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Immigration, Wealth and the 'Mortality Plateau' in Emergent Urban-Industrial Towns of Nineteenth-Century Massachusetts

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Abstract

The mortality transition in Western Europe and the U.S. encompassed a much more complex set of conditions and experiences than earlier thought. Our research addresses the complex set of relationships among growing urban communities, family wealth, immigration and mortality in New England by examining individual-level, socio-demographic mortality correlates during the nineteenth-century mortality plateau and its early twentieth-century decline. In contrast to earlier theories that proposed a more uniform mortality transition, we offer an alternative hypothesis that focuses on the impact of family wealth and immigration on individual-level mortality during the early stages of the mortality transition in Northampton and Holyoke, Massachusetts.

Keywords

Census; Epidemiological transition; Health; Healthy worker; Holyoke; Immigration; Massachusetts; Mortality; Northampton; Wealth

Researchers have long noted that late nineteenth-century North American mortality, particularly in urban environments, remained higher than would be expected given European mortality trends during this same period.¹ The theory of a uniform mortality transition has given way to a view that mortality decline depended upon a much more complex set of local conditions and experiences.² For the U.S., the evidence suggests that overall mortality may have declined in the third and early fourth quarters of the nineteenth century.³ However, in Massachusetts, mortality plateaued during the latter half of the nineteenth century, and not until the turn of the twentieth century did mortality begin a slow but sustained decline.⁴ In previous work, we have argued that high overall regional mortality was sustained by the strains of significant population growth within newly emerging urban-industrial communities.⁵ These strains were ultimately relieved as population growth stabilized and urban infrastructures developed, notably with the introduction of filtered water supplies and sewage systems.⁶ Although such improvements began after midcentury, their widespread penetration into emerging industrial towns was not completed until near the turn of the century or later, when regional mortality finally began to fall.

In this article, we expand our previous work on population growth and ecological conditions by assessing the impact of family wealth and immigration patterns on individual-level mortality during the early stages of the mortality transition in Northampton and Holyoke, Massachusetts. Immigrant populations in industrial destinations such as Northampton and Holyoke may have depressed mortality due to ‘healthy migrant’ and ‘healthy worker’ selection effects, i.e., migrants are more likely to be healthy, to be young adults, to have survived the rigors of migration, and to remain in these settings. In contrast, newly arriving immigrants may also temporarily increase mortality, as they become ‘seasoned’ in the new environment, and this effect may be particularly pronounced in urban destinations with higher population density and higher disease loads.⁷ Contemporaries argued that immigrant populations flooding into new urban communities, bringing with them vice, ill-health and poverty, were responsible for high mortality conditions.⁸ The incredible levels of wealth inequity and squalor in many emerging urban cities, exemplified particularly in Holyoke, may also have contributed to high mortality through the impoverished condition of the lower economic classes, or the most vulnerable among them.⁹ Rapid influxes of new immigrant populations coupled with high levels of wealth inequality provide evidence for suggesting alternative, or complementary, hypotheses for Massachusetts’s mortality plateau.

Mortality in Holyoke and Northampton exhibited a pattern of initial increase, followed by a plateau, and then a decline late in the period.¹⁰ We argue that the balancing of rapid growth from a series of in-migrating populations with the establishment of earlier migrants contributed significantly to this mortality pattern.¹¹ Newly arriving migrants throughout the period were disproportionately young and healthy but perhaps new to the urban experience and more susceptible to the infectious disease environment of nineteenth-century cities and may also have had fewer economic resources. Established migrants came to resemble the native born in terms of wealth accumulation and population composition. As time passed, new immigrants were also a smaller proportion of the population. The population subsequently aged and population growth slowed, even as clean water and functioning sewers reached more areas. Mortality at last began to decline, with a shift from infectious to chronic degenerative disease.

I. The Complexity of Locally Situated Mortality Transitions

In the U.S. overall, sustained mortality decline began in the 1870s. Dramatic changes followed quickly. Life expectancy improved from 47 to 51.5 years between 1880 and 1900 as the infant mortality rate fell from about 225 in 1880 to 114 in 1910.¹² Urban mortality decline played a central role in this transition. Vinovskis noted both the sharply higher mortality of emerging urban-industrial communities of Massachusetts,¹³ and significant early mortality declines in regions mostly confined to the largest established cities, (e.g., Boston and Salem, which contained only a fraction of the Massachusetts population).¹⁴ Size of place also had a pervasive influence on turn-of-the-century mortality in Preston and Haines’ 1991 analysis. Mortality was elevated by 20 per cent in U.S. cities of 5,000–24,999 and by 30 per cent in larger cities of 25,000 or more, compared to smaller cities. At the same time, mortality was actually lower among the very largest cities like New York, Boston, and Philadelphia.¹⁵ In addition, urban mortality change had profoundly different impacts upon different age groups,¹⁶ sex-specific age groups,¹⁷ and immigrant groups.¹⁸

