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Investigating Health Selection Within Mexico and Across the US Border

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Abstract

Despite acquiring lower levels of attainment and earnings, Mexican immigrants exhibit favorable health outcomes relative to their native-born counterparts. And while scholars attempt to reconcile this so-called paradoxical relationship with a variety of theoretical and empirical approaches, patterns of selective migration continue to receive considerable attention. The present study contributes to the literature on health selection by extending the healthy migrant hypothesis in a number of ways. First, we rely on a unique combination of data sets to assess whether the healthy are disproportionately more likely to migrate. We use the latest wave of the Mexican Family Life Survey and the 2013 Migrant Study, a survey that is representative of Mexican-born persons who are actively migrating through Tijuana. Pooling these data also allow us to differentiate between internal and US-bound migrants to shed light on their respective health profiles. Results provide modest support for the healthy migrant hypothesis. Although those who report better overall health are more likely to migrate, we find that the presence of certain chronic conditions increases migration risk. Our findings also suggest that internal migrants are healthier than those traveling to the US, though this is largely because those moving within Mexico reflect a younger and more educated population. This study takes an important step in uncovering variation across migrant flows and highlights the importance of the timing at which health is measured in the migration process.

Keywords

Mexico; Health selection; Healthy migrant hypothesis; Internal migration

Introduction

Hispanic immigrants exhibit lower rates of obesity, cardiovascular disease, activity limitations, and chronic diseases relative to native-born Hispanics and whites (Alegria et al. 2007; Hummer, Benjamins, and Rogers 2004; Hummer et al. 2007; Peek et al. 2010; Read and Reynolds 2012). Although several explanations have emerged to reconcile this so-called paradox, many attribute this health advantage to selective migration patterns (Abraido-Lanza et al. 1999; Bostean 2013; Crimmins et al. 2005; Ullmann, Goldman, and Massey 2011). One such possibility—the healthy migrant hypothesis—posits that the costs of migration prevent less capable (e.g. healthy) individuals from relocating. As a result, migrants represent a comparably advantaged population with respect to socioeconomic characteristics, health, and a variety of other attributes. The present study extends the healthy migrant hypothesis in the following ways.

First, we use a unique combination of data sources to investigate patterns of health-related migration. One data source is broadly representative of Mexican residents with no prior migration experience. The other captures Mexican-born persons in Tijuana who are actively moving within Mexico or attempting to reach the US. Because immigrants who are enumerated in US-based surveys have often spent substantial amounts of time in the host society, it is likely that the consequences of migration—including exposure to new social and environmental contexts—go on to influence later health and well-being. We overcome a primary limitation of existing work by interviewing migrants after they made the decision to relocate, but before they enter the US; this approach explicitly considers the timing at which health is measured in relation to migration decisions. Second, we compare the health of non-migrants to those traveling to the US as well as internal migrants. Despite a long line of scholarship investigating the relation between human capital accumulation and population movement within Mexico (e.g. Curran and Rivero-Fuentes 2003; Lindstrom and Lauster 2001; Stark and Taylor 1991), the health profile of internal movers remains systematically underexplored. Such an omission is particularly striking given that rates of state-to-state Mexican migration have remained relatively high since the 1970s (INEGI 2010). Differentiating between US- and internal migrant flows thus provides an opportunity to identify variation in the selection process across multiple receiving contexts.

The present study could help generate targeted policy solutions to improve the social and economic conditions for sending and receiving communities alike. If healthier or higher ability individuals systematically relocate to the US or within Mexico, existing inequality between sending and receiving communities—particularly in the Mexican context—may continue to intensify. Local investment in medical and educational services would thus be needed to ensure sending areas are not depleted of valuable resources and skills. If unhealthy individuals are more likely to engage in migration, however, receiving areas should find ways to accommodate and invest in the specific needs of this population; doing so would greatly enhance the health and productivity of the larger immigrant community. Our findings will ultimately help inform the relation between health and migration on both sides of the US-Mexico border.

The Hispanic Health Advantage: Explanations and Evidence

Despite earning lower education and wages, Mexicans who immigrate to the US exhibit favorable health outcomes relative to the native-born. This health advantage extends to older adult and infant mortality rates, obesity, cardiovascular diseases, as well as activity limitations and chronic conditions (Hill et al. 2012; Hummer et al. 2004, 2007; Jasso et al. 2004; Markides and Coreil 1986). Given the striking mismatch between Hispanics' relatively low socioeconomic status and their favorable health profile, scholars consider a number of explanations that may be driving this paradoxical relationship—including data misreporting (Elo and Preston 1997; Elo et al. 2004; Palloni and Morenoff 2001; Rosenberg et al. 1999), cultural buffering (Akresh 2007; Cho 2004; Singh and Siahpush 2002), and selective migration.

Contemporary scholarship argues that the Hispanic health advantage is unlikely to be driven by data artifacts (e.g. Arias et al. 2010), though some posit that protective cultural practices or familism may be responsible (Alegria et al. 2007). However, health does decline as immigrants spend longer periods of duration in the US (Antecol and Bedard 2006; Lopez-Gonzalez, Aravena, and Hummer 2005), suggesting that cultural influences must also weaken or decline to fully explain this paradoxical relationship.

It could also be the case that selective migration patterns create the illusion of a health advantage. The salmon bias hypothesis suggests that the favorable health found among Hispanic immigrants is the result of the less healthy systematically returning to their country of origin. Because return migration is likely correlated with employment, earnings, and family formation, salmon bias may arise when less successful migrants—who are presumably less healthy—return to their country of origin. Return migration may also occur when unhealthy individuals seek affordable health care or family assistance in their home country (Abraido-Lanza et al. 1999; Hook and Zhang 2011). And while mortality and morbidity rates are generally higher among those who return (Arenas et al. 2015; Turra and Elo 2008), such differentials are not large enough to solely explain the Hispanic health advantage.

