularly concentrated (3 out of 4 individuals were from this group) and where the French-Canadian culture might have exerted an even greater influence.

We identified the proximity of kin in two different ways. For kin coresiding with childbearing women, we used the "relationship to household head" question in the census to assess the presence of maternal or paternal grandmothers of children. For kin residing outside the household, we relied on linkages to BALSAC to calculate the number of maternal first-degree (parent-child) and second-degree (uncle, aunt, nephew, niece, and cousins) kin residing in Manchester. More specifically, we identified the location of maternal and paternal grandmothers living in Manchester who were not coresiding with the women under study. Using the geocoded data, we then measured the distance between both households (as the crow flies distances).

Descriptive statistics

Manchester's population was very diverse in the early twentieth century (see Table 1). Only 17.0% of the 5,997 currently married women aged 20–49 residing in Manchester in 1910 were native-born women of native-born parentage (NBNP). Just under two-thirds (65.3%) were first-generation immigrants (G1) born outside the United States and 17.7% were second-generation (G2) immigrants born in the United States to foreign-born parents. The largest first-generation immigrant group, by far, was composed of French-Canadian women (33.0% of all women and 50.5% of all first-generation women). Together, first- and second-generation French-Canadian women composed 39.0% of the currently married women aged

Table 1. Child mortality index by nativity/ethnicity of mothers age 20–49, Manchester in 1910

	Child Mortality Index	Number of mothers	%	Number of children	%	Mean number of children per mother
Native born of native-born parents (NBNP)	0.852	1,017	17.0	2,522	10.3	2.48
G1-English Canada	1.211	354	5.9	1,345	5.5	3.80
G1-French Canada	1.664	1,977	33.0	11,052	45.1	5.59
G1-United Kingdom	1.123	221	3.7	845	3.4	3.82
G1-Ireland	1.321	484	8.1	2,397	9.8	4.95
G1-Austria	1.612	281	4.7	952	3.9	3.39
G1-Germany	1.136	245	4.1	847	3.4	3.46
G1-Other Foreign	1.018	352	5.8	1,148	4.7	3.26
G2-English Canada	0.878	141	2.3	379	1.5	2.69
G2-French Canada	1.493	364	6.1	1,242	5.1	3.41
G2-United Kingdom	0.925	133	2.2	364	1.4	2.74
G2-Ireland	1.181	318	5.3	1,166	4.8	3.67
G2-Other Foreign	0.901	110	1.8	264	1.1	2.40
Total	1.390	5,997	100.0	24,523	100.0	4.09

Notes: Universe included women aged 20–49 in first marriages with spouses present and one or more children ever born. G1 indicates first-generation mothers born outside the United States. G2 indicates second-generation mothers born in the United States to a mother and/or father born outside the United States. Second-generation groups were identified by mother's country of birth or, if the mother was born in the United States, the father's country of birth. English and French Canadians were distinguished using the mother tongue information collected by the census.

20–49 living in Manchester in 1910. Because they had given birth to more children than other groups (5.59 on average compared to just 2.48 among native-born women of native parentage), the proportion of all births reported by first- and second-generation French-Canadian women was even larger, just over one-half (50.2%).

Child mortality indices calculated for a selection of Manchester's largest groups of women are also reported in Table 1. Consistent with prior studies, children born to first-generation French-Canadian women had the highest mortality index (1.664), closely followed by children born to a small number of Austrian women (1.612). Children of NBNP women were by far in the most favorable situation with a mortality index that was about half the value of French-Canadian children (0.852). Relative to the chosen life table standard, Model West Level 13.5, these index values imply that 29.8 percent of French-Canadian children died before reaching age 5, compared to 15.3 percent of NBNP children. Also consistent with previous results for the entire United States in 1910 (Preston et al. 1994), children born to second-generation women had lower child mortality indices than immigrant women from the same ethnic group. In the French-Canadian case, the mortality index for the children of second-generation women (1.493) was 10.3% lower than the mortality index for the children of first-generation women, but still substantially higher than the index for the children of NBNP women.

Table 2 focuses exclusively on the French-Canadian population. It shows the number of women according to various characteristics and the corresponding child mortality index, weighted by the number of children. As mentioned above, most of the French-Canadian women living in Manchester in 1910 were first-generation immigrants (84.5%). Although most were adolescents or young adults when they migrated to the United States, some (7.6%) arrived past their mid-thirties while more than one-quarter were children under 12 years of age. The diversity of migration experiences, which are only partially observed in the census data, likely bears important consequences for differences in family structures, the number and types of available kin nearby, the ability to speak English, and the choice of spouses, as well as direct consequences for the mortality environment experienced by their children. Interestingly, child mortality was lowest among children born to first-generation women who arrived at older ages in the United States, consistent with the assumption that mortality was lower in rural Canada than in Manchester.[4] This group was closely followed by second-generation women whose child mortality was lower than for immigrant women who arrived prior to 35 years of age.

The importance of the family in the migration movement is reflected by the significant presence of kin networks within the United States in 1910. Among the 1,770 French-Canadian women matched to the BALSAC database, only 28.6% had no identifiable kin (other than a spouse and children) residing in Manchester in 1910.[5] About half (45.2%) of these women had between one and four identifiable first- and second-degree relatives in the city, while 18.1% had five to nine, and 8.1% had 10 or more. The descriptive results indicate higher child mortality among children born to French-Canadian women with no kin in Manchester.