The relationship between wealth and mortality has been one of the more difficult to address historically. However, recent research on nineteenth-century mortality and the importance of standards of living to the mortality transition has clarified some of the effects of family wealth, and the complex interactions of proximate mortality determinants.¹⁹ Perhaps the greatest strides in understanding mortality change have been in documenting patterns of infant and childhood mortality among different populations. The resurgence of interest in

explanations of infant mortality produced a number of landmark studies in the U.S.,²⁰ some examining specific trends in urban areas.²¹ Parallel studies were also conducted using Canadian and European data.²² A key issue in many of these studies was estimating associations between household/family, socioeconomic and public health variables and rates of infant or childhood mortality. Preston and Haines provided a comprehensive study of cross-regional variation in U.S. childhood mortality at the turn of the century, and made a compelling argument against nutrition and socioeconomic status (i.e. class) as major childhood mortality determinants in the U.S. prior to the early 1900s.²³ However, by the first decades of the twentieth century, wages and other socioeconomic variables do seem to account for significant variation in childhood mortality in some U.S. cities.²⁴ Studies of aggregate data have been less clear in support for the import of public health initiatives,²⁵ or find socioeconomic status generally more significant.²⁶ Studies of specific localities and/or the use of localized health intervention data have proved more successful in isolating the role of specific improvements in general public health measures on age and cause-specific mortality.²⁷

We also have a clearer picture of the effects of socioeconomic status on late-nineteenth and early-twentieth-century adult mortality.²⁸ A number of studies have documented the importance of sharply changing age or sex-age-specific differentials.²⁹ Sex and age-specific changes, including collinear socioeconomic mortality differentials, reflect new regimes of occupational exposure, rising rates of degenerative diseases, and the possibility of emerging ecologies which may increase the risk of contracting certain infectious diseases as others decline.³⁰ Crimmins and Condran, for example, noted a greater contribution of airborne diseases to adult mortality, and waterborne diseases to infant mortality,³¹ while Condran et al. demonstrated the resulting differential impact of public health improvements on adult and infant mortality.³² Ferrie argued for the potential importance of socioeconomic effects specifically on adult mortality based upon antebellum cross-sectional associations between wealth and mortality.³³ Heterogeneities in the response of working-age individuals can be expected during health transitions, including a shift to mortality at older ages, a rising incidence of degenerative diseases, increased relative male mortality, and even overall increases in the rates of adult mortality.³⁴

Previous research has contributed to a growing recognition that the complexity of health and wealth relationships requires further fine-grained analyses in which associations uncovered in national or regional-level data can be more sensitively measured and understood in specific disease environments.³⁵ Some individual-level and small-area studies suggest that standard of living may have effects only in the worst health environments,³⁶ with others suggesting the effects of wealth may be overwhelmed, or less pronounced, in the face of high infectious mortality.³⁷ Longitudinal studies of the effects of wealth on mortality are further complicated by changes in population and disease environments due to natural increase and migration.

Efforts to understand the relationships of wealth and health in the U.S. are hampered because the census stopped collecting wealth data during the critical years of the nineteenth-century mortality transition, resulting in what has been called the 'dark ages of American inequality'.³⁸ Research using regionally or locally specific wealth information has begun to fill the gap in our understanding of the relationship between wealth and health during this period. In Massachusetts, for example, Bedford's study of reports from the Massachusetts Bureau of Statistics of Labour provides a general picture of the conditions of the working poor from 1870–1900,³⁹ while Wagner's study of Tewksbury 'Almshouse' inmate biographies offers a more nuanced biographical and longitudinal view of ordinary people falling into and rising out of poverty from 1865–1895.⁴⁰ Nevertheless, few studies link specific individual wealth assessments in Massachusetts to individual mortality during this

critical period, or assess these relationships in the context of urban-industrial growth and immigration.

II. The Emergent Urban-Industrial Towns of Northampton and Holyoke

The mill towns of Northampton and Holyoke changed dramatically between 1850 and 1910 due to industrial growth. Northampton's population quadrupled during this period, from 5,278 in 1850 to 19,431 in 1910, as this county seat transitioned from a rural market economy to a robust mix of industry, agriculture, commerce, and government.⁴¹ Northampton's infrastructure developed slowly, with severe housing shortages and lack of public works contributing to poor public health conditions. There were a small number of industrial mills of moderate size in Northampton, which in 1855 employed only 10 per cent of the labour force in the valley.⁴² A number of these firms were destroyed by a major flood in 1874 and many of the larger firms moved to nearby Holyoke.⁴³ Although Northampton never recovered to emerge as a major industrial centre, moderate-sized wood, metal, textile and other manufacturing firms contributed to its diverse economy.