The healthy migrant hypothesis argues that individuals who ultimately migrate are healthier than those who remain in their country of origin. Although rarely highlighted in existing literature, there are a number of scenarios that may result in health-related immigration. First, health could be correlated with individual characteristics (such as education or ability) that directly facilitate migration; selection would thus be induced if higher ability individuals are more likely to migrate (e.g. Jasso et al. 2004). In such a scenario, accounting for socioeconomic and demographic measures that are correlated with both migration and health should weaken the association between health and migration. A second possibility is that health is directly linked to the likelihood of migration, perhaps because the physical and mental demands of the journey prevent less healthy individuals from relocating. Here, the association between health and migration would persist with the inclusion of socioeconomic, demographic, or other attributes.

Another possibility could be that favorable health leads to the acquisition of benefits that allow for successful migration. For instance, individuals in good health may be recruited to

work in the US and obtain necessary documentation for border crossing (e.g. H-1B, H-2A, B visa classifications), or they may find it easier to pass health screenings along the border region (Chiswick, Lee, and Miller 2008). Here, the association between health and migration should become less pronounced after accounting for legal status or the presence of health screenings. Controlling for sociodemographics that are correlated with health (e.g. age, education) and the aforementioned benefits should also weaken the relation of interest. In the absence of rich, longitudinal data with measures of legal status and health screenings, adjudicating between the first and third scenarios is exceedingly difficult. Nevertheless, the healthy migrant hypothesis predicts that more capable individuals exhibit the highest risk of migration.

Empirical support for the healthy migrant hypothesis is mixed, though many studies identify a correlation between health and migration—even after adjusting for educational attainment, marital status, and other individual-level attributes. Specifically, Mexicans who migrate to the US tend to be taller, report better overall health, and are less likely to suffer from activity limitations, hypertension, high blood pressure, diabetes, and obesity than non-migrants (Bostean 2013; Crimmins et al. 2005; Riosmena et al. 2017; Ro and Fleischer 2014; Ullmann et al. 2011). Given the evidence, it would thus appear as though the relation between health and migration does not solely operate through socioeconomic status or demographic characteristics. Mexican immigrants are also less likely to smoke or drink heavily than non-migrants (Buttenheim et al. 2010), though immigrants do adopt unhealthy behaviors as they spend more time in the US (Abraido-Lanza, Chao, and Florez 2005; Antecol and Bedard 2006).

It is worth stressing, however, that the majority of existing studies rely on measures that were collected well after migrants arrived to the US. If immigration goes on to influence health, or is correlated with factors that influence later well-being—such as wage increases or perceived experiences with discrimination—this work will misstate the extent to which the healthy migrant phenomenon occurs. To partially address such limitations, Rubalcava and colleagues (2008) assess the health characteristics of young adults before they travel to the US (approximately 1 to 5 years before the event of migration) and find weak, inconsistent evidence for the healthy migrant hypothesis across a variety of indicators. Another useful approach would evaluate migrants' health and socioeconomic status after the decision to migrate was made, but immediately before they gain exposure to a new context of reception. In this way, one can assess the health profiles of those who are actively migrating while avoiding the costs associated with resettlement.

Internal Migration in the Mexican Context

When scholars evoke theoretical and empirical discussions of the healthy migrant hypothesis, they inevitably focus on Mexican-origin individuals who travel to the US. As a consequence, health-related migration within Mexico is consistently overlooked. This omission is particularly surprising as internal migration is a relatively common occurrence—approximately 20 million Mexicans (or 17.6% of the total population) reside in a state other than their place of birth (INEGI 2010). The sheer size of this migrant flow suggests that

health and socioeconomic disparities may be significantly exacerbated if health-related selection systematically occurs within the Mexican context.

Internal migration flows are dominated by labor migrants seeking to maximize earnings and economic opportunities in urban centers (Cole and Sanders 1985; Kuznets 1979; Stark and Taylor 1991; Todaro 1976), though many do relocate to earn additional attainment, provide stability for children, or to seek romantic prospects (Henderson 1986; Rosenzweig and Stark 1989). Individual migration decisions can also be induced by aggregate-level phenomena—including changes in local crime rates, political instability, and weather patterns (Engel and Ibáñez 2007; Marchiori, Maystadt, and Schumacher 2012; Morrison and May 1994). It should thus not be surprising that internal migrants are selected on a number of traits that are presumably correlated with health and overall well-being: they are more likely to be male, younger, childless, and more highly educated than non-migrants (Ambrosini and Peri 2012; Stark and Taylor 1991; Villarreal 2016). In this way, internal movers appear to be positively selected—mainly with respect to age and human capital accumulation.

However, the Mexican border region represents a unique context of reception that markedly differs from urban centers that traditionally attract migrants (Fussell and Massey 2004, Martinez-Donate et al. 2004; Simonelli 2002; Villarreal and Hamilton 2012). Tijuana, a border city made up of over 1.6 million residents, is a popular destination for Mexicans seeking employment as well as those with plans to migrate to the US in a later period (Fussell 2004). Some have attributed Tijuana's high rates of HIV/AIDS (Goldenberg et al. 2011; Strathdee and Magis-Rodriguez 2008), substance abuse (Wallisch and Spence 2006; Zhang et al. 2015), risky sexual behavior and criminal activity (Goldenberg et al. 2011) to high poverty rates and a large transient population. While it is possible that migrants who are less-risk averse are drawn to the border region, the rapid expansion of professional, manufacturing, and service sectors have created lucrative opportunities for those seeking regular, full-time employment (Simonelli 2002; Villarreal and Hamilton 2012). Indeed, Tijuana residents are younger, have fewer children, are more likely to be salaried employees, and earn higher levels of educational attainment than those who reside in other urban areas or Mexico as a whole (Fussell 2004; INEGI 2015). It is thus likely that migration into Tijuana is driven by individuals who accumulate (or are interested in accumulating) high levels of human capital.

