Does Destination Matter?
Geographic Patterns of Immigrant Health in the U.S.

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Motivation and Contribution

There are well-documented health disparities by geographic region in the United States. For instance, there are sharp differences in mortality and health outcomes across U.S. states (Montez, Hayward, & Wolf, 2017; Montez, Zajacova, & Hayward, 2016), and between counties (Murray et al., 2006; Wang, Schumacher, Levitz, Mokdad, & Murray, 2013) and commuting zones (Chetty et al., 2016). Broad geographic regions are also characterized by distinctive epidemiologic profiles. For example, residents in the South have higher risks of obesity and stroke than those in other census regions (Baskin, Ard, Franklin, & Allison, 2005; Obisesan, Vargas, & Gillum, 2000). These geographic regions, together with their racial, political, socioeconomic and epidemiological climates, form the heterogeneous contexts into which new immigrants are incorporated. However, few studies to date have examined variation in health across both nativity and region of residence in the United States. Do immigrants display different health patterns and trajectories as they settle in these regions? How do patterns further differ by immigrants' race/ethnicity? Aiming to answer these questions, we examine cross-sectional and longitudinal patterns of immigrants' health in the four U.S. census regions: Northeast, North Central/Midwest, South, and West.

Our research contributes to the literature on social determinants of health in two ways. First, we add a new geographic dimension to analyses of the immigrant health differential, a topic of growing relevance in the United States. Previous research on immigrants' health has mostly focused on its paradoxical nature, since immigrants typically have lower socioeconomic status but more favorable outcomes in health and mortality (Jass & Massey, 2004; Markides & Rote, 2015; Palloni & Arias, 2004). Recently, heterogeneities in the immigrant health differential have received more attention, especially that by immigrants' country of origin (Hamilton & Hummer, 2011; Mehta, Elo, Engelman, Lauderdale, & Kestenbaum, 2016). However, immigrants' health patterns may vary across destinations as well as by origins, yet little is known about the former. We directly address this level of heterogeneity in our paper.

Second, we extend previous research on geographic disparities in health by taking a life course perspective. We think of region of residence in the U.S. as a proxy measure of a set of contextual factors that individuals are exposed to in their daily life, including characteristics that shape health behaviors such as diets and physical activity patterns as well as social and economic factors that shape race relations, friendliness to newcomers, and access to material and social supports. We expect differing geographic contexts to differentiate the trajectories of individuals' health over time, especially in older ages. We will explore whether immigrants' average trajectories in different U.S. regions are different, as well as whether immigrants from Mexico follow similar trajectories in different regions. Our findings will deepen our understanding of how region of residence may shape individuals' health patterns across the life course.

Data and Methods

There are two parts to our analysis. In the first part, we use the 2000-2016 waves of the National Health Interview Survey (NHIS) to examine and understand cross-sectional patterns of the immigrant health differential by U.S. region. We pool together 17 waves of data to get a large sample size (n=1,099,276 for self-rated health, and n=480,094 for functional limitation), which enables us to gain more accurate estimates by U.S. region of residence. In the second part, we use waves 1 through 12 of the Health and Retirement Study (HRS) to estimate longitudinal trajectories of immigrants' health after age 50 (n=4,803). There are a total of five birth cohorts in the HRS sample.

Throughout our analysis, we use two outcome variables: self-reported health (SRH) and functional limitation. SRH captures individuals' subjective health status. Despite its potential lack of accuracy, it is widely used for population comparisons given its established validity (Idler & Benyamini, 1997). Functional limitation is a measure of disability, which is an important aspect of health that affects individuals' daily life, especially at older ages. In both datasets, SRH is a variable with five categories: excellent, very good, good, fair, and poor. In the NHIS, functional limitation is a binary measure of whether respondent as any functional limitation; in the HRS, functional limitation is a summary measure of the total number of limitations an individual has, ranging from 0 to 12. These limitations include: walking several blocks, walking one block, walking across the room, sitting for two hours, getting up from a chair after having sat for a while, climbing several flights of stairs, climbing a single flight of stairs, stooping / kneeling /crouching, lifting or carrying 10 pounds, picking up a dime off a table, raising one's arms above one's shoulders, and pushing or pulling large objects, such as furniture.

In the first part of the analysis, we show regional differences in the immigrant health differential on both outcomes. To allow calculations of rates and relative risks, we recoded SRH as a binary variable: whether respondent reports fair/poor health. We first explore the raw relative risks (foreign-to-U.S.-born) of having fair/poor health and any functional limitation, and the relative risks after accounting for compositional differences in age, sex, and racial/ethnicity. We then ask: how much of the nativity differential is due to differences among immigrants across regions and how much is due to differences among the U.S.-born across region? We answer these questions by decomposing differences in rates of fair/poor SRH and functional limitation across regions, accounting for compositional differences in educational attainment and immigrants' region of origin.