Over the same period, Holyoke residents experienced similar conditions, yet on a much larger scale. Holyoke's population grew far more rapidly, from 3,249 in 1850 to 59,732 in 1910.⁴⁴ As in Northampton, Holyoke's economic opportunity was the driving force underlying this growth, but its industrial emergence followed a more deliberate and singular path. Unlike Northampton, Holyoke was planned by the Boston Associates, a group of New England capitalists. Earlier ventures in Waltham, Massachusetts and along the length of the Merrimack River proved lucrative, and with the natural resources of the Connecticut River, Holyoke held even greater potential as an industrial mill town. The cotton textile industry became Holyoke's first principal economy as a result, serving as a catalyst for its exploding immigrant population. Despite differences in development, the demographic history of these two cities paralleled in many respects. Strains of urban growth and resulting high mortality environments were ameliorated only by infrastructural development and the later slowing of population increase.⁴⁵ Waves of immigration were transnational in scale (Figure 1) and affected the composition of the two towns similarly over time, as apparent in our selected sample of the most urban residents in these towns.⁴⁶ Moreover, the constant influx of poor immigrant labourers fuelled by these transnational population movements sustained remarkable levels of inequality in the two developing urban-industrial areas. Crude death rates early in the 1850s in Holyoke were between 5 and 10 per 1,000, rose to a peak of nearly 35 per 1,000 in 1872, fell to about 25 per 1,000 in the 1880s, and ended the period at around 17 per 1,000. Northampton had higher mortality initially (15 per 1,000), with peaks around 35 per thousand in the mid-1860s and mid-1870s, rates then fluctuating between 15 and 22 per 1,000, and with slightly rising mortality at the end of the period. As would be expected in a pre-transition population, crude mortality was driven by deaths among infants and young children, although estimates of mortality for infants from our census linked data are somewhat unreliable due to the impossibility of linking very young children who died before the census was taken. However, both cities exhibited the expected J-shaped age-specific mortality profile. Over time, mortality rates for the elderly rose, and there was some mitigation of mortality for infants and young children after the 1870s. Among all deaths (not restricted to those linked to census records) consumption, and later phthisis and tuberculosis, were the leading causes of death among adults in all decades, with dysentery, typhoid fever, and pneumonia being the next most common causes. By the 1900s, the five most frequent causes of adult death included heart disease and apoplexy, with chronic nephritis becoming a leading cause of death in the 1910s. Among children, dysentery, cholera infantum or gastroenteritis were the leading causes of death in all decades, followed in the 1870s by smallpox, scarlet fever, croup and whooping cough. Beginning in the 1880s, pneumonia and meningitis were also among the five most frequent causes of child death. We expect that

relationships between immigration, family wealth and mortality might be more readily discerned in such settings than on a national/regional scale or within urban centres such as New York, Philadelphia or Chicago. At the same time, with rapid growth and immigration, the very conditions that created stressful environments, present challenges to the identification of wealth effects.

III. Data Sources

Our data are drawn from an existing individual-level database constructed by computerized linkage of sampled census records from each city between 1850 and 1910 to corresponding death records from the two years following each census.⁴⁷ These linked records were then supplemented through a further linkage to tax valuation records. Our wealth analyses required demographic information (e.g. age, gender, occupation, nativity, etc.) not available in the tax records alone and necessitated a population sample of all individuals (not only wealth holders). The U.S. Censuses, first conducted in 1790, were decennial surveys of the U.S. population, which consisted of 'schedules,' or questionnaires, that recorded individual respondent's answers to questions asked by census enumerators. Earlier schedules were primarily concerned with simple head counts, e.g., the 1800 schedules asked for the name of the head of household, the number of free white males and females in age groups, and number of slaves owned. By 1850, the schedules gathered more than simple head counts, with questions asking for the names of every individual in the household, age, sex, race, occupation, the value of real estate, birthplace, literacy, etc. The census schedules changed throughout this period, reflecting the Nation's changing needs and interests in understanding its population.⁴⁸

In order to examine the relationship of taxed wealth to wealth as recorded on the census and the effect of accumulated economic resources on the risk of death from the mid-nineteenth century through the turn of the twentieth century, we linked tax valuation records to population census records. Wealth information is available from the census for the decades 1850, 1860 and 1870 and from city tax records for the decades 1860 through 1910. The census merely recorded a total dollar amount for individuals of real estate (in 1850, 1860 and 1870) and personal estate (1860 and 1870). As Steckel and Moehling note, at the beginning of the nineteenth century

All real and personal property not specially exempted was subject to taxation. Real estate included land and buildings, and personal estate included goods, chattels, money and effects (whatever they were); ships; money at interest; public stocks and securities; stocks in turnpikes, bridges, and moneyed corporations, in or out of state. Property exempted from taxation included household furniture not exceeding \$1000 in value, wearing apparel, farm utensils, and mechanics' tools up to the value of \$300.