Linking Migration Flows to Health Selection

Like those who migrate across international borders, internal migrants likely have access to financial and social capital, and should be in reasonably good health to sustain the physical and mental hardships associated with the journey (Lu 2008). The few studies that empirically assess health selection in relation to internal migration focus exclusively on the Asian context—placing significant emphasis on Chinese migration. The healthy migrant hypothesis does receive some support as healthier, working-aged individuals are more likely to relocate than their less healthy counterparts (Chen 2011; Tong and Piotrowski 2012). And because internal migrants in Mexico tend to be advantaged on a number of attributes that are also correlated with better health, we expect internal movers will be more advantaged (e.g. healthier) than individuals with no migration history.

It is less clear whether and how the health and sociodemographic profile of internal migrants will differ from those moving to the US. Unlike international migration, which necessitates substantial time and financial investment, internal migration generally requires fewer expenditures for individuals and households alike (Lu and Qin 2014). If relatively disadvantaged individuals are unwilling or unable to travel to the US—but seek improvements in their economic, social, or health standing—internal migrants should be less selected than those who move longer distances or cross international borders (Feliciano 2005; Jasso et al. 2004). Put differently: one would hypothesize that high ability (e.g. healthy) individuals are more likely to migrate to the US than to move within Mexico.

Alternately, scholars acknowledge that returns to human capital accumulation are comparably weak in societies of reception (e.g. Bratsberg and Terrell 2002; Hall and Farkas 2008; Kanas and van Tubergen 2009). If migrants are aware of this penalty—or if higher ability persons are presented with lucrative opportunities in Mexico—health selection should be more pronounced among internal movers. This possibility is bolstered by prior work that documents internal migrants earn significantly higher levels of attainment than those who travel to the US (Curran and Rivero-Fuentes 2003; Fussell 2004; Lindstrom and Lauster 2001). In the event that internal migrants are positively selected relative to US migrants, we would expect internal migrants to report favorable socioeconomic and health conditions. Of course, the selection process very well may be indistinguishable between these migrant populations. This may occur if the relatively close proximity of Mexico to the US reduces investments needed to cross international borders, for example.

To effectively test the healthy migrant hypothesis, we ask whether those in better health are more likely to migrate than their less-healthy counterparts. Here we rely on a range of physical and mental health indicators for a cohesive assessment of health selection. We then compare the respective health profiles of non-migrants and migrants to determine if unique selective processes are operating across flows. This portion of analyses allows us to observe whether internal migrants appear more or less selected than non-migrants as well as those who are traveling to the US. Finally, we ask if health is independently associated with the risk of migration after controlling for confounding factors—such as educational attainment, health insurance coverage, and other sociodemographic characteristics. In absence of a single dataset that provides information on non-migrants and respondents who are actively migrating, we pool data from two Mexican surveys.

Data

We rely on a unique combination of data from 1) The Migrante Project, a health survey administered to Mexican migrants along the Tijuana border region in 2013; and 2) the third wave of the Mexican Family Life Survey (MxFLS), a nationally representative study of Mexican households enumerated between 2009–12.

Migrante Project

The Migrante Project is a cross-sectional survey administered to Mexican migrants traveling through the Tijuana-San Diego border region in 2013. Migrante was developed and implemented by scholars from Drexel University, the University of Wisconsin – Madison,

the Center for Behavioral Epidemiology and Community Health at San Diego State University, the Colegio de la Frontera Norte, and the Mexico Section of the US-Mexico Border Health Commission in Tijuana, Mexico (Amuedo-Dorantes et al. 2013; Diaz, Koning, and Martinez-Donate 2016; Martinez-Donate et al. 2015). Migrante employs a multistage and multisite sampling strategy that is modeled after a well-established survey—the Encuesta sobre Migración en la Frontera Norte de México (EMIF)—to ensure data are representative of migrants who cross (or attempt to cross) along the US-Mexico border. Approximately 40% of Mexican migrants travel through the region, which designates this area as a major point of crossing (EMIF 2013).

Data were collected from Mexican-born adults who represent four unique migrant flows: 1) migrants traveling to the US or elsewhere in Mexico, 2) individuals leaving the Tijuana area after an extended stay in the border region, 3) those returning to Mexico from the United States, and 4) unauthorized migrants arriving to Tijuana as a result of deportation or forced removal by US immigration officials. Respondents were recruited in the central bus station, the Tijuana International Airport, and the San Ysidro deportation facility—each of which regularly hosts a large number of migrants.

For this study, we focus on individuals who are traveling to the US (N=456) or who have migrated from other regions in Mexico (N=364) when sampled in Tijuana. The response rate was 57.9% for all four flows combined, with a response rate of approximately 77% and 87.9% for US and internal migrants, respectively. One of the defining features of the Migrante is that detailed information pertaining to health, healthcare utilization, and sociodemographics are collected from individuals who are *currently* migrating. In this way, we can observe migrants before the consequences of migration influence their health and social conditions. It is worth noting that Migrante does not distinguish between respondents who reach their intended destination and those who are unsuccessful in their migration attempt. To assess the characteristics of non-migrants, we turn to a representative sample of Mexican residents with no prior migration experience.

Mexican Family Life Survey

The MxFLS is a nationally representative, longitudinal survey of Mexican adults and their children. Approximately 35,000 individuals in 8,400 households were randomly sampled during the first round of data collection in 2002. The second and third wave of data collection occurred in 2005–06 and 2009–12, and survey administrators successfully re-interviewed over 90% and 85% of original households at each follow-up (Rubalcava and Teruel 2013). Given the depth of information collected on individual health status and healthcare, socioeconomic characteristics, and prior migration experience, the MxFLS is well-suited to represent our comparison group of Mexican residents.

