Internal Migration and Longevity

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Abstract

Internal migration has been fundamental to American culture and economic growth, yet its relationship with population health remains understudied. While international migrants show longevity advantages in most contemporary societies, it has been unclear whether internal migrants also live longer than nonmigrants. Understanding internal migrant mortality has become increasingly important given the recent declines in internal migration in the United States (US). The US provides a particularly valuable case for studying these dynamics due to its historically high internal migration rates and complex bidirectional movement patterns. Using newly available population data with over 12 million individual death records for cohorts born between 1912 and 1930, this study reveals a substantial mortality advantage among internal migrants—equivalent to 10–20 years of mortality improvement for the total US population. We find evidence of place effects from both the origin and destination, with county of destination being more important than county of origin. However, most of the observed migrant mortality advantage seems to be attributable to selection mechanisms. We also demonstrate that internal migration increases mortality disparities across counties by 20% for men and 28% for women.

Introduction

The relationship between migration and mortality has been a classic topic in demography since the discipline's inception. Pioneers of demography such as John Graund (1662) and William Farr (1864) noted mortality differences by internal migration status in England. While researchers continued to examine this relationship throughout the twentieth century, attention has shifted from internal to international migration. Understanding mortality differences between migrants and nonmigrants serves two key purposes: reducing mortality disparities and generating insights to enhance longevity of the total population.

Two questions have guided previous research on this topic: (1) How does mortality differ by migration status? (2) What explains observed migrant-nonmigrant mortality differences? Studies of international migration in high-income countries, including the United States (US), have generally revealed an immigrant mortality advantage (Aldridge et al., 2018; Riosmena et al., 2017). Yet, this pattern has not been universal. For instance, in early-twentieth century US and in contemporary Sweden, immigrants had higher mortality than native-born individuals (Bakhtiari, 2022; Wallace and Drefahl, 2024). Currently, the vast majority of research on migrant mortality has focused on international migrants rather than internal migrants. The relatively limited research examining internal migration and mortality in contemporary populations has produced mixed results, with some studies showing mortality advantages for internal migrants while others find disadvantages or no differences (Andersson and Drefahl, 2017; Ginsburg et al., 2021; Saarela and Finnäs, 2008).

Demographers and other social and health scientists are interested in the relationship between migration and mortality for at least three reasons. First, the population redistribution of individuals with differential mortality mechanically influences overall mortality in both origin and destination locations (Dorn, 1932; Eichel, 1919; Hendi and Ho, 2021; Hill, 1925; Lanska and Peterson, 1995). This becomes especially important when studying subnational mortality rates in countries like the US where mobility between regions is frequent, and small-area mortality levels can be greatly affected by changes in migration flows. Second, there is an increasing interest in geographic disparities in health among researchers (Chandra and Skinner, 2003; Fletcher et al., 2023). While the role of internal migration in shaping geographic disparities in health has long been acknowledged, it is often not accounted for and represents a missed research opportunity (Darlington et al., 2015). Third, the mechanisms underlying migrant-nonmigrant mortality differences offer insights into broader theories of health inequalities. The healthy migrant hypothesis posits that migration is selective, whereby migrants tend to be healthier than nonmigrants based on pre-migration characteristics (Feliciano, 2020; Furuya et al., 2023; Palloni and Morenoff, 2006). While scholars generally agree that health selection in migration exists, its relative importance remains unclear. The change of residence involves changes in social, economic, and environmental conditions, such as occupational opportunity, living conditions, access to healthcare, and social network, which can impact health.

In the US, as well as in many other high-income countries, internal migrants significantly outnumber international migrants. As of 2022, the US was home to approximately 46 million foreign-born individuals, and it simultaneously had an even larger population of 90 million US-born individuals living in states different from their birthplaces (US Census Bureau, 2023). Using detailed mortality records, we find that 71% of deaths occurred outside the deceased's birth county. Demographically, internal migration has replaced fertility and mortality as the most important feature of contemporary population change (Bernard, 2017). The US is an excellent case for studying internal migration and mortality—it has one of the highest rates of internal migration, with 44.3% of its population changing residence in the last five years in 2005, surpassed only by New Zealand (54.7%) and South Korea (52.6%) among 61 studied countries (Bell et al., 2015). The high level of internal migration not only represents a fundamental feature of American culture but also serves as a pathway to individual economic success and an important driver of US economic growth (Turner, 1921; Ward, 2022). Migration scholars have critiqued the disproportionate attention to international migration, arguing that internal population movements merit equal attention given their profound effects on local labor and housing markets, community structures, and broader social and cultural dynamics (Ellis, 2012). Despite the overall importance of internal migration in the demographic landscape as well as the social, economic, and cultural life in the US, research on internal migrants' health and mortality outcomes remains notably lacking. A key barrier to studying these mortality patterns has been data limitations—most mortality records lack information about birthplace below the state level, and none contain individual migration histories.

While research has occasionally examined interstate mobility patterns and life expectancy (Fletcher et al., 2023), our study breaks new ground by analyzing mortality patterns at a finer geographic scale—the county level. Leveraging newly available Social Security Administration death records, we provide the first comprehensive analysis of how intercounty migration is related to mortality in the US. We focus on US-born individuals who were born between 1912 and 1930 and died between 1988 and 2005. Migration status is defined by comparing counties of birth and death. We have four main aims. First, we provide a descriptive account of the prevalence of lifetime internal migration. Second, we examine whether migrants have a mortality advantage or disadvantage and potential sex and geographic heterogeneity. Third, we evaluate multiple hypotheses to explain mortality differences between migrants and non-migrants. While these hypotheses were originally developed to study international migration patterns, their applicability to internal migration mortality patterns remains unexplored. Fourth, we investigate how internal migration affects both overall US mortality and mortality disparities between counties. This study contributes to multiple bodies of literature, including research on migrant health, early-life influences on health, place-based health effects, and geographic health inequalities.

Background

Do Migrants Live Longer?

The relationship between migration and mortality has been an area of demographic inquiry since the seventeenth century, with initial investigations focusing on population movements between urban and rural areas. John Graunt (1662) observed that urban-to-rural migration was often undertaken by ill individuals in search of healthier environments. William Farr (1864) also found that rural-to-urban migrants typically had better health outcomes than their urban-to-rural counterparts. While scholarly interest in internal migrants' mortality persisted through the twentieth century (Dorn, 1932; Hutchinson, 1936), research attention has increasingly gravitated toward international migration since the 1980s.

Contemporary research on international migrants in high-income countries typically find a migrant mortality advantage (Aldridge et al., 2018; Shor and Roelfs, 2021), including the well-documented *Hispanic paradox* in the US (Markides and Coreil, 1986; Turra and Elo, 2008). The majority of research on immigrant health compares immigrants with nonmigrants in the host country, whereas comparing immigrants with nonmigrants in the country of origin may give additional insights about immigrant selection (Spallek et al., 2011). Prior research has occasionally adopted this alternative approach—e.g., Wallace and Wilson (2019) showed that immigrants in England and Wales had a mortality advantage compared to nonimmigrants in their countries of origin. However, the immigrant mortality advantage has not been universal. Research has documented immigrant mortality disadvantage in historical US (Bakhtiari, 2022), contemporary Sweden (Wallace and Drefahl, 2024), and immigrants with disadvantaged backgrounds (Kaucher et al., 2017; Koppenaal et al., 2003; Regidor et al., 2008).