Linked data makes it possible to identify women's own mothers and mothers-in-law, that is the maternal and paternal grandmothers of the children whose mortality we observe. Among French-Canadian women, 16.2% had mothers and 13.1% had mothers-in-law residing in Manchester in 1910 but only 2.9% coresided with their mothers and 1.9% coresided with their mothers-in-law. We observe higher mortality among children with coresident grandmothers (either maternal or paternal) and lower mortality among children whose grandmothers lived in Manchester but outside their dwelling.

Linked data combined with geocoded data allow us to go a step further to determine the distance between the woman's household and that of her mother or mother-in-law also living in Manchester (see Maps 1 and 2). Of the women whose homes could be geocoded and whose mothers' or mothers-in-law's homes could also be geocoded, approximately one-in-four lived very close to them, that is within 75 m, while the remainder lived elsewhere in Manchester. In all cases, though, the distance separating these dwellings can be labeled as a "walkable distance." The mean distance between women and their mother was 690 m, while the mean

[4]Nearly three-quarters of the French Canadians who left Quebec for the United States between 1906 and 1930 came from rural areas (Ramirez 2001). We hypothesize that this proportion was equal if not larger for women who migrated before 1906.

[5]This estimate does not include her in-laws. It is based only on mother's genealogical lineage.

Table 2. French-Canadian women characteristics and child mortality index, Manchester 1910

	Child Mortality Index	Number of women	%	Number of children	%
Spouse's occupation group					
White-collar workers	1.383	199	8.4	866	7.0
Petty bourgeoisie	1.517	159	6.7	808	6.5
Farm workers	1.538	28	1.2	159	1.3
Skilled workers	1.589	720	30.6	3,919	31.7
Semi/unskilled workers	1.768	1,076	45.7	5,790	46.9
No occupation and undetermined	1.473	174	7.4	814	6.6
Women's employment					
No occupation	1.551	1,847	78.4	10,492	84.9
With an occupation	2.181	509	21.6	1,864	15.1
Home ownership					
Owned	1.512	245	10.4	1,514	12.2
Rented	1.644	1,924	81.7	10,386	84.1
Not in a HH head couple	2.138	187	7.9	456	3.7
Literacy					
Both spouses able to R&W	1.631	1,761	74.7	8,604	69.6
Other couples	1.680	595	25.3	3,752	30.4
Ability to speak English					
None	1.631	537	22.8	3,456	28.0
At least the mother (including both)	1.630	1,067	45.3	4,595	37.2
Only the father	1.674	752	31.9	4,305	34.8
Intermarriage					
Exogamous	1.660	151	6.4	496	4.0
Endogamous (Husband G1)	1.652	1,921	81.5	10,857	87.9
Endogamous (Husband G2)	1.574	284	12.1	1,003	8.1
Generation and age at immigration					
G1 (35+)	1.410	178	7.6	1,741	14.1
G1 (25–34)	1.653	260	11.0	1,807	14.6
G1 (13–24)	1.715	912	38.7	4,693	38.0
G1 ($\leq$ 12)	1.742	628	26.7	2,812	22.8
G2	1.493	378	16.0	1,303	10.5

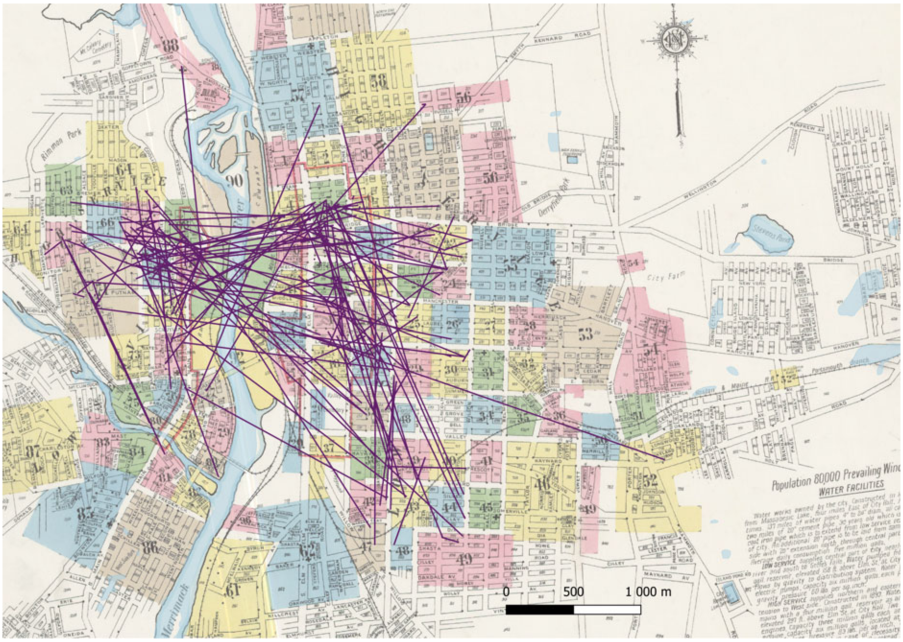
(*Continued*)

https://doi.org/10.1017/ssh.2023.11 Published online by Cambridge University Press