We limit our MxFLS sample to adult respondents who were surveyed during the latest wave of data collection in 2009–12; this period most closely aligns with the administration of the Migrante survey. We further restrict this sample to Mexican residents who have no prior migration experience. Specifically, respondents are categorized as non-migrants if: a) they have not permanently moved from their community/locality of residence since turning 12 years of age, or b) have not engaged in temporary migration spells lasting between 1 and 11

months in the past 2 years. Although we are less concerned with the omission of respondents' childhood migration history (as selective migration is likely to operate most strongly through parents), we do consider the implications of incomplete temporary migration history in our Discussion. Because the MxFLS is a household survey, we randomly select one individual per household, leaving 7,665 respondents.

Measures

Our main goal is to determine whether individuals in better health are more likely to migrate. Using the Migrante, we create two indicators: whether respondents are moving to the US, and whether respondents migrated to the border region. We obtain our reference group for both outcomes from the MxFLS: Mexican residents with no migration experience.

Health Status—Following past work investigating health selection (e.g. Ro, Fleischer, and Blebu 2016), we evaluate health in number of ways. We first turn to self-reports of global health status for an overall assessment of well-being. In the Migrante survey, the following response categories are used: “Excellent”, “Very Good”, “Good”, “Fair”, and “Poor”. The MxFLS also employs five response categories, but are as follows: “Very Good”, “Good”, “Fair”, “Bad”, and “Very Bad”. Due to discrepancies in response categories across datasets (e.g. the MxFLS reflecting a less positive distribution), we create a dichotomous measure that signals whether respondents report being in “good” or better health. Specifying self-reported health in this way helps ensure that answer categories are compatible across data sources and that the health of non-migrants is not artificially inflated as a result of these distributional differences (Jürges, Avendano, and Mackenback 2008).ⁱ

We also examine indicators of chronic conditions, mental well-being, and body mass index. In both surveys, respondents were asked whether they have been diagnosed with hypertension, heart disease, diabetes, or arthritis; we create a dichotomous indicator for the presence of each of these chronic conditions. To assess mental well-being, we create two dummy variables: whether respondents have felt stressed or sad “all of the time” or “a lot of times” in the past 4 weeks (versus “sometimes” or “never/no”). We also calculate body mass index (BMI) using the standard formula (kg/m^2). In both datasets, height and weight are measured by survey administrators to reduce error associated with self-reported anthropometrics.

Controls—We also adjust for a number of characteristics that are likely associated with the likelihood of migration and health—including age, gender, marital status, presence of children, urban residence, educational attainment, and health insurance coverage (e.g. Rubalcava et al. 2008; Tong and Piotrowski 2012).

A categorical measure of age is created to capture broad distinctions in population composition: 18–30 (reference), 31–64, and 65 and older. Gender is specified as a dummy variable, with males assigned a value of 1. Current marital status is measured as a dichotomous variable that distinguishes whether respondents are married or cohabiting

ⁱJürges and colleagues (2008) specifically suggest collapsing excellent/very good categories in addition to combining poor/very good categories. The resulting measure is a 4-category measure of self-reported health: excellent/very good, good, fair, poor/very poor.

(versus being single, divorced, separated, or widowed). We also specify the presence of children as a dummy variable, in which a value of 1 is assigned to those with at least 1 child. Unfortunately, we are unable to determine the place of residence for children when pooling these data together.

Respondents are also asked if their current (non-migrants) or last place of residence (migrants) was an urban location with 15,000 persons or more; those living in an urban area are assigned a value of 1. To capture the relatively lower educational distribution in Mexico, we create a 3-category measure of attainment: junior high school or less (reference), some high school or completion, or some college or more. Finally, health insurance is measured as a dummy variable, where a value of 1 indicates that the respondent has public or private insurance. In the Migrante, respondents are considered as having health insurance if they report “always” having coverage (as opposed to “sometimes” or “never”), whereas the MxFLS asks respondents whether they have health insurance at the time of the survey. Although the question and answer wording on this item is not identical, we believe the inclusion of this measure is particularly important. Health insurance provides individuals with access to preventative and medical care, which is instrumental in protecting against chronic conditions and general declines in overall well-being (Ayanian et al. 2000; Franks, Clancy, and Gold 1993; Wilper et al. 2009). We also suspect that insurance could discourage migration if losing access is deemed undesirable or risky—particularly if respondents believe their healthcare options are limited in destination areas.

Analytic Approach

We begin by estimating a multinomial logistic regression predicting the competing odds of migrating to the US or within Mexico (versus remaining in one’s locality of origin) using a dichotomous measure of good or better health. Because the healthy migrant hypothesis implies that selection may be directly or indirectly induced when individuals in favorable health make the decision to migrate, it is essential to first assess unadjusted correlations. We then test whether US-bound migrants and internal migrants differ with respect to their migration risk. Next, we include relevant covariates to determine whether health is independently associated with migration after adjusting for confounders. To supplement our global measure of health, we investigate whether chronic conditions—such as diabetes and hypertension—and broad indicators of physical and mental health are associated with the likelihood of migration. Here we examine unadjusted and adjusted correlations, and test whether US and internal migrants significantly differ from each other.

Sampling weights from the Migrante survey and MxFLS are used so that each migrant flow is representative of its respective population. We use multiple imputation with chained equations ($m=20$) when respondents do not respond to a questionnaire item. Due to the combination of data sets used in analyses, we separately estimate imputation models for each migrant flow (von Hippel 2009). Although the results of this study do not substantively change when using listwise deletion or multiple imputation, we present all estimates from imputed data.

We also conduct a number of sensitivity tests to evaluate the robustness of results. First, we re-estimate the relation between migrant status and health using two alternately coded measures of self-reported health: a dummy variable for “very good or better health” (versus good or worse health) and a 4-category measure consisting of excellent/very good, good, fair, and poor/very poor health. And due to concerns surrounding our unbalanced pooled sample (e.g. the sample of migrants is small relative to the sample of non-migrants), we generate a highly-stylized data set that contains the same number of US-bound migrants, internal migrants, and stayers as included in analyses. We then test the sensitivity of results by increasing the number of migrants in each flow so that sample sizes are equivalent across data sources. We also consider whether the Migrante data likely reflects the true population of Mexican immigrants who attempt crossing the San Diego-Tijuana border region. As a final check, we compare the sociodemographic and health characteristics of the Migrante with the 2013 EMIF.ⁱⁱ These additional analyses are detailed in our Results section.