Despite extensive research on international migration, internal migration has received comparatively less attention. Research on historical populations in the nineteenth and early twentieth centuries found mortality advantage among internal migrants in Stockholm (Hutchinson, 1936), Belgian cities (Alter and Oris, 2005), and Rotterdam (Puschmann et al., 2017). These findings have limited relevance for today's internal migrants, given vastly different epidemiological contexts and public health conditions. Importantly, the urban mortality penalty that characterized premodern societies due to overcrowded and unsanitary city conditions (Torres et al., 2019) has reversed in many countries since the mid-twentieth century, including the US, where rural areas now face higher mortality rates (Cosby et al., 2008; Cutler and Miller, 2005).

It remains unclear whether recent internal migrants have a mortality advantage. Empirical evidence is mixed: internal migrants have similar mortality as nonmigrants in Sweden (Andersson and Drefahl, 2017) and Brazil (Pescarini et al., 2023), lower mortality in England (Riva et al., 2011), Northwestern Italy (Rasulo et al., 2012), and Manitoba, Canada (Debbarman et al., 2023), and higher mortality in sub-Saharan Africa (Ginsburg et al., 2021). In Finland, while earlier research using a small sample (N = 1,940) found no conclusive results (Saarela and Finnäs, 2008), recent research using full-count Finnish population registers (N > 5.7 million) showed internal migrant mortality advantage (Paglino et al., 2025). In Britain, Scottish-born individuals have higher mortality than locals within England & Wales, whereas English & Welsh-born individuals have lower mortality than locals within Scotland (Popham et al., 2010).

Thus far, little is known about internal migrant longevity in the US, especially migration at smaller geographic scales. Using a period perspective, Fletcher et al. (2023) found an interstate migrant advantage in life expectancy. Johnson and Taylor (2019) studied individuals born in the rural areas of the Dakotas and Montana, and found that migrants were positively selected and moving to urban areas in the Midwest and West increased their mortality, possibly partly due to increased smoking and alcohol consumption. Black et al. (2015) found that the Great Migration of Blacks from the deep South to urban areas in the North, West, and Midwest had increased mortality. There have been no population-wide studies on intercounty migration and mortality. Unlike many other countries where internal migration is characterized by primarily rural-to-urban moves, the US internal migration is distinctive in two ways: it has one of the highest rates of internal migration globally, and more complex bidirectional moves. These unique patterns of US internal migration make it an especially important and interesting case.

Potential Mechanisms

The historical investigations of internal migrants, combined with the extensive research on international migrants, suggest that internal migration may have significant implications for health and mortality. We identify three primary mechanisms linking migration and health: selection, place, and mobility effects. While these mechanisms were mostly conceptualized to explain immigrant health, they are likely also relevant relevance for internal migrants' health.

Selection Effects

Selection effects include both the positive selection of healthier individuals into migration (i.e., healthy migrant effect) and the selective return of less healthy individuals to their place of origin (i.e., salmon bias). Selective in-migration can operate at both individual and institutional levels. At the individual level, those with better health, higher education, more resources, stronger aspirations for a better life, and personality traits such as perseverance, with empirical evidence from both international and internal migration (Feliciano, 2020; Jasso et al., 2004; Lu, 2008; Palloni and Ewbank, 2004; Tong and Piotrowski, 2012; White et al., 2024). For international migrants, selection also operates at the institutional level through immigration policies that favor better labor market skills and health (Chiswick et al., 2008; Gushulak, 2007). Additionally, return migration of ill individuals to their origin countries can create a downward bias in immigrant mortality rates in destination countries (Abraído-Lanza et al., 1999; Guillot et al., 2023). For internal migration within the US, institutional selection is absent due to freedom of movement, but individual-level selection likely exists. Halliday and Kimmitt (2008) found evidence for health-based selection of internal migration for US men, but for women, their spouse's health, not their own health, affects migration. The salmon bias is less plausible in the domestic context. Notably, the degree of selection may vary with migration distance, with longer-distance moves typically associated with better health, higher socioeconomic status, and personality traits that may lead to better health (Feliciano, 2005; Furuya et al., 2023; Long, 1973; Shuttleworth et al., 2021). This distance gradient in selection suggests that long-distance migrants may exhibit a larger mortality advantage compared to the short-distance migrants.

Place Effects

While the decision to move is more likely to be primarily driven by economic considerations such as employment opportunities and housing market (Molloy et al., 2011), individuals' health may be directly or indirectly affected by changes in a wider array of place characteristics. Moving from a less desirable place to a more desirable place can therefore have a positive effect on health and longevity, and vice versa. Place effects operate through origin conditions, destination conditions, and their interactions (Shor and Roelfs, 2021). A large literature on the impact of conditions at fetal development and early life on later-life health, which highlights the importance origin conditions (Barker, 1992, 1994; Bengtsson and Mineau, 2009; Costa, 2000; Finch and Crimmins, 2004; Noghanibehambari et al., 2024). Place-based conditions include environmental factors, socioeconomic characteristics, healthcare access, and other social and policy contexts. Some place conditions may directly affect health—for instance, better air quality reduces respiratory diseases—while others may operate through individual-level pathways, for instance, increases in personal income following moves to areas with better economic opportunities.

The combination of origin and destination effects can lead to interactive effects. van Tubergen and Kalmijn's (2005) showed that immigrants' language proficiency varies depending on the specific origin-destination pairing rather than being uniformly determined by either origin or destination characteristics alone. We posit that the interactive effects also hold for migrants' health outcomes. Significant environmental mismatches between place of birth and current residence—such as differences in climate and overall disease environment—may adversely affect health outcomes through a process known as "predictive adaptive response" (Bateson et al., 2004; Gluckman and Hanson, 2004; Nederhof and Schmidt, 2012). This process involves epigenetic modifications during fetal and early-life development that optimize individuals for their anticipated environment, but when these early adaptations are mismatched with later conditions—as often occurs with migration—disease risk increases. For example, research has found that dissimilar temperatures in early- and adult-life increase adult mortality (Bruckner et al., 2014; Catalano et al., 2012).

Geographic distance between places of birth and current residence may serve as a useful proxy for environmental mismatch, as places further apart typically exhibit greater differences in climate, disease environments, and socioeconomic conditions. Yet environmental dissimilarity may not always align with geographic distance, particularly in regions with substantial variation in elevation, coastal proximity, or other geographic features.

Mobility Effects

Moving itself can affect health through several pathways, including the physical and economic burden of direct moving expenses, and opportunity costs from foregone earnings while traveling, searching for jobs, and learning new skills (Chiswick and Miller, 2015; Sjaastad, 1960). Beyond these tangible costs, migrants face substantial psychic costs from separating from familiar environments (Sjaastad, 1960). Importantly, migration disrupts social ties, reducing contact with family and community networks that are crucial for maintaining physical and mental health (Lu, 2010). Mobility effects may vary with migration distance, as longer moves typically entail higher direct costs, greater opportunity costs, and more severe disruption to social networks. Furthermore, the accumulation of these mobility-related stresses may be particularly pronounced for frequent movers who repeatedly experience both economic and social disruptions, potentially leading to adverse health outcomes through both physiological and psychological pathways.