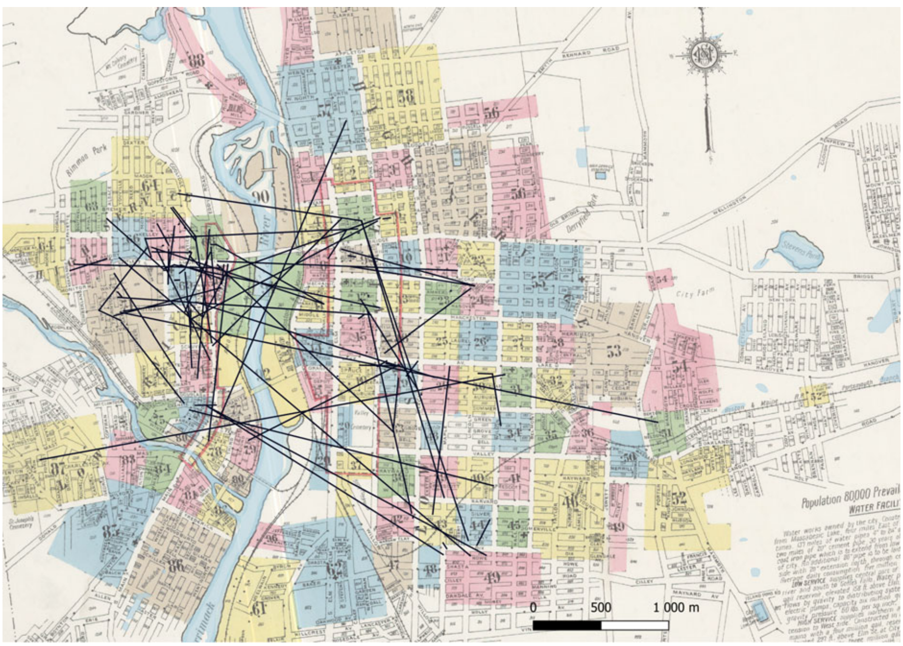
Table 2. (*Continued*)

	Child Mortality Index	Number of women	%	Number of children	%
Living in Little Canada					
Elsewhere	1.662	1,477	62.7	7,485	60.6
Little Canada	1.621	879	37.3	4,871	39.4
Coresidence of maternal grandmother					
Not coresiding	1.638	2,286	97.0	12,028	97.3
Coresiding	1.946	70	3.0	328	2.7
Coresidence of paternal grandmother					
Not coresiding	1.642	2,308	98.0	12,167	98.5
Coresiding	1.883	48	2.0	189	1.5
Total (Census Dataset only)	**1.646**	**2,356**		**12,356**	
Number kin living in Manchester (mother's kin only) – linked sample					
0	1.637	506	28.6	2,526	25.7
1 to 4	1.595	800	45.2	4,587	46.8
5 to 9	1.532	320	18.1	1,870	19.1
10 to 14	1.541	101	5.7	554	5.6
15 +	1.563	43	2.4	274	2.8
Coresidence and distance of the maternal grandmother – linked sample					
Not in Manchester	1.602	1,468	82.9	8,590	87.5
Coresiding	1.931	51	2.9	262	2.7
Not coresiding and . . .					
Residing within 75 m	1.858	30	1.7	146	1.5
Residing more than 75 m	1.495	98	5.5	497	5.1
Not geocoded	1.224	123	7.0	316	3.2
Coresidence and distance of the paternal grandmother – linked sample					
Not in Manchester	1.605	1,525	86.2	8,916	90.9
Coresiding	1.948	34	1.9	146	1.5
Not coresiding and . . .					
Residing within 75 m	1.414	28	1.6	134	1.3
Residing more than 75 m	1.371	74	4.2	353	3.6
Not geocoded	1.535	109	6.1	262	2.7
Total (Linked with BALSAC)	**1.597**	**1,770**		**9,811**	

Note: Universe includes all French-Canadian women aged 20–49 in first marriages with spouses present and one or more children ever born.



Map 1. Distances between women's households and their mother's (for those not living within the same household).



Map 2. Distance between women's households and their mother-in-law's (for those not living within the same household).

https://doi.org/10.1017/ssh.2023.11 Published online by Cambridge University Press

distance between women and their mothers-in-law was 721 m. The maximum distance was 4.0 and 3.8 km, respectively. Descriptive results suggest that a grandmother living in the city but not coresiding was associated with lower child mortality.

A large majority of French-Canadian women (93.6%) married French-Canadian men, which strengthens the impact of the French-Canadian culture even though these couples lived in an American context. Within that sub-group, we make a further distinction between women whose husband was a first-generation immigrant (81.5%) or a second-generation immigrant (12.1%). Only 6.4% of French-Canadian women in the dataset had a spouse from another group, either a man born in the United States of U.S. parentage (almost half of the exogamous marriages)[6] or a man identified to another immigrant group. Differentials in child mortality according to this attribute appear to be modest.

Despite their French-Canadian ethnic background, only 22.8% of couples were unable to communicate in English (both wife and husband). Another 31.9% of women were unable to speak English but were married to a husband who was able to do so. This lack of English fluency may have limited cultural exchanges with other communities and hindered the transmission of knowledge regarding best practices to promote child health and survival (Condran and Preston 1994; Dribe et al. 2020). There is little difference between these categories when only this variable is considered (Table 2).

French Canadians in Manchester were concentrated on the lower side of the socioeconomic structure: almost half of the husbands were in semiskilled or unskilled occupations, 81.7% did not own their homes, and 21.6% of women aged 20 to 49 were working for wages. Taken separately, each of these characteristics was associated with higher child mortality.