Results

Descriptive Statistics

Table 1 summarizes descriptive statistics for our analytic sample separately by migrant flow. Approximately 79% of US-bound migrants and 87% of internal migrants report good or better health compared to 54% of Mexican residents. Such pronounced differences in self-reported health provide preliminary support for the healthy migrant hypothesis among both US-bound and internal movers. However, individuals who migrate to the US exhibit significantly higher BMI scores (28.3), and are more likely to experience hypertension (15.4%), heart disease (3.9%), diabetes (10%), and arthritis (4.9%) than their non-migrant counterparts. While a large percentage of US-bound migrants suffer from chronic conditions relative to stayers, these rates are much lower than observed in the US adult population (Barbour et al. 2017; Merai et al. 2016).ⁱⁱⁱ We find similar rates of stress (ranging between 19% to 21%) and sadness (from 4.9% to 5.8%) across each migrant group. And both internal and non-migrants report higher rates of health insurance coverage (75.2% and 61.2%) than US-bound migrants—only 37.3% of whom are medically insured. While these rates may seem rather high, it is worth noting that Mexico achieved near-universal healthcare coverage during this period of investigation (Knaul et al. 2012).

Turning to sociodemographic characteristics, we observe that a larger percentage of migrants are male and reside in urban areas than non-migrants. Those traveling to the US are also significantly older (nearly 15% are 65 years or older), are more likely to be married or cohabiting with a partner (69%), and have a child (79%) than both internal migrants and non-movers. There are also differences in educational attainment worth highlighting. While a majority of non-migrants have completed high school or less (89%), migrant flows are

ⁱⁱWe deliberated using the MxFLS-3 (2009–12) follow-up to draw comparisons with the Migrante, but MxFLS-3 movers have already experienced a change in social and local context when interviews were performed; this means health and socioeconomic status are confounded with exposure to the receiving context. We then considered assessing those who have not migrated in the MxFLS-2 (2005–06) but will later migrate in the MxFL-3. However, it would be difficult to determine whether any differences in migrant attributes would reflect potential issues with the Migrante or actual changes in migration flows during this 7–8 year period.

ⁱⁱⁱAmong US-residents aged 18 or older, the Center for Disease Control (CDC) estimates that 29% of the population has been diagnosed with hypertension, nearly 12% suffer from heart disease, 23% have arthritis, and 9.3% suffer from diabetes during the 2010–13 period.

characterized by more variation at the top and bottom categories. Specifically, 52% of migrants traveling to the US have completed junior high school or fewer years of education, whereas internal movers are much more likely to be highly educated—60% have received a college education. These distributions are generally consistent with prior studies investigating migration and well-being (Durand, Massey, and Zenteno 2001; Riosmena and Massey 2012).

Self-Reported Health: Evidence for the Healthy Migrant Hypothesis?

Table 2 presents results from two separate multinomial logistic regressions that predict the competing risk of migrating to the US or within Mexico versus not relocating. Model 1, which shows the unadjusted association between self-reported health and migration, indicates that individuals in comparably good health are 1.5 times more likely to migrate to the US and 4 times more likely to internally migrate relative to non-movers. Such patterns provide support for the healthy migrant hypothesis: individuals who report better overall health are more likely to leave their community of origin.

Analyses also suggest that those in good or better health are significantly more likely to move within Mexico than cross international borders. This result implies that internal migrants are *more* selected in terms of health and sociodemographic characteristics than those who travel to the US. As such, it would indicate that healthier individuals—who also likely have access to a variety of social and economic resources—are choosing to remain in Mexico as opposed to making the journey to live and work in the US.

To test whether health is independently associated with migration, we include a number of characteristics that likely confound the relationship of interest (Model 2). We find that good health is associated with a risk of US and internal migration that is nearly 3 times as large as not migrating; this demonstrates that health selection operates above and beyond these observable traits. However, we do not find health differences between US and internal migrants in the presence of these controls. It would thus appear that the earlier finding that internal migrants are highly selected relative to US immigrants is largely driven by disparities in educational attainment, healthcare coverage, and other characteristics. Put differently: compositional differences rather than health-related differences are responsible for the increased risk of migration among internal movers.

We also find that individuals who are older, male, have children, and live in urban areas are more likely to migrate to the US than remain to Mexico. Those who have obtained comparably low (junior high or less) and high (some college or more) levels of attainment exhibit a significantly higher US migration risk than those who have attended or completed high school. We find similar patterns for those who internally migrate, though urban residence and older ages do not significantly predict movement within Mexico. Individuals who are married/cohabiting and who have health insurance are significantly less likely to travel across international borders relative to non-migrants. And while health insurance coverage reduces the risk of migrating to the US by 72%, it significantly increases the risk of internal migration by nearly 60% relative to non-movers. Healthcare coverage could thus be a major incentive to remain in one's country of origin or may reflect disparities in

socioeconomic status—which are likely correlated with migration risk—that we are unable to fully measure.

The Relationship Between Chronic Conditions and Migration

Table 3 supplements our measure of self-reported health by using BMI, chronic conditions and mental health status to predict migration. We find that individuals with higher BMI values as well as those diagnosed with hypertension and arthritis are significantly *more* likely to migrate to the US than remain in their locality of origin. That comparably unhealthy individuals move across international borders contradicts the patterns highlighted in earlier analyses (e.g. Table 2). And there is little evidence that such health conditions significantly predict the risk of internal migration or that US and internal movers differ with respect to these conditions. We elaborate on these findings and their implications in our discussion.