Impacts on Macro Mortality Dynamics

Internal migration may impact at least two aspects of macro mortality dynamics: geographic disparities in mortality and overall population-level mortality. Geographic disparities in mortality have been growing in the US since the 1980s across various geographic units including urban-rural areas, regions, states, and counties (Elo et al., 2019; Ezzati et al., 2008; Fenelon, 2013; Singh and Siahpush, 2014; Vierboom et al., 2019). Because migrants tend to carry different morbidity and mortality risks compared to local nonmigrants, the overall mortality and morbidity rates of places can be affected by migration, unless the impacts of in-migration and out-migrantion cancel each other out (Geronimus et al., 2014). Recent evidence suggests that migration may play a crucial role in shaping these disparities: Fletcher (2023) found that the variation in state-level life expectancy by state of death is smaller than the variation in life expectancy by state of birth, indicating that interstate migration mitigates the baseline state-level inequality in life expectancy. However, the geographic scale of analysis matters significantly for understanding migration's role in shaping geographic mortality patterns: research from Britain showed that while regional-level mortality variations was unrelated to internal migration, local district-level variations were largely explained by lifetime migration patterns (Brimblecombe et al., 1999).

The overall population-level mortality can also be affected by internal migration, primarily through place effects, mobility effects, and spillover effects on nonmigrants. While selection effects influence the geographic distribution of mortality by redistributing healthier or less healthy individuals across locations, they do not impact overall population mortality since they merely reflect sorting rather than changing anyone's underlying health and mortality risks. The net impact of internal migration on population mortality therefore depends on whether place effects (potential health benefits or harms from changing environments) outweigh mobility effects (stresses and disruptions from moving). For example, if the health and longevity benefits of moving to better environments exceed the negative impacts of moving-related costs, internal migration would reduce overall population mortality. Conversely, if mobility-related health costs exceed any gains from environmental improvements, internal migration could increase overall migrant mortality. Additionally, migrants may affect the health of nonmigrants in both origin and destination locations through spillover effects. While there is extensive research on migrants' spillover effects on nonmigrants' wages in both internal and international migration contexts (e.g., Boustan et al., 2010; Card, 1990; Dustmann et al., 2013), empirical research on health spillovers is lacking. Such spillover effects could occur through various channels, such as changes in local health behaviors, health knowledge transfer, or through indirect effects on local wages.

Data and Methods

Data

We use the Berkeley Unified Numident Mortality Database (BUNMD), a harmonized version of the death records from the Social Security Administration (Breen and Goldstein, 2022), which is part of the CenSoc project at the University of California, Berkeley (Goldstein, Alexander, et al., 2023). The BUNMD contains birth year, age at death, sex, race, and father's and mother's first and last names. We infer siblings by exact matching based on father's and mother's first and last names. The BUNMD covers deaths between 1988–2005, and has a coverage rate of over 95% for most of the ages above 65 (Breen and Goldstein, 2022). We select US-born individuals who were born between 1912–1930. The choice of the birth cohorts was made to ensure there are over 300,000 deaths above age 65.

We define internal migration using county and state of residence at the times of birth and death. While there are various approaches to defining migration across spatial and temporal scales (see Section A, Appendix), this definition enables direct comparison with the extensive body of research that measures internal migration at the county and state levels. We divide individuals into three groups: county stayer (i.e., county of birth same as county of death), intrastate, intercounty movers (i.e., birth state same as death state, whereas birth county different from death county; for brevity, we refer to them as intercounty movers), and interstate movers (i.e., birth and death states differ). To partially address the critique of excessive focus on administrative lines, we use county centroids to approximate moving distance for individuals who moved across county boundaries. Traditional lifetime migration measures are based on currently living populations, while ours focuses on lifetime migration at the end of life for deceased individuals, hence reflecting the cumulative movements including return migration or final-stage moves that might be missed in conventional lifetime migration measures. Due to missing birth or death county information for 13.6% of records, we employed inverse probability weighting to address potential sampling bias (see details in the Section A and Table A1 in Appendix).

Analytical Strategies

We use linear regression models to examine mover-stayer differences in age at death, an approach recommended in prior studies examining modelling approaches with CenSoc data (Breen and Goldstein, 2022; Goldstein, Osborne, et al., 2023). Birth year fixed effects are included in linear models predicting age at death (in months) to account for differences in death windows across birth cohorts. We identify siblings by exact matching on father's and mother's first and last names. The sibling sample is used for sibling fixed-effects modeling with which we address confounding factors related to shared early-life family and community environments as well as gene-based selections. Our analyses use these weights generated by the CenSoc project (Goldstein, Alexander, et al., 2023). These weights are calculated by matching BUNMD deaths to the total U.S. deaths in the Human Mortality Database (HMD, 2023), for individuals born between 1900–1940 who died between 1988–2005, by year of birth, year of death, age at death, and sex.

We use two approaches to examine place effects: (1) county or state fixed effects, and (2) including sex-cohort-county-specific average age at death of stayers as a proxy of average healthiness of the county. This second approach has also been used by previous research on migrant mortality as a measure of overall measure of place effects (Finkelstein et al., 2021). We use moving distance to examine the relative importance of the three mechanisms: selection effects, environmental mismatch, and mobility effects. Selection effects predict a positive association between moving distance and migrant longevity, whereas environmental mismatch and mobility effects predict a negative association.

County centroids are used to construct distance measures between birth and death counties (in 100 miles).

To evaluate internal migration's impact on geographic mortality disparities, we calculate average age at death for birth and death counties. We use two summary measures: 1) standard deviation of county average age at death for global inequality, and 2) Moran's I for spatial autocorrelation, which reveals regional clustering of longevity. We use the k-nearest neighbor (k=6) based Moran’s I. Different definitions of neighbors change slightly the levels of Moran’s I, the overall patterns remain largely the same. Comparing these measures between birth and death counties illustrates internal migration's role in spatial inequality in longevity.

Results

How Often Were Americans Born in One Place and Died in Another?

Table 1 presents the sample's summary statistics. The average birth year is 1920.6, the average death year is 1998.3, and the average age at death is 77.8 years (933.2 months). The sample consists of 88.6% Whites, 9.2% Blacks, and 2.3% individuals of other races, and about equal number of men and women. Comparing birth and death regions reveals net out-migration from the Northeast and Midwest, slight in-migration to the South, and notable in-migration to the West. In total, 29.0% of the sample moved across counties within the same state, 42.4% moved across states, and 28.7% died in their county of birth.

Our additional results (Tables A2–A7) in the Appendix show older cohorts are less likely to be county stayers than younger cohorts, but the cohort differences are relatively small (county stayers ranged between 27.8 for the 1912 cohort and 29.9 for the 1927 cohort). Sex differences in lifetime migration patterns are relatively small in these cohorts: women were more likely to move within their state (29.7–30.9% vs 27.9–28.9% for men), whereas men were slightly more likely to move between states (41.0–43.6% vs 40.7–42.9% for women). There are several interesting racial differences in lifetime migration. Blacks had substantially higher interstate migration rates (46.6–52.4%) compared to Whites (40.5–42.3%), with the racial gap being largest (around 10 percentage points) for the 1912–1920 cohorts before narrowing to about 6 percentage points for the 1930 cohort. In contrast, Whites were more likely to move between counties within state (29.3–30.6%) compared to Blacks (21.2–24.8%), a pattern that remained consistent across cohorts, with Black intrastate migration rates declined from 24.8% for the 1912 cohort to 21.3% for the 1930 cohort. Whites were initially more likely to stay in their birth county (28.3–29.6%) than Blacks (23.8–25.3%) for the 1912–1920 cohorts, this pattern flipped for later cohorts, with Blacks becoming slightly more likely to stay (31.5–31.8%) compared to Whites (29.0–29.5%) for the 1928–1930 cohorts. These patterns reflect the historical context of the Great Migration, with earlier cohorts of Blacks showing higher interstate mobility, while later cohorts exhibited increasing geographic immobility.