The overlap from 1860 to 1870 in wealth information from census and tax records allowed us to examine the relationship of taxed wealth to wealth as recorded on the census.⁴⁹

The linkage procedure employed a nominal matching strategy similar to, but more limited than, that used in the Saguenay project.⁵⁰ Criterion developed from name, age, and wealth were applied in a multiple pass linkage algorithm similar to that developed by Harvey, Green, and Corfield.⁵¹ Higher likelihood linkage criteria required more demanding matches, for example, exact literal matches of first, middle, and last names. The fewer the matches between census and tax records, the greater the likelihood that our linkage procedure produced a true match. Given the relatively small numbers of linked records in the database and the interactive linkage process, all were manually examined to some extent. The interactive and manually confirmed linkage process ensured the maximum quality of the

record-linkage results.⁵² After linkage, the data file contains 50,137 linked census, death and tax records for Northampton and Holyoke. Linkage rates varied across decades and although there is no precise method for computing the number of links one would expect in the database, examination by town and decade gave us no reason to expect bias and the percentage of successfully linked tax records in each decade appears to be in the 80 – 95% range.⁵³

IV. Analysis and Comparison of Wealth Sources

Population and mortality data are relatively easy to come by for nineteenth-century settings compared to data on wealth. The issue of measuring inequality in relation to health and mortality also depends upon the types of socioeconomic measures used and their reliability. The most widely used data on socioeconomic status have been income-based measures. One of the limitations of using income data exclusively is its inability to provide a more comprehensive picture of total wealth holdings. Most studies on infant and childhood mortality correlates have attempted to avoid this limitation by relying on aggregate measures of census wealth within families. Census family wealth does provide a more comprehensive measure of socioeconomic status than income, but affords a limited period of coverage.⁵⁴ As Steckel suggested, tax assessment lists are another source for measuring wealth in local settings and can be found in tax valuation records.⁵⁵ Steckel's data for Massachusetts show a significant overall correlation between wealth measures derived from tax assessments and those based on reported census wealth, as well as rising inequality within urban areas and the growing importance of real estate wealth.⁵⁶ In addition to longitudinal coverage, tax records also distinguish various types of wealth holding. Moreover, the reporting of taxable wealth was generally compulsory while the reporting of wealth on the census was voluntary and subject to arbitrary enumerator distinctions. Our data for Northampton and Holyoke, Massachusetts confirm this general correlation across sources of wealth data for the years 1860 and 1870, when both data resources are reliably available. There are also clear differences important for mortality analysis in the distribution of family wealth from the two different resources.⁵⁷

One of the more important discrepancies between tax and census assessments is the underreporting of family wealth. It was not uncommon for tax assessments to underreport and exempt small amounts of wealth. Census records appear to report small amounts of personal wealth inconsistently, and may over report such wealth relative to tax records. For example, the 1860 and 1870 Holyoke censuses recorded \$50 of personal wealth for a large number of individuals, resulting in families with multiples of \$50. It is clear from the census records that enumerators entered this rate consistently - perhaps even automatically - for large residential groups in poorer areas of the town. As a result, it is unclear in substantive terms what distinguished those households or individuals with this small but not trivial amount of wealth. By any reasonable standard of living measure (e.g., dwelling size and geographic location, family structure, and occupation) households with small amounts of wealth are indistinguishable from households without wealth. Table 1 presents the percentage of families without wealth, and dollar amounts of family wealth at the quartiles and mean.

Since we are primarily interested in either the longer-term effects of significant wealth or the effects of more substantial resource mobilization that wealth may have afforded in the face of acute health needs, one simple solution to measurement inconsistency is to rely upon a measure that does not draw fine distinctions at the lower end of wealth distributions. For this purpose, we constructed a dichotomy of 'significant wealth holding.' Families with significant wealth are in the upper three quartiles of the wealth distribution among those with any wealth. Families without significant wealth are in the lowest quartile or had no

recorded wealth. Although this measure is less sensitive to reporting discrepancies than the simple presence or absence of wealth, it is still somewhat affected by the heaping of wealth-reporting categories, and thus different numbers of individuals end up in lower quartiles as a result of different heaping. Nonetheless, this measure appears robust enough for the analyses we present. The general caution remains that fine distinctions between wealth-holding categories are likely to be plagued by measurement errors and inconsistency across different resources when using historical records. Ideally, analytical distinctions of wealth holding should not be highly sensitive to such minor discrepancies which are likely, at the same time, to affect classification or analysis of a very large and poor segment of the population.

V. Mortality by Wealth and Immigrant Ethnicity in Northampton and Holyoke

The following analyses first examine the correlation of family wealth holding and cause-specific mortality for Northampton and Holyoke in 1860 and 1880 in some detail, and then proceed to a multivariate modelling of wealth effects across all decades from 1860 to 1910. The comparison of 1860 to 1880 provides both a stable geographic base for comparison (the urban sample area does not significantly change over this period),⁵⁸ and a chance to examine wealth and immigration effects reaching beyond the last census data wealth collection in 1870.⁵⁹ To examine wealth and mortality across these periods we compare the mortality rate of those with significant wealth holdings to the mortality rate for those without. To control for the confounding influence of changes or differences in the age distribution from 1860 to 1880, we directly standardized the mortality rates of 1860 and 1880 to the 1870 census age distribution.⁶⁰ Given the extreme fluidity of our study population, we focus our analysis on age-specific mortality rates for adults and children.⁶¹ Finally, to afford the largest and most robust sample size possible, the two town populations are pooled for the computation of these standardized rates.