It is also important to assess whether chronic health issues independently influence migration. Results from Model 2 indicate that those diagnosed with hypertension and arthritis are more likely to migrate—both internationally and internally—relative to non-movers even after controlling for sociodemographics. This implies that such characteristics are unlikely driving the relationship between chronic conditions and elevated migration risk. We also find that individuals who report feeling frequently stressed are less likely to engage in internal migration, which suggests that this migration flow selects on specific dimensions of mental well-being. Being older, male, and the presence of children increases the risk of US migration though health insurance operates in the opposite direction. While working-age individuals are likely migrating for labor market opportunities, those who are 65 and older could be traveling to reunite and co-reside with children and grandchildren (Glick and Van Hook 2002; Wilmoth 2001). We generally observe similar associations between these covariates and the likelihood of internal migration, though older persons are less likely to relocate within Mexico.

Taken together, results provide rather weak evidence for the healthy migrant hypothesis. Although those who report favorable overall health are more likely to engage in both US and internal migration, individuals who have been diagnosed with chronic conditions are significantly more likely to migrate. It is important to stress that knowledge of these conditions requires a diagnosis by a medical health professional. Because those who are uninsured are less likely to be aware of their current health status, the actual number of persons who suffer from chronic conditions will be greater than observed here; this is especially true for those traveling to the US, as they report the lowest rates of coverage. Even so, our overall conclusions would not change: those with chronic conditions would still be more likely to relocate to the US than remain in Mexico.^{iv} We now turn to supplementary analyses that assess the robustness of our results.

^{iv}For conclusions to substantively change, it would have to be the case that uninsured non-migrants (38.8% of the MxFLS sample) disproportionately suffer from undiagnosed chronic conditions relative to migrants who are uninsured.

Sensitivity Analyses

First, we test whether results for self-reported health are sensitive to alternative coding strategies. We re-estimate earlier specifications using whether respondents are in “very good” or better health. Results (not shown) indicate that the relationship between health and migration risk—both to the US and within Mexico—is even stronger when this measure is used. We repeat analyses using a 4-category measure of health to reconcile differences in response categories: excellent/very good, good, fair, poor/very poor. We find a substantively similar relationship between health and migration risk as demonstrated earlier.

Next, we conduct a basic statistical demonstration to test whether the uneven sample size across flows (e.g. migrants and stayers) could be influencing our results. We begin by creating a stylized data set with the same number of US-bound migrants, internal migrants, and stayers as included in our main analyses. We then generate pseudo-random draws from a binomial distribution with success probabilities that align with the proportion of migrants in good or better health in each migrant flow. We successfully replicate results shown in Table 2 (Model 1) and proceed to increase the sample of the Migrante by 50%, 100%, and finally to match the sample size of the MxFLS. These results, which are also available upon request, do not alter our conclusions with respect to the relation between health and migration.

Perhaps the most concerning issue is that the Migrante may not adequately represent the health profile of migrants attempting to travel to the US or within Mexico. We thus compare health and sociodemographic characteristics collected by Migrante with the 2013 EMIF Norte—a large survey that investigates migration patterns along the US-Mexico border region. Two comparison groups are created from the EMIF: Mexican-born adults who are heading to the US and those moving within Mexico. Because the Migrante was designed to be representative of migrants traveling through the Tijuana-San Diego region, we select EMIF respondents who were sampled in Tijuana to maximize compatibility across data sets.

Table 4 contains overlapping measures across data sets, the weighted percentages from each migrant flow, and whether these differences are statistically significant. Unfortunately, we were unable to compare additional indicators due to the limited health assessment conducted by the EMIF. Turning first to internal migrants, we find that respondents are quite similar with respect to self-reported health and hypertension diagnoses. Although those sampled by the EMIF are more likely to report having diabetes, this difference disappears after we control for age, marital status, gender, place of residence, and insurance status. We also find that Migrante respondents are more likely to be male, but less likely to have health insurance or be in married/cohabiting unions than those captured by EMIF. These correlations provide some evidence that the Migrante data is reflective of internal movers with respect to health conditions.

For migrants traveling to the US, we find differences worth highlighting. A significantly lower proportion of Migrante respondents report being in good health (74.9%) than those captured by the EMIF (88%), and this relationship persists with the inclusion of controls. This may indicate that results presented earlier are lower bound estimates of the relation between self-reported health and migration risk, though we are hesitant to further speculate

on this issue. We also find that respondents sampled in both data sets experience comparable rates of diabetes and hypertension; a higher percentage of Migrante respondents do report chronic conditions, but this difference is not statistically significant. Furthermore, US migrants captured by Migrante tend to be older, are less likely to be married, and are also less likely to have health insurance than the EMIF. This could suggest that US-bound migrants captured by the Migrante project are less positively selected on a number of social and demographic attributes that are plausibly related to health than the true population of Mexican immigrants. If this is indeed the case, it would indicate that health selection is likely to be even more pronounced than observed here.

The Migrante and EMIF are broadly representative of persons who are actively engaged in migration, but they do not distinguish between successful and unsuccessful crossings; this differentiation is particularly important for those traveling to the US—who likely encounter additional barriers throughout their journey. And while we are unable to empirically test whether aspirational migrants differ from those who have successfully crossed in the immediate period, our results indicate that health-related migration is unlikely limited to those who arrive and indefinitely settle in the US.

Discussion

This study contributes to existing scholarship on Mexican migration and health disparities by pooling a unique combination of data sources to further advance the healthy migrant hypothesis. One data source is an established survey that has been extensively used to investigate large-scale demographic processes in Mexico. The other collects information from Mexican-born individuals who are actively engaged in the migration process at the San Diego-Tijuana border. We test whether those in better health exhibit a higher risk of migration, and also consider whether the health and socioeconomic profiles of US-bound immigrants differs from those migrating within Mexico.