Overall, we find the prevalences of lifetime interstate and intrastate intercounty migration are 42.4% and 29.0%, respectively. Previous period analysis using cross-sectional census data has shown that the prevalence of lifetime interstate migration is 31.0–32.0% in 1980–2009 (Molloy et al., 2011). The gap between these two types of measurements of lifetime interstate migration rates is about 10%, which could be explained by two distinct processes. First, younger cohorts may have inherently lower migration propensities, whether measured in the short term or over their lifetimes, and our study focuses mostly on older cohorts. Second, migration rates measured at death may naturally exceed those observed in a living population due to continued mobility over the life course. However, it is unclear which one of these processes is more important in driving the observed gap between period and cohort measurements of lifetime migration.

Table 1: Descriptive statistics

Variable	Min	Max	Mean	SD
Birth year	1912	1930	1920.531	4.904
Death year	1988	2005	1998.289	4.630
Death age (in months)	779.992	1127.984	933.089	73.381
Race				
White	0	1	0.880	
Black	0	1	0.096	
Other	0	1	0.024	
Female	0	1	0.504	
Birth region				
Northeast	0	1	0.263	
Midwest	0	1	0.297	
South	0	1	0.364	
West	0	1	0.076	
Death region				
Northeast	0	1	0.209	
Midwest	0	1	0.251	
South	0	1	0.367	
West	0	1	0.172	
Lifetime migration status				
Intercounty mover	0	1	0.289	
Interstate mover	0	1	0.425	
County stayer	0	1	0.286	
Moving distance (in 100 miles)	0	52.260	3.493	5.667
Moving distance, excluding Alaska and Hawaii (in 100 miles)	0	28.389	3.436	5.501
Birth county stayer average death age (in months)	780.057	1126.144	931.251	50.512
Death county stayer average death age (in months)	780.057	1126.144	931.761	50.544
N		12,235,259		

Notes: The combined weights (CenSoc weights and inverse probability weights) are used.

Figure 1 shows the distribution of distances between birth and death counties for movers. Moving distances show a right-skewed distribution concentrated at short-distance moves. The density peaks sharply at around 33.4 miles and rapidly declines, indicating that a large proportion of movers relocate relatively short distances. Figure 1B presents the cumulative percentage of individuals moving more than a given distance. This curve shows a steep initial decline, further confirming that a substantial portion of moves occur over short distances. Figure 1B shows that approximately 25% of movers relocated less than 47 miles, 50% moved within 187 miles, and about 75% moved less than 768 miles. The long tail in Figure 1A and the gradual flattening of the curve in Figure 1B indicate that while long-distance moves are less common, they still constitute a significant minority of all migrations. Notably, a small percentage of individuals (roughly 3.6% as shown in Figure 1B) moved distances exceeding 2,000 miles.

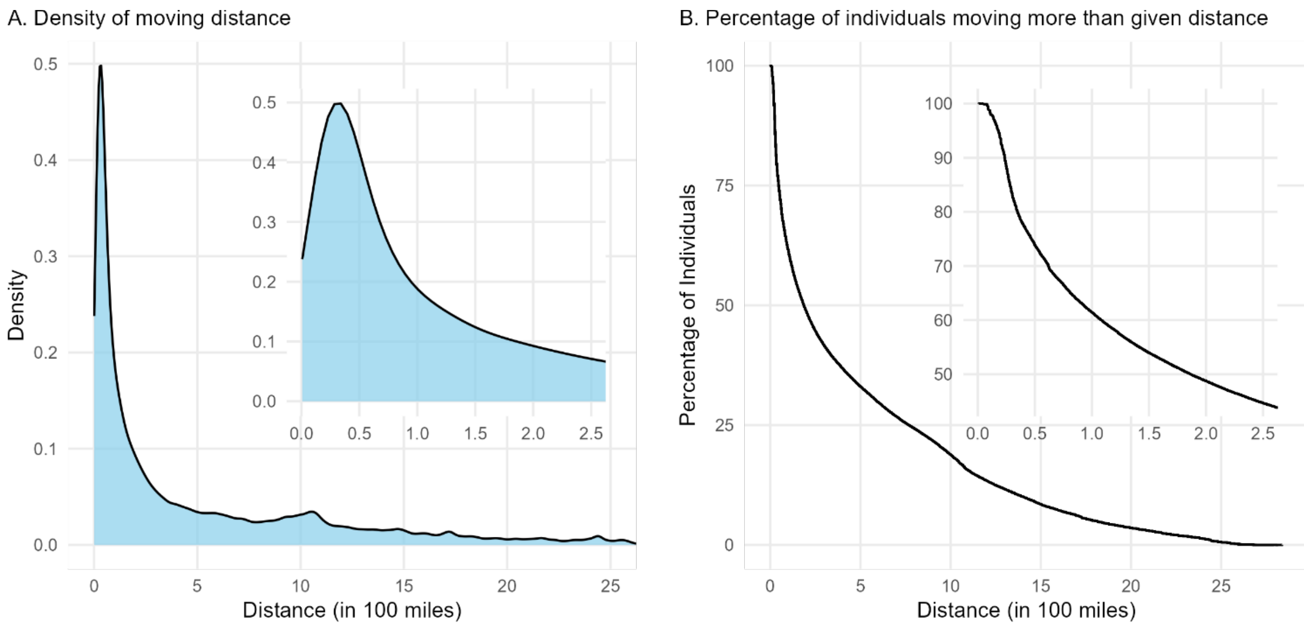


Figure 1: Distribution of the distance between county of birth and county of death for movers (Panel A) and the cumulative percentage of individuals moving more than given distance (Panel B). Alaska and Hawaii are excluded.

We present the geographic patterns of lifetime in- and out-migration across counties in Figure 2. Figure 2A shows that out-migration is most pronounced in the Great Plains region. The darkest shades stretching from North Dakota to Texas, along with parts of Oklahoma, indicate the highest percentages of out-migration. This strong tendency for people born in these areas to move away before death aligns with historical migration patterns, particularly during the Dust Bowl era of the 1930s when severe environmental and economic conditions triggered substantial population displacement in this region (J. Long and Siu, 2018). In contrast, areas around the Great Lakes, and parts of the Carolinas, New England, the West Coast, and Southwest show relatively lower, though still substantial, out-migration rates (mostly between 50 and 70%). Figure 2B shows the variation in the levels of lifetime in-migration across counties (SD 16.2%) is higher than that of lifetime out-migration (SD 12.0%). The popular destinations include counties in Florida and states on the West coast. The Northeast and much of the Midwest show more mixed patterns, with pockets of both high and low in-migration. Some areas (e.g., southern California, New York City) show high both in- and out-migration, indicating population churn. Figures A1 in the appendix further break down the migration rates shown in Figure 2 into intrastate intercounty migration and interstate migration patterns. Overall, we find higher out-of-state migration rates in the Great Plains and Mountain West compared to other regions, and higher intrastate intercounty migration for individuals born in California and Texas. Florida, Arizona, and parts of the West Coast standing out as popular destinations for interstate migrants. We find little sex differences in the spatial variation in lifetime migration (Figures A2 and A3).