Mortality in 1860 was higher for those without significant family wealth holdings and lower for those with greater resources (see Table 2), with very similar mortality findings between census and tax assessment wealth. However, by 1880, when only tax assessment data are available, lower mortality occurred among those with no significant family wealth, contrary to hypothesized effects of urban inequality and wealth. This reversal of fortunes may be rooted in the dynamic and changing nature of these emergent communities over the course of the transition, central to hypothesized immigration effects. The age-standardized analysis in Table 2 ignores changing population composition through immigration and aggregates distinct ethnic categories that radically changed in proportion and composition over the period of analysis.

Comparisons of age-standardized mortality rates for US-born, Irish, Canadians and other foreign born (Table 3) show that lower mortality among those with resources in 1860 (seen in Table 2) is largely due to the U.S. native population⁶². The Irish-born in 1860 had lower overall age-standardized mortality rates than the U.S. native population regardless of wealth holding. This surprising effect likely represents migration and ‘healthy worker’ selection effects. Such effects might be consistent with taxable wealth differences in mortality reported for 1860, since newly arrived immigrants would be less likely to have significant wealth holdings than the U.S. born. Nevertheless, Irish mortality results in 1860 are also clearly affected by reporting differences between the census and tax assessments. Mortality comparisons in 1870 are compounded by both changes in the immigration stream and epidemic mortality events, and so are not included in Table 3. However, by 1880, when Irish immigration had declined significantly, mortality among that group had risen considerably and differences by wealth had disappeared. Again, the rising mortality and decline in

differential mortality by wealth could reflect the loss of selection advantages in the now relatively stable residential population of Irish immigrants.

French Canadians were not an appreciable segment of the town populations in 1860. This situation changed radically by 1880 when French Canadians comprised nearly one fourth of the population. Despite well-documented higher infant mortality,⁶³ French Canadians in our sample who did not report significant wealth nevertheless had lower mortality than the Irish- or native-born. The dramatic growth and lower mortality of this group were the major reasons for lower mortality among those without wealth in aggregated 1880 rates (Table 2). Again, lower mortality among the French Canadian population might well reflect more recent arrival of healthy migrants.

Differential mortality levels, especially the much lower than expected French Canadian mortality and the rapid decline in any mortality advantage among Irish immigrants, are consistent with the different immigration patterns of these two groups. French Canadians began arriving following the economic crisis of 1857. Mill agents travelled to Quebec recruiting workers, most of whom were young, single women. It was assumed that most of the workers would be temporary or seasonal labourers, and this was also the intent of many of the migrants. Those hired in this first migration phase of direct recruitment had year-long contracts.⁶⁴ Whether they actually returned to Canada after their contracts ended or simply remitted their earnings is unclear. But, as Bélanger notes, ‘As Eastern North America’s railroad became more complex and affordable, immigrating to the United States became simpler and cheaper. Indeed, while in 1840 a trip from Montreal to Vermont would have taken several arduous and expensive days in a cart, by the 1880s it would only be a question of a few dollars and hours’.⁶⁵ The gamble was not a difficult one to make given the prevailing conditions of poverty in Quebec, and inexpensive transportation also made the decision to relocate easier for families. If their situation in the U.S. turned for the worse, returning to Canada was not that difficult. As with Irish immigrants, we cannot know the migration history, but French Canadians most likely came directly from rural areas of Quebec to Holyoke and Northampton.⁶⁶ In contrast, the Irish transatlantic migration was more permanent from the outset, was probably not a migration directly to this area, and in some cases was a more inclusive family migration.

Immigration and selection effects might also explain the trends in age-standardized mortality and wealth among the U.S. native population. Virtually everyone in Holyoke in 1860 was a recent arrival, and given the rapid growth during this period, the same situation was true to a lesser degree in Northampton. During this decade, wealth appears to have had some advantage and mortality was lower compared to later decades. By 1880, there was continuing, but much diminished, native migration into the cities. Age-standardized mortality rose considerably for all groups, consistent with a declining selection effect. Those without wealth gained a relative mortality advantage, with both low wealth and low mortality consistent with newly arrived migrants. Only the Irish, with much curtailed immigration, had increases in age-standardized mortality irrespective of wealth.