Results provide conflicting support for the healthy migrant hypothesis. On the one hand, those who report better overall health are significantly more likely to engage in both internal and US migration—a finding consistent with work that uses binational data to assess international health selection (e.g. Riosmena, Wong, and Palloni 2013). Self-reported health continues to predict migration after controlling for sociodemographics and access to insurance coverage, suggesting that health independently influences migration, or that favorable health may induce migration through the acquisition of certain benefits (e.g. successful health screenings, employment recruitment) that we are unable to fully observe with these data. On the other hand, chronic health conditions do not impede migration. If anything, receiving hypertension and arthritis diagnoses increases one's risk of migration. Given that much of the support for the healthy migrant hypothesis has varied across data sources and health indicators (Rubalcava et al. 2008), it is not entirely surprising that we also find minimal support among active migrants.

In supplemental analyses, we assess the health of US-bound migrants by occupation to test whether it is plausible that healthier persons migrate with assistance from current employers. We find that a greater percentage of migrants who are employed as professionals while

crossing the border report fewer chronic conditions and health limitations, and better self-reported health. The picture is less clear for those employed in agriculture or as day laborers. While a smaller share report health limitations and diabetes, a larger percentage report being in fair or poor health (29.7% versus 20.5%). One possibility is that high-skilled workers are healthier as a result of targeted recruitment through US employers, while lower-skilled workers are subject to a less rigorous or non-existent screening process. Put differently: the mechanisms responsible for selective migration to the US may differentially operate for low- and high-skilled work, both of which require different levels of investment from employers. However, we are cautious about extrapolating conclusions from this descriptive exercise.

Prior to adjusting for confounders, internal migrants traveling to the Tijuana border region appear more positively selected than those traveling to the US—at least with respect to self-reported health. After controlling for a number of individual characteristics, we no longer observe substantive or significant differences between these migrant flows. Unlike for US-bound migrants, it would appear that disparities in human capital attainment and other attributes are driving the apparent health advantage among internal movers. This also supports our hypothesis that internal migrants are presented with additional labor market opportunities than those who travel across international borders. However, findings are unlikely to generalize to the larger population of internal migrants who relocate within Mexico's interior region more broadly.

We also examine migrants' health-seeking behavior to help reconcile unexpected patterns identified in Table 1. Although 56% of US-bound migrants received medical care in the past year, over 60% reported having no health insurance; this could indicate that uninsured persons face relatively few barriers in accessing medical care. Additional analyses (not shown) reveal that uninsured migrants are significantly less likely to have a usual source of care (38.4% versus 75.6%), and are more likely to receive medical attention in private and community clinics than their insured counterparts. Although those who travel to the US do seek healthcare regardless of their insurance status, they do so in fundamentally different ways: uninsured migrants are comparably disadvantaged with respect to the type and quality of medical services received. We also consider why migrants exhibit rather high rates of medical utilization. Though we are unable to test these assertions, it could be that mobile populations place an exceptionally strong value on healthcare services—particularly if they are concerned with facing limited access upon arriving to the host country/community. (Bustamante et al. 2012; Wallace et al. 2008). Another possibility could be that migrants, who are generally more educated than non-migrants, exhibit stronger preferences to closely monitor and maintain their health. Either scenario would lead us to observe high rates of healthcare usage and diagnosed medical conditions among migrant populations.

Results have significant implications for public policy in Mexico and the US. Origin communities appear to be disproportionally losing highly selected individuals—those who are healthy, educated, and generally more advantaged—who are relocating to Tijuana and the Northern border region. To improve the productivity and overall well-being of non-migrants who remain in sending areas, policymakers must consider investing in programs designed to boost the quality of healthcare as well as educational attainment (e.g. improving infrastructure, preventing dropout, increasing academic achievement). While implementing

these changes could improve the well-being of all Mexican residents and reduce inequality associated with selective internal migration, efforts will be fruitless if labor opportunities remain scarce or undesirable. We also believe that greater efforts could be extended by US and Mexican policymakers to provide quality healthcare services for recent arrivals. Since rates of chronic conditions do appear higher among migrants, communities of reception should consider investing in preventative care and regularly scheduled wellness exams. This approach could help ensure that immigrants receive medical attention before health conditions become unmanageable or prohibitive for the migrant and host society alike.

Alternate Considerations and Limitations

There are other considerations worth highlighting. Like all observational studies, we only observe—and control for—a finite number of characteristics. Although there is evidence of health-related migration, the omission of key variables (such as motivation or cognitive skills), limits our ability to definitively argue that health independently influences migration decisions. This limitation is shared with prior work investigating health selection. And while pooling the MxFLS and Migrante allow us to carry out the desired analyses, they do not perfectly overlap with respect to timing. Because MxFLS respondents were enumerated in 2009–12, it is possible that the composition of migrant flows shifted between this period and the implementation of the Migrante. If migrants became less selected during this period (e.g. non-migrants in the MxFLS ultimately made the decision to migrate), results would overstate the extent to which health-related selection occurred. However, the composition of migrant flows would have to drastically change during this short period in order to completely offset our results.

Finally, it is possible that certain MxFLS respondents are wrongly categorized as non-migrants due to incomplete temporary migration history. If this were the case, and if we believe temporary migrants are positively selected relative to non-movers, our MxFLS population will reflect a more advantaged set of individuals. This would indicate that the association between health and migration is larger in the population of “true” movers and stayers than presented here.

Despite these limitations, our study makes an important contribution to the literature on selection, migration, and health across both sides of the border. Future work will benefit from a continued exploration of health-related migration within Mexico as well as an assessment of the contextual factors (e.g. local unemployment, criminal activity) that could mitigate or exacerbate selective migration flows in both sending and receiving communities.