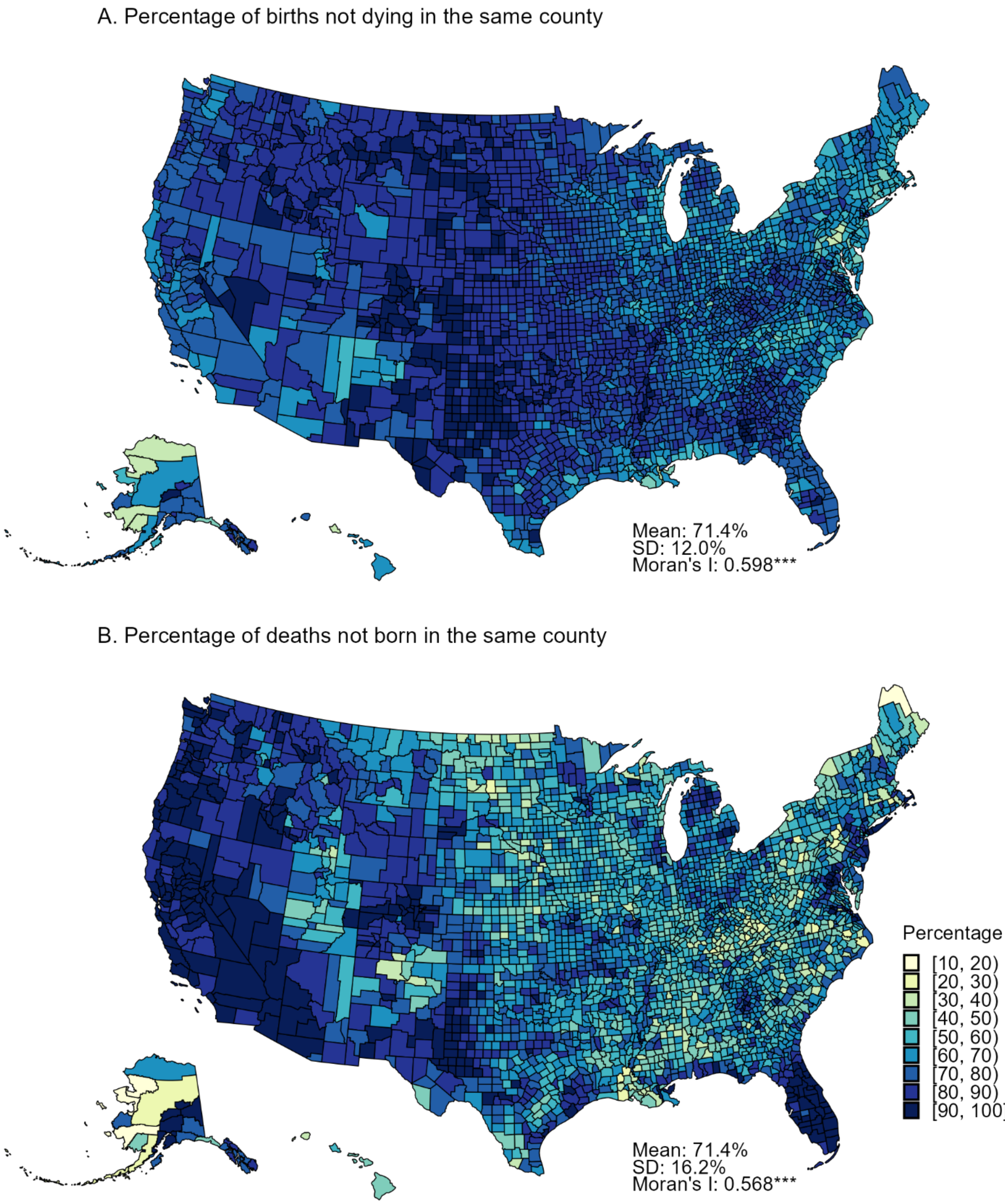


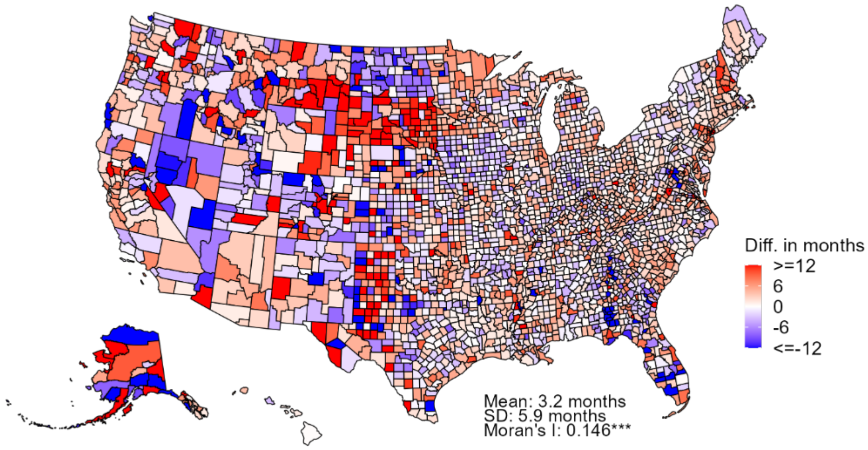
Figure 2: Geographic patterns of lifetime in- and out-migration. Panel A: Percentage of total births not dying in the same county. Panel B: Percentage of total deaths not born in the same county.

Mover Mortality Advantage and Potential Mechanisms

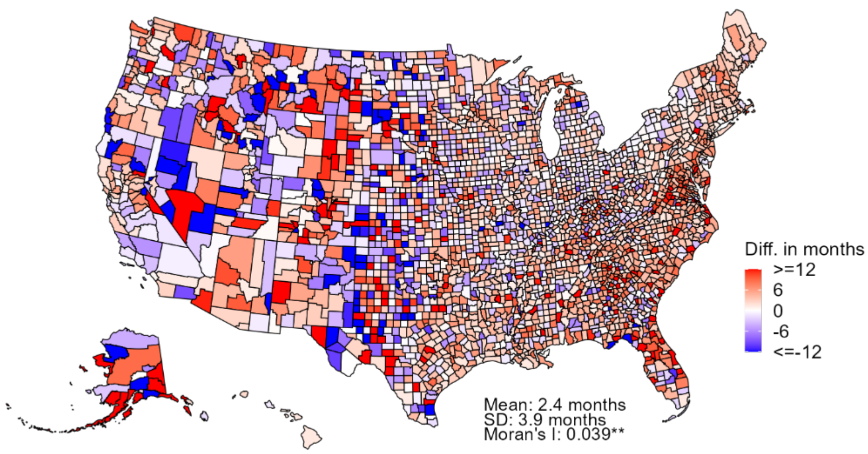
Figure 3 provides a descriptive overview of differences in age at death between movers and stayers across counties. As we do not find important sex differences in these results (Figures A4–A5), we report here the sex-combined results. On average, we find a mover mortality advantage, with a greater advantage when compared to birth county stayers (3.2 months) than when compared to death county stayers (2.4 months). This pattern suggests that, at the population level, migrants on average moved to counties where stayers lived 0.8 months more than stayers in their counties of birth. Figures 3A–3B, reveals complex geographic patterns. There is stronger geographic clustering of mover mortality advantages when compared to origin stayers (Moran's I = 0.146) than destination stayers (Moran's I = 0.039). We find mover mortality advantage relative to stayers in their birth counties clustered in counties in Minnesota and South Dakota. Conversely, people who moved from North Dakota counties typically had shorter lifespans than those who remained in their birth counties.