We caution that these comparisons and the results presented in the next section are subject to unobserved changes in independent variables over time and to secular trends in mortality. The time gap between when children were exposed to the risk of dying and the census, when the independent variables were observed, may bias results for time-dependent variables. The potential for bias is greater among older women, whose children tended to be born in the more distant past. Although a few of the independent variables used in the analysis are time independent (e.g., birthplace, age at immigration, and intermarriage), all other variables are time-dependent to various degrees. We suspect that men's occupational group and couples' literacy changed little over time and result in little measurement bias. Variables such as women's employment, the presence of the maternal or paternal grandmother in the household, or the number of maternal kin present in Manchester were probably more volatile, which makes the situation captured at the time of the 1910 census a potentially distorted image of the conditions prevailing when children were exposed to the risk of dying. Mother's employment is one example of this. Married women with young children worked sporadically, when there was a need for the family economy and when children were either old enough

[6]An unknown proportion of these cases likely involved third-generation French Canadians since the group started to immigrate in large numbers in the 1860s. For a study that examines third-generation intermarriage, see Logan and Shin (2012).

to care for themselves or had an older sibling, relative or neighbor who could care for them. In our descriptive and multiple regression results, women's labor force participation was positively correlated with child mortality. But whether that correlation was a sign of economic precarity, the systematic absence of the mother to take care of her children, or the results of reverse causality – women whose children were deceased were more likely to seek paid labor force employment – cannot be discerned from the data.

One way to minimize this potential bias would be to access information about children's births and deaths from parish registers around the time of a census (Gagné 2005; Olson and Thornton 2011a). In the absence of such information in the United States, we are careful in interpreting our results. More concretely, we present an alternative set of regression results limited to women in marriage durations of less than 15 years. Children in these unions were born, on average, much closer to the 1910 census, which reduces the potential bias from time-dependent explanatory variables.

Finally, although the mortality index is adjusted for differences in the exposure to the risk of dying among children in different groups, secular trends in mortality may bias some of the comparisons in Tables 1 and 2. Inclusion of the mortality reference date in our regression analyses should control for this bias.

Multivariate regressions

Differences in child mortality observed in Tables 1 and 2 may reflect multiple factors. Second-generation French-Canadian mothers, for example, were more likely to speak English and have husbands with higher income occupations (Hareven 1982). To distinguish the relative importance of multiple factors on child mortality, we employ a multivariate analysis with the mortality index as the dependent variable. Following previous researchers (Dribe et al. 2020; Preston and Haines 1991; Preston et al. 1994), we rely on ordinary least squares regression and weight the regression models by the number of children ever born to make children rather than women the fundamental unit of analysis. Also, as noted by Preston and Haines (1991: 137–38), weighting by the number of children ever born reduces the problem of heteroskedasticity. Coefficients indicate the effect of the independent variable on the mortality index relative to the reference category. Although our dataset represents the entire population of Manchester, we also note conventional measures of the statistical significance for each coefficient. Strictly speaking, however, the dataset is not a random sample of a population, and we therefore focus more on the size and direction of the coefficients rather than their statistical "significance."[7] All regression models include the women's age and age-squared (not shown in Tables 3 and 4), and the mortality reference date variable, which indicates the calendar year in which a woman's children were on average exposed to the risk of dying and controls for time trends in mortality.

Table 3 displays results for women aged 20–49 with spouses present in the household living in Manchester who were in their first marriage and with no

[7]We also constructed models with standard errors clustered at the woman level. As expected, standard errors were larger but coefficients remained the same.

https://doi.org/10.1017/ssh.2023.11 Published online by Cambridge University Press

Table 3. Regression estimates, Child Mortality Index (weighted OLS), all marital durations

Model	(1)		(2)		(3)		(4)	
Analytical universe	All mothers		French-Canadian mothers		French-Canadian mothers linked to BALSAC		French-Canadian mothers linked to BALSAC	
	coef.	*sig.*	*coef.*	*sig.*	*coef.*	*sig.*	*coef.*	*sig.*
Nativity/Ethnicity								
US Born – US parentage	*ref.*							
G1-English Canada	0.320	***						
G1-French Canada	0.701	***						
G1-United Kingdom	0.176	***						
G1-Ireland	0.399	***						
G1-Austria	0.593	***						
G1-Germany	0.220	***						
G1-Other Foreign	0.121	*						
G2-English Canada	0.013							
G2-French Canada	0.567	***						
G2-United Kingdom	0.097							
G2-Ireland	0.285	***						
G2-Other Foreign	0.028							
Occupation of Spouse								
White-collar workers	−0.225	***	−0.363	***	−0.335	***	−0.335	***
Petty Bourgeoisie	−0.108	***	−0.202	***	−0.201	***	−0.201	***
Farm Workers	−0.067		−0.194	†	−0.067		−0.062	
Skilled Workers	−0.129	***	−0.142	***	−0.187	***	−0.179	***
Semi/unskilled workers	*ref.*		*ref.*		*ref.*		*ref.*	
Missing and undetermined	−0.157	***	−0.328	***	−0.241	***	−0.240	***
Women's employment								
No occupation	*ref.*		*ref.*		*ref.*		*ref.*	
With an occupation	0.510	***	0.575	***	0.507	***	0.500	***
Literacy								
Both spouses able to R&W	−0.040	†	−0.027		−0.047		−0.044	
Other couples	*ref.*		*ref.*		*ref.*		*ref.*	
Home ownership								
Owned	−0.153	***	−0.095	*	−0.095	*	−0.094	*
Rented	*ref.*		*ref.*		*ref.*		*ref.*	

(*Continued*)

Table 3. (*Continued*)