VI. Modelling Immigration Selection and Wealth Effects on Mortality

To further examine the suggestion of immigration and wealth effects on the mortality plateau, we analyzed the probability of death for adults and children separately through logit regression of recorded death on individual-level characteristics across the entire period of 1860–1910. Wealth in current dollars is directly entered into the regressions in the form of taxable personal wealth and taxable real estate wealth from the linked tax records. Distinguishing real estate wealth from personal wealth was considered of potential importance given our initial findings suggesting an interaction between wealth and recency

of immigration. Real estate wealth may likely be more reflective of wealth holdings among a more established population.⁶⁷

Although we can readily estimate the effect of place of birth, which is available across this period, our analysis thus far suggests those estimates would confound selection effects from recently arriving immigrants with effects of later periods when the same immigrant group was a more stable residential population. Data on the year of immigration are not consistently available across this period of time in U.S. censuses, making it impossible to directly estimate selection effects among immigrants. After examining ethnicity-by-decade interactions, we created a dummy variable for each immigrant group, indicating whether the individual was born in Ireland, Canada, or an Eastern European country, and resided in the city during a decade prior to the decline in immigration from those areas (1860, 1880 and 1910 respectively). These variables are thus nested ethnicity effects within decades where the immigrant group was a newly arriving population. Decades are entered into the models as dummy variables with 1860 as the excluded category. Although these models are limited because they do not directly operationalize the timing of individual arrival, model results should be consistent with predictions from the hypothesized wealth and immigration selection effects. Models were fitted separately for adults (15 years of age or greater) and children (less than or equal to 14 years of age) as well as for each city. Several other effects potentially related to ethnic group and mortality, including gender and dwelling density, were examined but not included due to lack of significance.

Results for adults are presented in Table 4. The odds ratios for decade effects confirm what we know of the mortality rise and plateau in these developing urban industrial centres. In both cities, mortality was higher in all decades than in the early period and peaked during the most expansive decades of population growth. Any slight indication of mortality decline is early in the twentieth century. Total family wealth from personal estate is not significant, yet total family real estate wealth is associated with higher mortality in both Northampton and Holyoke. In Holyoke, mortality rates for the newly arrived immigrants in all three waves of immigration are significantly below the rest of the population. In Northampton, this is true for all but the Irish, who were a much smaller group in that city and who did not arrive in the force that they did in the organized mill town of Holyoke.

Table 5 presents results for children 14 years of age or less. Since most children, even of immigrants, are native born, all non-native children are combined into a single category. No nesting within time is required to capture healthy migration selection effects among the nonnative born because they all arrived relatively recently. Children as a group had a much more homogeneous mortality experience, as might be expected, particularly in the smaller city of Northampton. In Holyoke, child mortality was higher in all decades between the initial period of settlement and the eventual decline during the last decade. Child mortality was especially high in the 1870's, revealing the devastating toll of epidemic mortality on Holyoke's children during this period. In contrast, for Northampton only the lower mortality in the 1910 panel is significant. The cities also differ in the effects of parental wealth and immigration on child mortality. There is modest evidence that personal wealth might have purchased lower mortality among children in Holyoke. Similar to the effect for adults, having parents with real estate wealth conveyed a mortality penalty. Non-native immigrant children in Holyoke seem to reflect a selection effect quite similar to the adult population. For Northampton, neither wealth nor nativity effects explain any difference in child mortality.

After an extensive investigation of alternative model specifications, we believe the model results presented in this paper accurately capture a complex relationship between mortality, wealth and immigration in western Massachusetts. The final models presented resulted from

collaborative discussion of initial findings, which did not include time and ethnicity interactions, at an IUSSP seminar at the University of Utah and a presentation at the Minnesota Population Center. Robust estimates were obtained only through controlling for ethnic group and time interactions, which led to the models presented here. A variety of individual-level measures are not included in these regressions due to lack of significance, lack of relationship to hypotheses tested and/or concern for possible collinearity. Inclusion of any of these effects did not, however, substantially alter the estimated effects presented. Variables excluded from results notably include census family size, a classification of occupational groups (agricultural, professional, trade and transportation) and a number of interaction terms explored. Although models are stratified by age, lower adult ages within newly arriving immigrant groups did affect the magnitude of wealth in these groups and could plausibly affect results through selection biases. To examine this possibility, all interactions of age, ethnicity and wealth were tested in the models. The only statistically significant result was for an age-by-Irish interaction on mortality. While statistically significant, the result was substantively trivial, did not interact with wealth or alter the wealth effects presented and was omitted from the model. Concern over the substantial skew in census family size due to inclusive definitions (e.g., boarders, lodgers and servants) was also addressed by fitting these models to a sub-sample with census family size of less than 14 family members. Eliminating larger census families had only minor effects on the magnitude of wealth effects and did not alter their statistical significance. Various non-linear transformations of wealth were also explored before deciding to dichotomize wealth. Because of the extreme skew in wealth for this population, dichotomies are somewhat more robust and higher power logarithmic transformations were found to substantively approach the dichotomous effects presented.

VII. Conclusion

The expectation, following most studies on socioeconomic status and mortality, is that those with significant wealth holdings will typically experience lower mortality than those with insignificant or no wealth holdings. Historical as well as contemporary research shows that lower socioeconomic status is associated, by and large, with greater health risks. As Ferrie notes, ‘...it seems reasonable to imagine that higher status individuals may be able to purchase better nutrition (both more calories and a greater variety of calories sources), and better housing (larger, better ventilated, farther from sanitary hazards, more thoroughly protected against rain and cold)’.⁶⁸ However, in complex local environments the simple hypothesis that family wealth and resources will lead to lower mortality is not an unconditional expectation.