The contrasting patterns of mover mortality advantage shown in Figures 3A and 3B reflect differences in mortality between in-migrants and out-migrants across counties, as the stayer populations are identical in both comparisons. Figure 3C displays the mean age at death for stayers in each county. Counties with higher stayer longevity, such as those in North Dakota, typically show reduced out-migrant advantage or even out-migrant disadvantage; on the contrary, counties with lower stayer longevity, like those in South Dakota and New Hampshire, generally have stronger out-migrant advantages. The geographic distribution of out-migrant mortality advantage (Figure 3A) correlates more strongly with stayer mortality patterns. In contrast, since in-migrants originate from counties with varying baseline longevity, their mortality advantage shows less geographic correlation with stayer longevity. This explains why the spatial autocorrelation of out-migrant mortality advantage in Figure 3A closer to that of stayer longevity in Figure 3C.

A. Longevity differences: Movers vs. stayers in county of birth



B. Longevity differences: Movers vs. stayers in county of destination



C. Average stayer age at death

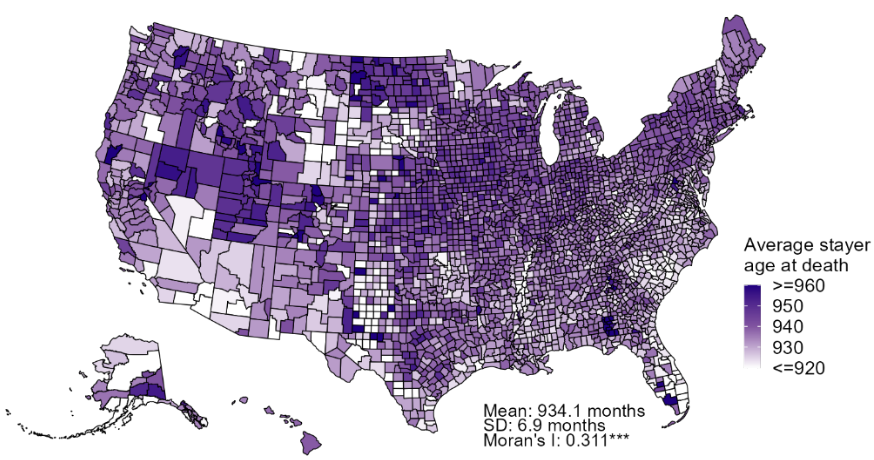


Figure 3: Geographic patterns of mover mortality advantage and stayer longevity. Panel A: Longevity differences between movers and stayers in county of birth. Panel B: Longevity differences between movers and stayers in county of death. Panel C: Average age at death of stayers. All results are standardized based on the birth-year distribution of the total population.

Movers' longevity advantage is confirmed in Models 1 (men) and 5 (women) in Panel A in Table 3, where we regress the age at death on mover indicators with birth-year fixed effects. Interstate movers have a greater longevity advantage than intrastate intercounty movers. Models 2 and 6 include birth and death state fixed effects, and Models 3 and 5 include birth and death county fixed effects. State- and county-level fixed effects can help account for state- and county-specific factors such as policy environment, healthcare quality, and environmental risk factors. The inclusion of birth and death state fixed effects (Models 2 and 6) shows different patterns by sex: male interstate mover advantage remains relatively stable (from 2.668 to 2.701), while female interstate advantage increases noticeably (from 2.560 to 3.117). The increase in women's interstate mover advantage after controlling for state fixed effects suggests that state-level factors were actually masking, not driving, their mortality benefit. This indicates female interstate movers achieved greater longevity despite, rather than because of, state conditions—suggesting strong positive selections among women who chose to move across states. When adding birth and death county fixed effects (Models 3 and 7), both men's and women's mover advantages decrease substantially compared to models 1 and 5, suggesting that county-level factors explain an important portion of the movers' advantage. The reduction is particularly pronounced for intercounty movers, whose advantage drops to 1.402 months for men and 1.727 months for women, while state movers maintain a relatively stronger advantage of 2.403 and 2.658 months respectively. The persistence of substantial mover advantages even after controlling for both birth and death locations indicates that while place effects matter, they explain only a modest portion of the mortality advantage—the majority likely stems from positive health selection of movers.

Models 4 and 8 employ sibling fixed effects, comparing siblings within the same family to account for shared family-level factors like early life environment and genetics that might influence both migration decisions and health outcomes. Surprisingly, we find slightly larger coefficients for both mover dummies in these sibling comparison models. For men, siblings who move across states live on average 3.144 months longer, and siblings who move across counties within the same state live 2.325 months longer than their non-moving siblings. For women, the advantages are even larger, with interstate movers living 4.320 months longer and intrastate intercounty movers living 2.921 months longer than their non-moving siblings. Using sibling fixed effects both controls for shared family influences but also substantially changes the sample—only those with same sex siblings who die in the data window and are matched remain in the sample. In order to decompose these two sources of the changes in coefficients between M3/M4 (men) and M7/8 (women), we include analysis of the sibling samples without controlling for sibling fixed effects and county fixed effects in Table A8. Roughly speaking, we see that over half to two-thirds of the coefficient change for both men and women are the result of sample composition changes. The remaining increases in the coefficients may reflect that migration selection operates in part through individual-level traits (such as personal health and ambition) rather than shared family characteristics. The fact that movers achieve better longevity even when compared to their non-moving siblings suggests that those who overcome family circumstances to migrate may be particularly positively selected on individual characteristics that promote both mobility and survival.

Table 2. Longevity of migrants vs. stayers, 1912–1930 cohorts.

	Men				Women			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
A. Using mover dummies								
Ref. County stayers								
County movers	1.797***	2.091***	1.402***	2.325***	2.418***	2.640***	1.727***	2.921***
	(0.058)	(0.059)	(0.064)	(0.283)	(0.058)	(0.059)	(0.064)	(0.263)
State movers	2.668***	2.701***	2.403***	3.144***	2.560***	3.117***	2.658***	4.320***
	(0.053)	(0.061)	(0.065)	(0.326)	(0.054)	(0.062)	(0.065)	(0.301)
Birth state FE		Yes				Yes		
Death state FE		Yes				Yes		
Birth county FE			Yes	Yes			Yes	Yes
Death county FE			Yes	Yes			Yes	Yes
Sibling FE				Yes				Yes
Observations	6,134,450	6,134,450	6,134,450	362,766	6,100,809	6,100,809	6,100,809	412,061
R-squared	0.423	0.425	0.428	0.705	0.461	0.463	0.466	0.722
B. Using moving distance (in 100 miles)								
Distance	0.418***	0.421***	0.405***	0.488***	0.302***	0.423***	0.412***	0.646***
	(0.009)	(0.012)	(0.012)	(0.070)	(0.010)	(0.012)	(0.013)	(0.068)
Distance squared	-0.013***	-0.012***	-0.011***	-0.011**	-0.012***	-0.011***	-0.011***	-0.015***
	(0.000)	(0.001)	(0.001)	(0.003)	(0.000)	(0.001)	(0.001)	(0.003)
Birth state FE		Yes				Yes		
Death state FE		Yes				Yes		
Birth county FE			Yes	Yes			Yes	Yes
Death county FE			Yes	Yes			Yes	Yes
Sibling FE				Yes				Yes
Birth year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,134,450	6,134,450	6,134,450	362,766	6,100,809	6,100,809	6,100,809	412,061
R-squared	0.423	0.425	0.428	0.705	0.461	0.462	0.466	0.722

Notes: All models control for race and use combined weights (CenSoc weights and inverse probability weights).
* p < 0.01, ** p < 0.05, *** p < 0.001.
Standard errors in parentheses.