Model	(1)		(2)		(3)		(4)	
Analytical universe	All mothers		French-Canadian mothers		French-Canadian mothers linked to BALSAC		French-Canadian mothers linked to BALSAC	
	coef.	*sig.*	*coef.*	*sig.*	*coef.*	*sig.*	*coef.*	*sig.*
Ability to speak English								
None			*ref.*		*ref.*		*ref.*	
At least the mother (including both)			−0.043		0.026		0.025	
Only the father			−0.004		0.058	†	0.060	†
Intermarriage								
Exogamous			−0.017		−0.282	**	−0.281	**
Endogamous (Husband G1)			*ref.*		*ref.*		*ref.*	
Endogamous (Husband G2)			−0.061		−0.087	†	−0.076	
Generation and age at immigration								
G1 (35+)			−0.011		0.061		0.055	
G1 (25-34)			0.188	***	0.175	**	0.162	**
G1 (13-24)			0.273	***	0.313	***	0.307	***
G1 (≤ 12)			0.241	***	0.262	***	0.261	***
G2			*ref.*		*ref.*		*ref.*	
Living in Little Canada								
Elsewhere			*ref.*		*ref.*		*ref.*	
Little Canada			−0.047	†	−0.031		−0.031	
Number of maternal kin living in Manchester					−0.006	†	−0.006	†
Coresidence and distance of the maternal grandmother								
Not coresiding	*ref.*		*ref.*					
Not present in the city					*ref.*		*ref.*	
Coresiding in household	0.184	***	0.232	**	0.259	**	0.261	**
Present, but not coresident					−0.148	**		
Living nearby (less than 75 m)							0.087	
More than 75 m distant							−0.129	*
Present, but not geocoded							−0.291	**
Coresidence and distance of the paternal grandmother								
Not coresiding	*ref.*		*ref.*					
Not present in the city					*ref.*		*ref.*	
Coresiding in household	0.088		0.060		0.200	†	0.216	*
Present, but not coresident					−0.190	***		

(*Continued*)

Table 3. (*Continued*)

Model	(1)		(2)		(3)		(4)	
Analytical universe	All mothers		French-Canadian mothers		French-Canadian mothers linked to BALSAC		French-Canadian mothers linked to BALSAC	
	coef.	*sig.*	*coef.*	*sig.*	*coef.*	*sig.*	*coef.*	*sig.*
Living nearby (less than 75 m)							−0.301	**
More than 75 m distant							−0.287	***
Present, but not geocoded							0.237	*
Mortality reference date (year)	0.006		0.018	***	0.009		0.009	
R^2	0.075		0.045		0.047		0.050	
N mothers	5,997		2,356		1,770		1,770	
N children	24,523		12,356		9,811		9,811	

Notes: Universe includes all French-Canadian women aged 20–49 in first marriages with spouses present and one or more children ever born with no restrictions on length of marital duration. All models include controls for mother's age and age-squared (not shown). Number of maternal kin living in Manchester not counting her own mother.

restrictions on the length of marital unions. Model 1 presents the results of weighted OLS models for all children reported by all women living in Manchester. We focus on French-Canadian children only in Model 2 and pay special attention to the impact of the kin-related variables derived from the linked data in Models 3 and 4.

Consistent with the literature and with the descriptive results, children born to first-generation immigrant mothers of various ethnic backgrounds and children born to some second-generation mothers experienced higher mortality than the reference category of children born to native-born white parents of native-born parents (NBNP), all else being equal. The largest coefficients were for children of first-generation French-Canadian mothers (70.1% higher than children of NBNP mothers). These results indicate that controlling for other variables, including the grandmothers' variables, helped explain some of the nativity/ethnicity differences shown in Table 1. Among children of first-generation French-Canadian mothers, the mortality disadvantage relative to children of NBNP mothers was reduced from 95.3% to 70.1%. In other words, controlling for the other variables in the model explained approximately one-fourth of the differences in mortality among children born to French-Canadian and NBNP mothers. Clearly, however, substantial differences remain after controlling for these independent variables.

Children of second-generation immigrants experienced lower mortality than children of first-generation immigrants with the same ancestry. The differences suggest either better knowledge among second-generation immigrants of how to safeguard child health in the northeastern U. S. context (and maybe specifically in the Manchester environment if they grew up in the city), changes in childcare and cleanliness, or changes in other behaviors closer towards the NBNP than the behaviors of first-generation immigrants. It is also possible that second-generation

Table 4. Regression estimates, Child Mortality Index (weighted OLS), marital durations less than 15 years

Model	(1)		(2)		(3)		(4)	
Analytical universe	All mothers		French-Canadian mothers		French-Canadian mothers linked to BALSAC		French-Canadian mothers linked to BALSAC	
	coef.	*sig.*	*coef.*	*sig.*	*coef.*	*sig.*	*coef.*	*sig.*
Women's employment								
No occupation	*ref.*		*ref.*		*ref.*		*ref.*	
With an occupation	0.598	***	0.733	***	0.618	***	0.611	***
Number of maternal kin living in Manchester					0.006		0.007	
Coresidence and distance of the maternal grandmother								
Not coresiding	*ref.*		*ref.*					
Not present in the city					*ref.*		*ref.*	
Coresiding in household	0.121		0.074		0.149		0.139	
Present, but not coresident					−0.213	**		
Living nearby (less than 75 m)							−0.161	
More than 75 m distant							−0.166	†
Present, but not geocoded							−0.228	†
Coresidence and distance of the paternal grandmother								
Not coresiding	*ref.*		*ref.*					
Not present in the city					*ref.*		*ref.*	
Coresiding in household	0.111		−0.074		0.125		0.128	
Present, but not coresident					−0.235	**		
Living nearby (less than 75 m)							−0.299	†
More than 75 m distant							−0.353	***
Present, but not geocoded							0.180	
Mortality reference date (year)	−0.044	***	−0.061	**	−0.058	**	−0.061	**
R^2	0.090		0.056		0.066		0.069	
N mothers	3,514		1,370		1,008		1,008	
N children	9,883		4,462		3,371		3,371	