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Table 1

Selected Descriptive Statistics by Migrant Flow

	Migrante		MxFLS
	<i>US Migrants</i>	<i>Internal Migrants</i>	<i>Non-Migrants</i>
<i>N=</i>	456	364	7,665
Good or better health (self-reported)	78.9 ^{a,b}	86.6 ^c	54.0
BMI	28.3 ^b (5.7)	27.7 (5.8)	27.3 (7.1)
Respondent has hypertension	15.4 ^b	11.0	9.9
Respondent has heart disease	3.9 ^b	2.0	1.7
Respondent has diabetes	10 ^{a,b}	4.6	6.8
Respondent has arthritis	4.9 ^b	3.4	2.2
In the past 4 weeks, respondent:			
Felt stressed all/most of the time	20.4	20.8	19.4
Felt sad all/most of the time	5.8	5.1	4.9
Has health insurance	37.3 ^{a,b}	75.2 ^c	61.2
Received medical care	55.8 ^b	60.8 ^c	19.1
Respondent is male	66.7 ^{a,b}	75.6 ^c	41.0
Married/cohabiting	68.9 ^{a,b}	55.7 ^c	64.3
Has any children	79.2 ^{a,b}	53.0	63.1
Urban residence	73.7 ^b	78.7 ^c	44.2
Education			
Junior high or less	52.4 ^{a,b}	26.6 ^c	41.7
Some high school or completion	16.9 ^b	13.2 ^c	46.9
Some college or more	30.7 ^{a,b}	60.2 ^c	11.4
Age Categories			
18–30	13.82 ^{a,b}	34.07 ^c	41.27
31–64	71.49 ^{a,b}	62.09 ^c	48.25
65 or older	14.69 ^{a,b}	3.85 ^c	10.48

Note: Descriptive statistics shown as percentages or means, standard deviations are in parentheses. Unweighted results obtained from imputed data (m=20).

^a=US-bound significantly different from internal migrants,

^b=US-bound significantly different from non-migrants,

^c=internal migrants significantly different from non-migrants

Table 2
Relative Risk Ratios from Multinomial Logistic Regressions Predicting Migration using Self-Reported Health

	Model 1			Model 2		
	US exp(B)	Internal exp(B)	se	US exp(B)	Internal exp(B)	se
Good or better health	2.58 *** ^a	5.01 ***	1.10	3.53 ***	3.82 ***	0.86
Male				2.79 ***	3.76 ***	0.70
Age						
(18–30)						
31–64				3.85 ***	2.70 ***	0.63
65 and older				6.24 *** ^a	0.63	0.27
Education						
(Junior high or less)						
Some high school/completion				0.34 ***	0.28 ***	0.07
Some college or more				2.25 ***	3.24 ***	0.71
Has children				3.04 *** ^a	0.92	0.48
Married or cohabitating				0.61 *	0.70	0.25
Lives in urban center				1.40 *	1.34	0.25
Has health insurance				0.28 *** ^a	0.05	1.56 *

Note: International and internal migrants are obtained from the Migrate Project, Stayers (reference outcome) are obtained from the Mexican Family Life Survey. Results obtained from imputed data (n=20) are weighted to reflect the population of migrants and non-migrants. Exponentiated coefficients shown.

* p < 0.05,

** p < 0.01,

*** p < 0.001;

^a = statistically significant difference between international and internal migrants

Table 3
Relative Risk Ratios from Multinomial Logistic Regressions Predicting Migration using Alternative Measures of Health

	Model 1				Model 2			
	U/S exp(B)	se	Internal exp(B)	se	U/S exp(B)	se	Internal exp(B)	se
Hypertension	1.65 *	0.37	1.41	0.37	1.87 *	0.48	2.06 *	0.67
Heart disease	1.56	0.63	1.14	0.57	1.43	0.61	0.81	0.52
Diabetes	1.16	0.30	0.98	0.33	1.18	0.31	1.27	0.46
Arthritis	2.12 *	0.72	1.72	0.70	2.64 **	0.90	2.86 *	1.28
BMI	1.02 *	0.01	1.02	0.01	1.01	0.01	1.02	0.02
Felt stressed all/most of the time	0.78	0.14	0.73	0.13	0.80	0.18	0.63 *	0.13
Felt sad all/most of the time	1.11	0.35	1.13	0.39	1.11	0.40	1.50	0.59
Male					2.79 ***	0.44	4.19 ***	0.84
Age								
(18–30)								
31–64					3.39 ***	0.73	2.22 **	0.53
65 and older					3.95 *** ^a	1.14	0.35 *	0.16
Education								
(Junior high or less)								
Some high school/completion					0.45 ***	0.09	0.39 ***	0.10
Some college or more					3.86 ***	0.78	5.58 ***	1.18
Has children					2.94 *** ^a	0.72	0.92	0.46
Married or cohabitating					0.72	0.15	0.65	0.22
Lives in urban center					1.14	0.18	1.34	0.24
Has health insurance					0.26 *** ^a	0.05	1.61 *	0.33

Note: International and internal migrants are obtained from the Migrate Project, Slayers (reference outcome) are obtained from the Mexican Family Life Survey. Results obtained from imputed data (m=20) are weighted to reflect the population of migrants and non-migrants. Exponentiated coefficients shown.

* p < 0.05,

** p < 0.01,

is statistically significant difference between international and internal migrants

;100.0>d
= p

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Table 4

Comparing Selected Weighted Characteristics of Migrante Flows with EMIF

	<i>Migrante</i> US %	<i>EMIF</i> US - Tijuana %	<i>Migrante</i> Internal %	<i>EMIF</i> Internal - Tijuana %
Good or better health	74.9 ^a	88.0	84.7	81.0
Diabetes	10.5	8.0	7.4 ^a	14.7
Hypertension	19.2	13.2	13.9	15.0
Male	67.2	71.4	77.8 ^a	44.5
Age				
18–30	15.2 ^a	31.4	31.0	37.1
31–64	69.8 ^a	55.8	66.3	54.5
65 and older	15.0	12.8	2.7	8.4
Married or cohabitating	66.7 ^a	81.5	56.2 ^a	85.6
Lives in urban center	70.0 ^a	49.5	77.5 ^a	59.3
Has health insurance	36.5 ^a	58.9	75.1 ^a	85.9

Note: US-bound and internal migrants are obtained from the Migrate Project and EMIF survey.

^a = statistically significant difference between Migrante and EMIF. All differences calculated using an alpha level of .05 ($p < .05$)