Panel B of Table 2 examines the relationship between moving distance and longevity, revealing a positive but diminishing association.[1] For each additional 100 miles moved, longevity increases, though these benefits taper off at very long distances (over 2,000 miles in sibling fixed effects models for both men and women)—distances rarely reached by most migrants in our sample. The stability of distance coefficients across models with different county and state fixed effects suggests that place characteristics associated with county and state boundaries play only a moderate role in explaining the mortality advantage of movers. The distance results provide several insights about migration mechanisms. First, the consistently positive relationship between moving distance and longevity, even

[1] See Table A9 for results from models excluding Hawaii and Alaska.

at long distances, contradicts the environmental mismatch hypothesis—which would predict worse health outcomes for those moving between dissimilar environments typically found at greater distances. Second, while migration can impose social and psychological costs that typically increase with distance, the positive distance gradient suggests that these potential downsides are outweighed by other factors. The most plausible explanation is that longer-distance moves reflect stronger positive selection on health and other individual characteristics that promote both mobility and survival. Similar to our earlier findings in Panel A, the distance coefficients become larger in sibling fixed effects models, reinforcing that migration selection operates through individual rather than family-level characteristics.

The sibling comparison in both panels reveals greater mortality advantages for female movers compared to male movers. Women's migration, especially for these cohorts, was often tied to marriage and their husbands' characteristics. The larger mortality advantage for women may reflect a double selection process: women who moved were selected not only on their own individual characteristics but also through their marriage to men (Mincer, 1978). However, this marriage-based selection mechanism alone many not fully explain why women would experience greater longevity benefits than men. Other factors might include women being more successful at maintaining social connections across distances (i.e. less negative mobility effects), or female movers being particularly selected for traits like grit (White et al., 2024) that promote both successful migration and longer life.

Table 3 examines how the overall health environments of birth and death counties, using sex-cohort-specific average age at death of stayers, affect mover longevity. Models 1 and 3 show that the health environments of the destination county have a stronger influence than that of the birth county. Specifically, when the average age at death among stayers in the destination county increases by one month, male movers' longevity increases by 0.105 months, while female movers' longevity increases by 0.090 months. In contrast, the birth county's health environment shows a small impact: a one-month increase in stayers' longevity in the birth county corresponds to only a 0.022-month increase in longevity for both male and female movers. Models 2 and 4, which incorporate sibling fixed effects, demonstrate that while the influence of the destination county's health environment diminishes (to 0.091 months for men and 0.067 months for women), it remains statistically significant. This attenuation suggests that shared familial and genetic factors among siblings partially explain the observed destination effects. When analyzing the sibling samples without sibling fixed effects, the coefficients (see Table A10) are similar to what is observed in Models 1 and 3.

Table 3: Effects of county stayer average longevity on migrants' age at death.

	Men		Women	
	Model 1	Model 2	Model 3	Model 4
Birth county stayer average longevity	0.022***	-0.021	0.022***	0.018
	(0.002)	(0.015)	(0.002)	(0.013)
Death county stayer average longevity	0.105***	0.091***	0.090***	0.067***
	(0.002)	(0.014)	(0.002)	(0.013)
Observations	4,288,207	135,494	4,295,727	155,219
R-squared	0.422	0.693	0.461	0.714
Sibling FE		Yes		Yes
Birth year FE	Yes	Yes	Yes	Yes

Notes: All models control for race and use combined weights (CenSoc weights and inverse probability weights).
* p < 0.01, ** p < 0.05, *** p < 0.001.
Standard errors in parentheses.

Implications for Macro Mortality Dynamics

In this subsection, we consider two types of such impacts: population overall mortality level and geographic disparities in mortality. We indirectly gauge the likely magnitude of these impacts in accordance with the three pathways linking internal migration with migrant mortality. First, the selection mechanism has no impact on population overall mortality, as simply redistributing individuals with different mortality risks across space does not affect aggregate mortality. Second, the places effects will lead to a moderate positive effect on overall population mortality. This is because our previous analyses show that (1) 71% of the U.S born population moved across counties (Figure 2), (2) movers on average moved to counties where local stayers lived on average 0.8 months more than stayers in their birth counties (Figure 3), and (3) an additional month in average stayer longevity in destination county is associated with an additional 0.1-month longevity of movers (Table 3). Combining these three pieces of evidence together, the places effects amount to $71\% \times 0.8 \times 0.1 = 0.057$ months added to the total U.S. born population. Third, the contribution of mobility effects to overall population mortality remains uncertain, though likely modest given that our earlier findings indicate selection effects dominate mobility effects in magnitude (Table 2).

Table 4: Inequality measures by county of birth and county of death.

	Standard deviation		Moran's I	
	Men	Women	Men	Women
By county of birth	5.86	5.82	0.22	0.28
By county of death	7.01	7.43	0.13	0.15
% difference	19.57%	27.79%	-40.47%	-45.85%

Note: SD: Percentage difference calculated as (death - birth)/birth × 100%. All Moran's I values are statistically significant at p=0.001 level.

We also examine how internal migration can affect geographic disparities in longevity, which can be conceptualized and measured in two ways. One approach is to examine global inequality measures that do not account for spatial configuration. The other approach is to examine spatial autocorrelation, i.e., the degree to which similar values cluster together in space. We use standard deviation (SD) to capture global inequality and Moran's I (ranging from 0 no spatial autocorrelation to 1 perfect positive spatial autocorrelation) to capture spatial autocorrelation. Comparing inequality measures based on place of birth and place of death allows us to assess how internal migration impacts the geographic pattern of mortality, as any differences between the two must stem from population redistribution through migration, including the causal impact of migration on mortality. Table 4 presents the average inequality measures pooled across all birth cohorts. For men, SD increased by about 20% when measured by county of death compared to county of birth (from 5.70 to 6.93 months). The increase is even larger for women, at around 28% (from 5.61 to 7.37 months). Interestingly, the results for Moran's I show the opposite pattern, with spatial autocorrelation decreasing when measured by county of death compared to county of birth. For men, Moran's I decreases by about 40% from 0.22 to 0.13, while for women it decreases by nearly 46% from 0.28 to 0.15. These contrasting patterns suggest that while internal migration leads to greater overall geographic inequality in longevity (as shown by the increasing SD), it simultaneously reduces the spatial clustering of similar mortality outcomes (as indicated by the decreasing Moran's I). The higher Moran's I values for county of birth suggest that either early-life conditions have persistent effects on mortality regardless of later moves, or people from neighboring birth counties tend to follow similar migration patterns (i.e. moving to similar places). The lower clustering by death county indicates that even when people share the same local conditions in their destination counties, their diverse origins and exposures across lifetime migration trajectories create more heterogeneous mortality patterns across destination counties.

Discussion

In this study, we present the first comprehensive analysis on the relationship between intercounty migration and longevity in the US. Using over 12 million Social Security Administration death records for cohorts born between 1912 and 1930, we find that a substantial proportion of individuals (41-43%) died in a state that is not their birth state, with an additional 28-30% dying in a different county within their birth state. There is an overall longevity advantage for movers compared to stayers in both origin and destination counties, which is consistent with the well-established "healthy migrant effect" documented in the international migration literature.