Notes: Regressions were run with all variables presented in Table 3. Only the variables of interest for the discussion are presented here. Universe includes French-Canadian women aged 20–49 in first marriages with spouses present, one or more children ever born, and marital durations of less than 15 years. All models include controls for mother's age and age-squared (not shown). Number of maternal kin living in Manchester not counting her own mother.

immigrants enjoyed improved economic well-being relative to first-generation immigrants that is not captured by the variables in the models. All socioeconomic variables show the expected negative association between higher socioeconomic status and the child mortality index.

Based on the information available in the census about the presence of maternal or paternal grandmothers, Model 1 shows that mortality was substantially higher (18.4%) for the small proportion of children whose maternal grandmothers was coresiding in 1910. The coefficient for coresiding paternal grandmothers was also positive but smaller (8.8% higher). These results suggest the opposite effect from that predicted by the "helpful grandmother" theory, and instead support the hypothesis of a negative selection associated with multigenerational families, especially in the case of the maternal grandmother.

Turning to model 2 that targets French-Canadian children only, we see similar results for coresidence with maternal and paternal grandmothers. Children born to women residing with their mother at the time of the census experienced a 23.2% higher risk of death, all else being equal, while children born to women residing with their mother-in-law had a 6.0% higher risk. This result suggests a selection effect associated with maternal grandmothers rather than a crowding effect. It may be the case that elderly women in poor health were more likely to coreside with an adult daughter than with an adult son.

Some of the additional demographic and cultural variables included for the French-Canadian population were associated with the child mortality index. Children born to second-generation women enjoyed lower mortality than children of first-generation women, with the exception of children born to first-generation women who migrated after age 35. Children born to women who migrated to the United States as children (less than 12 years of age) or as young adults (aged 13–25) experienced a 24.1% higher risk of death and a 27.3% higher risk of death respectively, relative to children born to second-generation mothers. These results suggest the existence of a large urban penalty when women first experienced living in an industrial city. Although we do not know the place or precise timing of birth of children numbered in the CEB and CS data (the birthplace of coresident own children can be observed, but the birthplaces of deceased and surviving, non-coresident children cannot), children born to women migrating at older ages (aged 35 or more years) were much more likely to be born and spent their first years in a pre-migratory rural context where children enjoyed more favorable sanitary conditions than children born to women migrating at younger ages, who were more likely to have been born in Manchester or in a similar urban-industrial environment in the northeastern United States.

Children born to the small number of women in exogamous marriages and in endogamous marriages with second-generation French-Canadian husbands had modestly lower mortality (1.7% and 6.1% lower respectively). Children of French-Canadian women who spoke English also experienced modestly lower child mortality (4.3% lower) Together with the lower mortality of children born to second-generation mothers, this result may be a sign of greater knowledge among second-generation immigrants about how to prevent a child's death in the urban environment of Manchester, which NBNP couples seem to have mastered relatively well for the period.

Living in the Little Canada ward of Manchester resulted in modestly lower child mortality relative to other city wards. Kinship ties might have been more closely knit within Little Canada and have contributed to mutual support leading to better children survival, but it is also true that the French-Canadian presence was not limited to that district. Finally, socioeconomic variables present similar associations described for Model 1 when the analysis is limited to French Canadians only.

Model 3 shows the results of similar analysis of child mortality for children born to French-Canadian women who have been linked to their family histories in the BALSAC database. Linkage to BALSAC allows us to examine the association between a wider-range of kin-related variables and child mortality including a variable indicating the presence of the childbearing woman's own mother or mother-in-law in Manchester.

According to the model results, children coresiding with either the maternal or paternal grandmothers was associated with increased child mortality compared to children whose grandmothers did not live in Manchester. On the contrary, children whose grandmothers lived in Manchester, but in a different household, had substantially lower mortality than the reference category: 14.8% fewer deaths for children with maternal grandmothers and 19.0% fewer for children with paternal grandmothers. The differentiated impact between coresiding and non-coresiding grandmothers suggests that not all grandmothers were "helpful" and that coresidence may have been harmful for the survival of children.

The number of maternal kin in Manchester also had a modestly decreasing effect on child mortality. All else being equal, a child whose mother had 10 of her relatives present in Manchester experienced a 6.0% lower risk of death. Together, these results suggest that grandmothers as well as other maternal kin improved children's odds of survival and the reproductive success of married couples in a migratory context.

Like the results shown in model 2, the results for model 3 indicate that children of immigrant women, except for those born to women who arrived in the United States aged 35 years or older, had higher mortality than children born to second-generation women. In the linked dataset, children born to French-Canadian women in exogamous unions had lower mortality relative to the reference group of women in endogamous husband G1 marriages. This result differs from what we found with model 2 but is more in line with what could be expected. We believe this change is likely the consequence of our inability to capture third-generation French-Canadian men who appear as exogamous spouses in Model 2; this situation is much less likely to occur with women in the linked sample. Most other variables are less affected by potential biases associated with linking and most of them, especially the socioeconomic variables, had a similar association with child mortality in the linked and unlinked datasets. The results now show a modest positive association between the woman's inability to speak English and child mortality, which was expected.