Northampton and Holyoke constitute a case study in which localized determinants of mortality and mortality decline are likely to be salient at the same time that such relationships are likely to be shaped by radical population growth and changes in population composition. We have shown that, for overlapping years, the general conclusions drawn from census and tax assessment records of family wealth are largely similar. We have also demonstrated that the family wealth effects on mortality derived from tax assessments are both reasonable and insightful. With either resource we have demonstrated the advantages of individual-level data to disentangle the often very complex relationships between family wealth and mortality during the mortality plateau and early stages of the mortality transition. We do, however, find that caution is necessary when analysing small amounts of family wealth. Important discrepancies between tax and census assessments were present at the low end of the scale and we doubt the consistency or accuracy of either data source for small amounts of wealth.

Using these resources we found further evidence of the complexity and importance of local environments in analysing the relationship between immigration, family wealth and mortality in the nineteenth and early twentieth centuries. Regardless of whether census or tax assessment wealth is used, in 1860 mortality was higher overall for those without significant family wealth holdings. During the following period of dramatic population growth and immigration, overall mortality rates changed direction and those with significant family wealth holdings experienced higher mortality. We argue that this surprising shift in mortality is due to successive waves of immigration bringing in healthy persons with lower initial mortality burdens. Mortality effects due to out-migration are difficult to directly assess given the lack of data on these groups and are, therefore, speculative. Any losses due to out-migration would inflate mortality rates for some groups while deflating them for others. Nevertheless, the effects of out-migration are likely to be small when compared to those of in-migration for these two rapidly growing industrial cities. As a result, it is difficult to develop any clear sense of shifting mortality trends due to the effects of out-migration.

The general pattern of more recently arriving immigrants having the lowest mortality, especially in more rapidly growing and industrializing Holyoke, is consistent with the hypothesized migration selection bias of healthy workers and families. Other results of our analysis also lend support to that hypothesis. The multi-variate estimates of wealth effects are similar in direction to the marginal shift in age-standardized rates from lower mortality to higher mortality among those with wealth in Table 2. Higher mortality among those with real estate is consistent with the interpretation that such wealth largely differentiates between newly-arrived and longer-term residents. Our findings also support recent research that suggests such effects may not be easily discerned or especially salient in dynamic settings of urban-industrial development in the nineteenth century. Like Reid's and Lee's emphasis on the changing disease environments of such settings,⁶⁹ our analysis suggests changing population composition and immigration patterns associated with development may have significant confounding and even ameliorating effects on the health of the poor in otherwise harsh disease environments. The single finding of significant personal wealth benefits for the children of Holyoke, however, supports those who have argued that the positive benefits of disposable wealth are likely to be found only in the most stressful circumstances and for the most vulnerable of populations.

Our findings are especially important for the rather simplistic view of emerging urban-industrial areas as environments placing satanic burdens upon the poor. Whatever those burdens might have been, they may not have been sufficient to overcome the fact that family migration favours the healthy. With the evidence at hand it is not possible for us to weigh whether the benefits of healthy immigration were greater than the collective costs to these rapidly growing communities. However, it is entirely plausible that without the constant influx of new immigrant populations mortality would have been much higher. We remain convinced that the high mortality of emergent communities such as Northampton and Holyoke, the lack of urban infrastructures and the high, often epidemic, mortality they engendered is a principle compositional feature of the overall mortality plateau in the Northeast U.S. Through the dramatic growth of New England towns during this period, possible negative effects of poverty may have been overshadowed by a steady stream of newly arriving healthy workers and by the homogenizing mortality effects of an underdeveloped health infrastructure affecting all members of the community. Those who stayed across the decades may have acquired wealth and property, but they were not selected for health. A collectively experienced mortality among those who became long-term residents declined only after the significant investment in collective health infrastructure.

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60. This can be understood in counter-factual terms, i.e. if the age distributions for each town had been the same as 1870 from 1860 through 1880, what would the death rate look like relative to their unadjusted (non-standardized) rates?
61. It is likely that infants (under 1 year of age) are significantly underrepresented in our data because of the highly mobile and newly settled population. In all analyses we compared results including and excluding infants and decided to present complete data given the substantive and statistical equivalence of results. We have also stratified analysis by age when appropriate to ensure conclusions are not contaminated by varying representation of infants and children.
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Figure 1.
Population by place of birth, Northampton and Holyoke sample, 1860–1910.

Centile distributions of family wealth holding^a in current U.S. dollars from tax assessments and census records, Northampton and Holyoke, 1860 and 1870.