In the second part of the analysis, we estimate random coefficient growth curve models of immigrants' health trajectories after age 50 by their region of residence in the United States. Region of residence is a time-varying variable, but the actual within-person variability is low because most people move over short distances and not between census regions (Clark & Dieleman, 1996). We take the mode of respondents' reported census region over the twelve waves as their region of residence. There are two sets of growth curve models in our analysis. We first include all immigrants, and then take a closer look at Mexican immigrants' trajectories

by region of residence as a case study for the impact of places on health. For each set of growth curves, we estimate a naïve model followed by three models that respectively account for individuals' demographic characteristics (sex, race/ethnicity), socioeconomic status (educational attainment, income, occupation type), and health behaviors (obesity status, smoking status, drinking behaviors). These subsequent models test the validity of our potential explanations for regional differences in immigrants' health trajectories.

Preliminary Results

Table 1 shows weighted descriptive statistics from the National Health Interview Survey (2000-2016). Populations in the four U.S. census regions largely differ from each other in terms of their racial/ethnic, education, and nativity composition(Table 1). While non-Hispanic Whites are a majority in all regions, they make up the largest proportion in the Midwest (83% White) and the smallest in the West (60% White). Nationally, the second-largest racial/ethnic group is non-Hispanic Blacks except in the West, where Hispanics make up for 26% of the population. The most educated regions are the Northeast and the West, where about 30% of the population have at least a Bachelor's degree. In terms of nativity, the Midwest has the highest proportion of native-born individuals, and the West as the highest proportion of foreign-born individuals. Most frequently, foreign-born populations in the four U.S. regions come from Latin America, followed by those from Asia and Europe. Overall, these basic statistics reflect that the demographic and socioeconomic contexts of the four census regions are quite different.

Table 2 shows unweighted descriptive statistics from the Health and Retirement Study(HRS). Naturally, the HRS sample is older and has a slightly higher proportion of females since it targets individuals over the age of 50. It is worth emphasizing that we have not applied weights to numbers in this table, so they are not representative of national averages. Overall\, individuals in the HRS sample have lower educational attainment than the national averages in 2000-2016 (Table 1), which makes sense because the five cohorts in the HRS are older. In the final paper, we will apply weights to Table 2 so that it also reflects national averages.

In Table 3 and 4, we calculate rates of reporting fair/poor health and having any functional limitation for foreign- and native-born individuals by census region, as well as foreign-to-U.S.-born ratios. The results vary by outcome. While foreign-born individuals are less likely to have fair/poor SRH than their native-born counterparts in the Midwest and the South, they are more likely to report fair/poor SRH in the Northeast and the West. On the other hand, results for functional limitation are relatively homogenous: there is a foreign-born health advantage in all the census regions. The foreign-to-U.S.-born ratio in SRH is the lowest in the South (a strong foreign-born advantage), and the highest in the Northeast (a strong foreign-born disadvantage). The foreign-to-U.S.-born ratio in functional limitation is the lowest in the Midwest and the West, and the highest in the Northeast. Overall, it is evident that the direction and magnitude of the immigrant health differential vary across U.S. regions.

Last, we seek to more formally understand whether the "foreign-born effect" is stronger in some census regions than others. We estimate logistic regressions for SRH and functional limitation, accounting for age, sex, and race/ethnicity. Our main predictors are region of residence, nativity, and an interaction term between region and nativity. If the interaction term (e.g. Foreign-born*Midwest) is significantly different from zero, we take it as a signal that the "foreign-born effect" is indeed different across regions. Preliminary results in Table 5 confirm our intuition that destination matters. While foreign-born individuals have an overall disadvantage in general health, this disadvantage is smaller in the Midwest and the South than in the Northeast (Model 1). While foreign-born individuals have an overall advantage in functional limitation, this advantage is even larger in the South and the West than in the Northeast (Model 2).

Summary

While previous research has shown that immigrants' health varies by their regions of origin, we know little about the influence of migration destinations. Our preliminary findings indicate that destinations indeed matter to the direction and magnitude of the immigrant health differential. As next steps, we will use HRS data to estimate growth curve models to understand whether destination also matters to immigrants' longitudinal health trajectories, and try to explain our findings. Our final paper will contribute to the literature on migration and health by documenting geographic variability in the health of foreign-born Americans, and to the literature on spatial disparities in health by considering Mexican immigrants as a case study for the impact of place on health.