The magnitude of the longevity difference between internal migrants and nonmigrants is substantial. The results (Table 2) reveal that, depending on the model and type of migration (interstate vs. intrastate intercounty), migrants live on average 2-4 months longer than nonmigrants. To put this into perspective, we compare the magnitude of the migrant longevity advantage with old-age mortality statistics at the national level. Our study focused on deaths within a 17-year period; hence, for 65-year-olds, deaths between ages 65 and 82. Using US life tables from the Human Mortality Database (HMD, 2023), our calculation shows that the average age at death in the US between 65 and 82 increased from 74.2 in 1933 to 75.7 in 2019, with an average increase of 0.2 months per calendar year. Thus, the observed migrant longevity advantage is equivalent to 10 to 20 years' improvement in mortality over these ages at the national level. It is important to note that our study focuses on a 17-year death window, not the entire lifespan. If we assume that migrants maintain an overall advantage across the life course, the total migrant mortality advantage over a full lifespan could be even more pronounced than what we have observed in this study.

This mover mortality advantage persists even after accounting for place effects and shared genetic and childhood family influences, which suggests most of the observed migrant mortality advantage is due to selection effects that operate at the individual level. These selection mechanisms could include positive selections on adulthood socioeconomic resources, health-related human capital, and psychological traits such as risk tolerance and future orientation, which are in part heterogeneous within families. The stronger mortality advantage we observe for longer-distance movers further supports the importance of these selection factors, as longer moves typically require more resources, planning, and risk tolerance. Understanding specific selection mechanisms remains important for theoretical development. The selection mechanisms operating in internal migration may differ from some of those typically emphasized in international migration research. Cultural factors—such as healthier dietary habits, lower smoking rates, or stronger family ties—that are often cited to explain phenomena like the "Hispanic paradox" likely play a less important role in internal migration within a relatively culturally homogeneous country like the US.

Selective out-migration, i.e. the salmon bias, is also often used to explain international migrants' health advantage (Abraído-Lanza et al., 1999). This hypothesis suggests that migrants in poor health are more likely to return to their place of origin, thereby creating an artificially healthier remaining migrant population. While research has found evidence of such selective out-migration among internal migrants in Sweden (Andersson and Drefahl, 2017), this mechanism likely plays a less significant role in U.S. internal migration compared to international migration. Internal migration rates at older are much less common than at younger ages and such late-life moves are mostly due to moving to institutional care facilities (Bernard et al., 2014). Most moves to institutions tend to be short-distance relocations. While this could affect our estimates of intercounty movers' mortality advantage, our findings regarding interstate movers' mortality advantage are likely less influenced by such late-life institutional moves, as these typically occur within states.

While we found an overall population-level mover mortality advantage, there is significant geographic heterogeneity in both migration patterns and longevity differences between migrants and nonmigrants across the country. For instance, the magnitude of the mover advantage varies substantially across birth counties and migration corridors, and these variations may be linked to local socioeconomic conditions, healthcare access, or environmental factors. Understanding these geographic patterns and their underlying determinants will be an important extension for future work, as it could reveal how place-specific contexts shape both migration decisions and subsequent health outcomes.

Our findings reveal that geographic inequality in longevity is larger when measured by county of death compared to county of birth, suggesting that internal migration tends to reinforce existing patterns of mortality inequality across counties. This contrasts with recent period analysis by Fletcher et al. (2023), which found that interstate migration appears to mitigate state-level disparities in longevity, with less inequality observed across states of death than states of birth. To investigate whether the choice of geographic unit may explain these seemingly contradictory findings, we calculated the inequality measures using state as the unit of analysis (see Appendix Table A11). Interestingly, the state-level results are consistent with our county-level findings, showing greater inequality (measured by SD) across states of death than states of birth. This suggests that the discrepancy between our findings and those of Fletcher et al. (2023) is likely not driven by differences in geographic scale. Instead, other methodological differences, such as the use of cohort vs. period approaches or differences in the death ages studied, may explain the contrasting conclusions. Further research is needed to develop a more comprehensive understanding of how internal migration influences geographic health inequalities at various spatial and temporal scales.

Future research could benefit from addressing the limitations of this study. First, the double truncation of the death records is an unusual feature of mortality analysis. Our analysis is limited to mortality at ages 65 and above. Thus, we cannot examine the internal migration effect at ages below 65. However, this age restriction also helps reduce a fundamental selection bias inherent in migration-mortality research using death records: migrants mechanically exhibit higher average age at death compared to non-migrants within the same birth cohort, simply because individuals must survive long enough to migrate before dying to be classified as migrants. Since the majority of internal migration occurs before age 65, our focus on mortality at ages 65 and above partially mitigates this survivorship bias, though it does not eliminate it entirely. Despite these constraints, the CenSoc data represents a valuable and relatively underutilized resource for examining old-age mortality differentials by migration status at the population scale (Bakhtiari and Das, 2024).Our estimates should therefore be interpreted as migration effects on late-life mortality, conditional on dying within the cohort-specific death windows. To demonstrate that the left and right truncations, although adding to the difficulty of the interpretation, do not change the direction of the association between internal migration and old-age mortality, we conducted robustness checks with single-cohort analyses. Analysis of cohorts 1923–1930 with varying right truncation shows smaller coefficients for younger cohorts with shorter observation windows, while analysis of cohorts 1912–1923 with varying left truncation shows smaller coefficients for older cohorts with later starting ages (see Figures A6–A9 in Appendix). Both analyses demonstrate that truncation mechanically reduces coefficient magnitudes but does not change the consistent positive direction of the internal migration-mortality relationship or the associations between average birth- and death-county stayer destination and mover longevity, consistent with prior research evaluating the impact of truncation (Goldstein, Osborne, et al., 2023).

Second, we lack detailed variables like socioeconomic status that could help us better understand the mechanisms behind the migrant advantage we observed. However, we have used some innovative approaches, such as county and sibling fixed effects, and using distance as a proxy for testing selection vs direct moving effects. Third, our definition of migration is based on end-of-life geographic location, which does not capture the potentially complex migration trajectories between birth and death. Studies with more detailed migration histories could examine how the timing of moves and complex migration trajectories influence mortality outcomes across the life course. Research incorporating socioeconomic variables could better illuminate the mechanisms underlying the migrant mortality advantage. Fourth, we excluded the entire foreign-born population. In future work, integrating findings on internal migration with those of international migration into a coherent framework could provide valuable insights, particularly by examining how internal migration patterns of international migrants influence their health and mortality outcomes. Despite these limitations, this study makes important contributions to research on internal migration and longevity by providing the first set of empirical results as a foundation for future work.

The declining internal migration rates in the US over recent decades raise important questions about potential impacts on population health. Our findings of a migrant mortality advantage add complexity to this issue. If this advantage primarily stems from selection effects, where healthier individuals are more likely to migrate, the decrease in geographic mobility might have limited direct impact on overall population health. However, if migration itself confers health benefits through improved socioeconomic opportunities or access to better environments, reduced mobility could have more significant consequences. Currently, we lack a comprehensive understanding of the causal health benefits resulting from migration events. Understanding these mechanisms is key to assessing how shifts in internal migration might impact population health and to shaping policies that address population health challenges arising from changing mobility trends.

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