Model 4 repeats this analysis with geocoded microdata. The presence and proximity of maternal and paternal grandmothers relative to their daughters, daughters-in-law, and grandchildren is now broken down into five categories of distance: (1) not present in Manchester; (2) present in the same household; (3) present in Manchester but in a different household within 75 m; (4) present in Manchester but in a different household more than 75 m away; and (5) present in

Manchester but in a different household at an unknown distance away because one or both households could not be geocoded.[8] There is some evidence that distance mattered for maternal grandmothers. Like children born to women coresiding with the maternal grandmother at the time of the census, children whose maternal grandmother lived within a 75-m distance experienced higher child mortality (although this difference was not significant using conventional sample statistics). Children whose maternal grandmothers lived further away in Manchester appear to have benefited from their presence. The same was not true for paternal grandmothers, whose presence in Manchester was associated with greater child survival regardless of their distance, except when they coresided. Other results remain mostly unchanged for the socioeconomic, demographic, and cultural variables in both models.

In Table 4 we repeat all regression models shown in Table 3, but with one critical change to the analytical universe: we limit the analysis to women in marriage durations of 15 or fewer years.[9] There are two consequences from this limitation, one of which is positive and one of which is negative. The positive consequence is that children's deaths – and their exposure to the risk of death – occurred much closer to the 1910 census, which limits potential biases in measurement of time-dependent variables. The negative consequence is a much smaller dataset. The models are based on roughly one-third as many children. This is an important shortcoming in an analysis based on a relatively small urban city in 1910. We report only the results for the variables that were the most likely to be affected by the measurement bias, which include the kin-related variables.

Here too, the presence of both maternal and paternal grandmothers in Manchester, but in a different household, was associated with better child survival for women who had been married for 15 or fewer years. The relationship between child mortality and coresidence with the maternal or paternal grandmothers remained positive, but was smaller for coresiding maternal grandmothers (associated with 12.1% higher child mortality) and larger for coresiding paternal grandmothers (11.1% higher mortality). The percentages of these women who were coresiding with their mother or with their mother-in-law were slightly higher than for all marriage durations, which makes sense when one thinks that both grandmothers are more likely to be alive if the couple was married more recently (the mean age of women in the model 1 dropped from 36.4 years in Table 3 to 29.5 years in Table 4). With shorter marriage durations, we presume that more mothers and mothers-in-law were able to provide assistance rather than the opposite. The positive association previously observed in Table 3 between maternal grandmothers residing in a different household but within 75 m of their grandchildren (model 4) is no longer evident in Table 4. This result undermines our speculation that nearby residence of elderly women and their adult daughters may have been negatively

[8]These were cases where the address was unreadable on the census sheet or there was no match with fire insurance plans.

[9]Because marriages of less than 15 years included very few first-generation French-Canadian women who migrated after age 35, we collapsed the 25-34 and 35 plus age categories into one category in the variable "Generation and age at immigration."

associated with child survival. Because residence locations are time-dependent and only observed at the time of the census, we need to be careful in drawing conclusions about the impact of specific residential distances on child mortality.

In these new models using linked and geocoded data with shorter marriage durations (models 3 and 4), the relationship between child mortality and the number of maternal kin living in Manchester is now slightly positive. This variable may be as volatile as the variables for grandmothers. The number of maternal kin could fluctuate over time as kin members would come and go. Women's employment, another variable that may vary in time, is again strongly associated with increased child mortality levels in all four models. Even when performed sporadically, women's paid work was an important piece of the family-wage economy that prevailed throughout the marriage duration among those families at the bottom of the socioeconomic ladder.

Finally, it is worth mentioning that the mortality reference date variable, which was not correlated consistently with child mortality in most of models with longer marriage durations included, was consistently and negatively correlated in models with shorter duration marriages. This result would be expected if the mortality transition had only recently commenced in Manchester.

To summarize, multivariate analysis of 1910 census microdata indicates that children of French-Canadian women living in Manchester suffered much higher mortality rates compared to the children of native-born mothers of native-born parentage, even after controlling for father's occupation, home ownership, literacy, unemployment, mother's labor force participation, and other independent variables. Coresidence of maternal grandmothers was positively correlated with child mortality. Separate analysis of the French-Canadian using linked data from the BALSAC and geocoded residential information for households in Manchester added several new analytical perspectives. Although coresident grandmothers remained positively associated with child mortality in models limited to the French-Canadian population, non-coresident grandmothers living in Manchester were associated with *lower* child mortality in most models, supporting the hypothesis of "helpful grandmothers." Children born to French-Canadian who were aged 34 and younger when immigrating the United States suffered higher mortality than second-generation mothers and mothers who were aged 35 and older when immigrating (that latter suggesting the likelihood that most of the children of these women had been born in rural Canada prior to immigration), indicating that children of French-Canadian immigrants paid a particularly heavy price in the new industrial environment. Intermarriage of French-Canadian women with other ethnic groups was relatively rare, but associated with lower child mortality, all else being equal.

Discussion

The powerful association between ethnicity and child mortality, and more broadly speaking of culture, is quite clear from this case study. As other previous studies have shown (Dribe et al. 2020; Olson and Thornton 2011a; Preston et al. 1994), French-Canadian children suffered a greater risk of death than children raised in other cultural backgrounds. The higher fertility of French-Canadian women relative to other women, partly a consequence of shorter breastfeeding, contributed in turn to shorter birth intervals and higher child mortality. Breastfeeding practices among French-Canadian women seem to have been particularly harmful for infants (Olson and Thornton 2011a; Woodbury 1925).