Table 1. Weighted Descriptive Statistics, by U.S. Region of Residence
(Source: National Health Interview Survey, 2000-2016)

	Northeast	Midwest	South	West
Female	0.53	0.52	0.52	0.51
Age (Mean)	49.12	47.80	47.62	46.65
(Standard Deviation)	18.06	18.34	17.96	17.79
Race/ethnicity				
Non-Hispanic Asian	0.05	0.03	0.03	0.10
Non-Hispanic Black	0.10	0.09	0.18	0.04
Hispanic	0.10	0.05	0.13	0.26
Non-Hispanic White	0.74	0.83	0.66	0.60
Education				
Less than High School	0.13	0.12	0.18	0.17
High School or Equivalent	0.30	0.31	0.28	0.23
Some College	0.26	0.32	0.29	0.32
Bachelor's Degree	0.19	0.17	0.16	0.19
Graduate Degree	0.12	0.08	0.09	0.10
Region of origin				
United States	0.80	0.92	0.86	0.74
Latin America	0.10	0.03	0.09	0.15
Asia	0.03	0.01	0.01	0.06
Europe	0.03	0.01	0.01	0.02
Russia/Former U.S.S.R.	0.01	0.00	0.00	0.00
Africa	0.01	0.01	0.01	0.00
Elsewhere	0.03	0.02	0.01	0.03
n	77,637	91,065	155,285	102,275

Table 2. Unweighted Descriptive Statistics (based on the first interview for each respondent), by U.S. Region of Residence (Source: Health and Retirement Study)

	Northeast	Midwest	South	West
Female	0.60	0.57	0.57	0.56
Age (Mean)	59.99	60.50	58.14	56.93
(Standard Deviation)	11.95	12.90	11.14	10.65
Race/ethnicity				
Non-Hispanic Black	0.21	0.03	0.09	0.01
Non-Hispanic Other	0.11	0.12	0.06	0.15
Hispanic	0.36	0.26	0.66	0.61
Non-Hispanic White	0.32	0.59	0.18	0.23
Education				
Less than High School	0.43	0.40	0.48	0.45
High School or Equivalent	0.25	0.25	0.22	0.19
Some College	0.15	0.17	0.15	0.17
Bachelor's Degree or above	0.17	0.18	0.16	0.19
Self-rated health (1~5; 1=poor, 5 = excellent) (Mean)	3.06	3.19	3.04	3.06
(Standard Deviation)	1.25	1.22	1.23	1.19
n	1,196	366	1,698	1,445

Table 3. Rate of reporting fair/poor health, foreign-born vs. U.S.-born adults aged 18+.
(Source: National Health Interview Survey, 2000-2016)

	Northeast	Midwest	South	West
Foreign-born	0.14	0.10	0.11	0.13
U.S.-born	0.11	0.12	0.15	0.11
Foreign-to-U.S.-born ratio	1.27	0.82	0.74	1.14

Table 4. Rate of having any functional limitation, foreign-born vs. U.S.-born adults aged 18+.
(Source: National Health Interview Survey, 2000-2016)

	Northeast	Midwest	South	West
Foreign-born	0.25	0.24	0.20	0.23
U.S.-born	0.33	0.37	0.35	0.35
Foreign-to-U.S.-born ratio	0.74	0.65	0.57	0.66

Table 5. Odds ratio of reporting fair/poor health and functional limitation, foreign-born vs. U.S.-born aged 18 +.
(Source: National Health Interview Survey, 2000-2016)

	Model 1: Fair/poor health	Model 2: Functional limitation
Foreign-born	1.13* (1.06 - 1.20)	0.72* (0.68 - 0.75)
Region of residence (Ref: Northeast)		
North Central/Midwest	1.18* (1.14 - 1.23)	1.29* (1.25 - 1.33)
South	1.47* (1.42 - 1.53)	1.14* (1.11 - 1.17)
West	1.08* (1.04 - 1.13)	1.17* (1.14 - 1.21)
Foreign-born*Midwest	0.72* (0.64 - 0.80)	0.97 (0.90 - 1.05)
Foreign-born*South	0.56* (0.52 - 0.60)	0.76* (0.72 - 0.81)
Foreign-born*West	0.96 (0.89 - 1.03)	0.90* (0.84 - 0.95)
Age	1.04* (1.04 - 1.04)	1.05* (1.05 - 1.05)
Female	1.08* (1.06 - 1.10)	1.52* (1.49 - 1.54)
Race/ethnicity (Ref: non-Hispanic White)		
Non-Hispanic Asian	0.96 (0.90 - 1.03)	0.67* (0.64 - 0.70)
Non-Hispanic Black	1.99* (1.93 - 2.05)	1.08* (1.05 - 1.10)
Hispanic	1.92* (1.85 - 1.99)	1.02 (0.99 - 1.05)
Observations	1,099,276	480,094

Note: Confidence Intervals in Parentheses. * $p<0.01$, + $p<0.05$

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