Table 1

%						
Holyoke	No wealth ^b	percentile			75 th percentile	Mean
		25 th	50 th	75 th		
1860	Tax	79.4	0	0	0	585.40
	Census	2.5	50	100	300	1581.30
1870	Tax	75.0	0	0	40	578.00
	Census	58.5	0	0	800	2060.00
Northampton						
1860	No wealth	percentile			75%	Mean
		25%	50%	75%		
1860	Tax	40.0	0	600	3200	4173.30
	Census	24.4	100	800	4200	4356.60
1870	Tax	51.5	0	0	1300	2121.00
	Census	25.8	0	1000	4500	5176.80

^aFamily wealth holdings are the sum of individually reported wealth in census “families” (analogous to households)

^bWealth not reported for any family member.

Table 2

Age-standardized death rates per 1,000, by significant family tax and census wealth, Holyoke and Northampton, 1860–1 and 1880–1.

Northampton & Holyoke		1860 Census		1860 Tax		1880 Tax	
		Rate	n	Rate	n	Rate	n
Total							
Significant Wealth		8.3	(5781)	8.8	(3211)	19.6	(2964)
No Significant Wealth		10.3	(2323)	9.0	(4893)	12.4	(5509)

Notes: Death rates are calculated for the year following each census, beginning in July and ending in June (e.g., July 1, 1860–June 30, 1861). Families with significant wealth are in the upper three quartiles of the wealth distribution among those with any wealth. Families without significant wealth are in the lowest quartile or had no recorded wealth.

Table 3

Age-standardized death rates per 1,000 by significant family tax and census wealth and ethnicity, Holyoke and Northampton, 1860–1 and 1880–1.

	Northampton & Holyoke		1860 Census		1860 Tax		1880 Tax	
	Rate	n	Rate	n	Rate	n	Rate	n
U.S.								
Significant Wealth	9.3	(3893)	8.9	(2468)	19.0	(1983)		
No Significant Wealth	14.2	(1105)	11.6	(2530)	13.8	(2492)		
Irish								
Significant Wealth	5.9	(1307)	9.0	(545)	14.1	(534)		
No Significant Wealth	6.3	(942)	4.5	(1704)	14.0	(636)		
Canadian								
Significant Wealth	10.2	(168)	0.0	(65)	10.9	(264)		
No Significant Wealth	7.2	(155)	9.0	(258)	7.1	(2110)		
Other								
Significant Wealth	1.8	(413)	0.0	(133)	14.3	(183)		
No Significant Wealth	0.0	(121)	1.7	(401)	5.5	(271)		

Note: Death rates are calculated for the year following each census, beginning in July and ending in June (e.g., July 1, 1860 – June 30, 1861).

Table 4

Logistic regression odds ratios of individual mortality effects for adults 15 years of age or older, Holyoke and Northampton, 1860–1910.

Model Effects	(excluded category)	Holyoke	Northampton
1870	(1860)	2.23 ^a	1.07
		(.560)	(.272)
1880		2.78 ^a	1.92 ^a
		(.713)	(.413)
1900		2.41 ^a	2.20 ^a
		(.614)	(.459)
1910		2.15 ^b	2.10 ^a
		(.568)	(.447)
Family Wealth: Personal Estate		1.06	0.89
		(.149)	(.132)
Family Wealth: Real Estate		1.64 ^a	1.72 ^a
		(.211)	(.300)
Irish & prior to 1870	(other)	0.25 ^a	1.22
		(.128)	(.327)
Canadian & prior to 1890		0.36 ^a	0.37 ^a
		(.074)	(.090)
Eastern European & prior to 1920		0.13 ^a	0.34 ^c
		(.041)	(.138)
LR chi2		209.21 ^a	65.83 ^a
N of Observations		15908	13077

Standard errors are included in parentheses below each coefficient. Significance levels presented are selected to reflect significant cutoff points of the models, e.g. there are no results significant at .01 that are not significant with an even more conservative significance probability cutoff.

^a p<.001

^b p<.005

^c p<.05

Table 5

Logistic regression odds ratios of individual mortality effects for children 14 years of age or younger, Holyoke and Northampton, 1860–1910.

Model Effects	(excluded category)	Holyoke	Northampton
1870	(1860)	3.54 ^a	0.63
		(.878)	(.236)
1880		2.01 ^b	1.42
		(.538)	(.424)
1900		2.11 ^a	0.81
		(.560)	(.290)
1910		0.91	0.23 ^b
		(.568)	(.447)
Family Wealth: Personal Estate		0.54 ^c	0.70
		(.131)	(.217)
Family Wealth: Real Estate		1.71 ^a	1.08
		(.298)	(.300)
Non-Native	(native & unknown)	0.29 ^a	1.04
		(.062)	(.494)
LR chi2		105.00 ^a	18.68 ^c
N of Observations		7614	5015

Standard errors are included in parentheses below each coefficient. Significance levels presented are selected to reflect significant cutoff points of the models, e.g. there are no results significant at .01 that are not significant with an even more conservative significance probability cutoff.

^a p<.001

^b p<.005

^c p<.05