Although multigenerational households were not common in western contexts where the nuclear family system dominated, including Manchester in 1910 (Gauvreau and Harton 2023; Nelson 2020), the presence of a maternal or paternal grandmother in the households of a childbearing couple was associated with higher child mortality rates among their grandchildren. This negative impact of coresidence is consistent with prior findings for fertility, child mortality, and reproductive success in the North American context (Hacker and Roberts 2017, 2019; Hacker et al. 2021; Harton et al. 2019), and suggests that the presence of these women could have signaled adverse conditions in the household. Coresiding grandparents also might have contributed to overcrowding and the spread of infectious disease and strained household resources (Chapman et al. 2023).

This article also shows that the presence of both maternal and paternal grandmothers in Manchester who were not coresiding, but living close enough to help on a daily basis, was associated with reduced child mortality. At the city scale, these matriarchs seemed to better fit the model of the "helpful grandmothers." These results largely parallel those reported by Willführ et al. (2021) for Sweden in the early twentieth century. Although Willfürh and colleagues did not examine child mortality directly, the geographic proximity of husbands' parents (measured in km) was associated with increased net fertility (the number of surviving children) and maternal survival, while the presence of the wives' parents in the household lowered net fertility and reduced maternal survival. More broadly, this finding suggests that the presence and availability of supportive kin went beyond household boundaries. When addressing this issue, more attention should be given to how geographic proximity is defined in various contexts.

In some models, the number of maternal kin living in Manchester also proved to be positively associated with children's survival. Although numerous kinship ties could have been associated with the retention of detrimental French-Canadian cultural practices and slower adaptation to the urban-industrial environment of Manchester, these negative effects may have been more than compensated by the benefits of denser kin networks (more assistance, better information, greater material resources). The mixed results suggest that researchers should further investigate that question, especially to expand analyses to include other supportive kin (sisters, for example), both coresiding and not coresiding. As suggested by Short et al. (2006), the broader family context might be a rich exploratory trail, especially in the French-Canadian case.

A few explanatory hypotheses can be put forward to explain the correlations between women's age at immigration and child mortality. First, we can assume that women who migrated after the age of 35 had most of their children in rural Quebec, where infant and child mortality rates were lower than in urban settings at the turn of the twentieth century (Olson and Thornton 2011a). Women who arrived at younger ages were more likely to have some or all their offspring in the United

States, most likely in an urban context, undermining children's chances of survival given the short time they had to adapt to their new environment and to enter broader social networks.

On the contrary, second-generation French Canadians who were likely to have grown up in an urban-industrial environment, learned to speak English, and reduced their fertility may have been better attuned to strategies to prevent and treat childhood diseases. This advantage might also be related to improvements in living conditions associated with social mobility and greater social integration, leading to a broadening of social networks and better knowledge of beneficial practices regarding children's health. Being married to a second-generation husband or to a husband from another ethnic group, mostly to a NBNP husband, was also correlated with lower child mortality, reinforcing the social integration hypothesis. This finding corroborates other studies on child mortality (Dribe et al. 2020), fertility (Hacker and Roberts 2017), and reproductive outcomes (Harton 2017) that have stressed this gap between first and second generations immigrants.

French Canadians living in Manchester's Little Canada experienced modestly lower rates of child mortality. Although the high-density of French Canadians in the ward suggests greater strength of French-Canadian culture, Manchester was small enough that households in different wards were not isolated from one another. In Manchester, French Canadians did not live exclusively within Little Canada. Two out of three French Canadians lived in one of the other nine wards of the city and contrary to Montreal, socioeconomic and cultural segregation was not "extreme" (Harton and Robichaud forthcoming; Olson and Thornton 2011b). The lack of large differences might also be attributed to the time-dependent nature of couples' residence, which cannot be accounted for in the data.

In addition to the effect of the kinship and migration variables specific to the French Canadians, our study confirmed the existence of an association between the material situation of households and child mortality. Children born to higher SES parents and homeowners enjoyed lower mortality rates than children born to lower SES parents and renters. Women's employment strongly correlated with higher child mortality, although the direction of causation is difficult to establish. The family-wage economy that prevailed among the semiskilled or unskilled workers' families drove many French-Canadian women into textile mills and a variety of paid occupations, which might have contributed to higher mortality rates. In this context, our results suggest that French-Canadian children would have suffered even higher mortality without chain migration from Quebec and the creation of strong kinship networks in a new American environment.

Acknowledgements. We thank the Canada Research Chairs Program, the Social Science and Humanities Research Council of Canada (SSHRC) and the Fonds de recherche du Québec – Science et culture (FRQSC) for the financial support to conduct this research. We are also grateful to the BALSAC research infrastructure team (Université du Québec à Chicoutimi), to IPUMS (University of Minnesota), to Léon Robichaud and Gabrielle Thériault (Université de Sherbrooke) and to Laurent Richard (Centre interuniversitaire d'études québécoises, Université Laval) who assisted us with data geocoding. This project was also supported by a research grant from the Eunice Kennedy Shriver National Institute of Child Health and Human Development (R01-HD082120-01Q3) and the Minnesota Population Center (P2C HD041023). The authors also thank the reviewers for their helpful and stimulating remarks.

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Cite this article: Harton, Marie-Ève, J. David Hacker, and Danielle Gauvreau (2023) "Migration, Kinship and Child Mortality in Early Twentieth-Century North America," *Social Science History* **47**:367–395. doi:10.1017/ssh.2023.11