Migration and Low Birthweight: Testing Health Selection in Binational Data from Mexico and the U.S.

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Abstract

Infants born to Mexican migrants have remarkably good health outcomes. This could result from the benefits that accrue to migrants or from the positive health selection of migrants. We arbitrate between these explanations using two sources of binational data. Using Mexican and U.S. vital statistics data, we confirmed that infants born to Mexican immigrants have a rate of low birthweight lower than infants born to U.S.-born mothers in all major race/ethnic groups and 34% lower than their counterparts born in Mexico, consistent with selection. We then determined that up to 26% of the selection ratio could be explained by geographic selection, or the fact that migrants originate from areas that are advantaged in terms of infant health. Next we will use birth history data from the Mexican Family Life Survey to test whether the difference between immigrants and non-migrants in Mexico arises from selection or benefits from migration.

Introduction

Infants born to Mexican migrants have remarkably good health outcomes, an association that is observed on both sides of the Mexico-U.S. border. In the U.S. the association is a defining characteristic of the "epidemiologic paradox" of better-than-expected health given the socioeconomic disadvantage of Mexican immigrants relative to other U.S. groups (Hummer et al. 2007; Markides and Coreil 1986). In Mexico, the association has been called the "other side of the paradox" (Frank and Hummer 2002): infants born to return migrant mothers, in households receiving remittances from the U.S., and even in communities with high levels of emigration have better outcomes than infants without these various sources of migration experience (Hamilton et al. 2009; Kanaiaupuni and Donato 1999).

Although the better-than-expected health of Mexican immigrants and the health advantage of return migrants in Mexico are well-established, the mechanisms engendering these health advantages are still debated. Identifying the sources of the epidemiologic paradox will inform public policy efforts aimed at reducing race/ethnic disparities in health and maintaining the good health of Mexican immigrants in the United States.

Identifying the mechanisms behind both sides of the epidemiologic paradox involves evaluating the merits of two hypotheses: (1) migration itself is beneficial to migrants and their

children because of the resources accessed through migration and, in the case of children born in Mexico, remitted back home, or (2) migrants are positively selected on health, meaning that the good health of infants born to migrant parents reflects the fact that the healthy are more likely to migrate.

In this paper we arbitrate between these hypotheses by focusing on selection. A standard selection analysis compares the health of immigrants in the receiving country to the health of non-migrants in the sending country and attributes the difference to selection. Selection analyses focused on infant health have yielded mixed conclusions, possibly due to the limits of binational data available to date (Abraido Lanza et al. 1999; Landale et al. 2000; Palloni and Morenoff 2001; Weeks et al. 1999). We conduct a selection analysis using a complete census of births occurring in Mexico and the United States in 2008 and 2009, using the natality files from U.S. and Mexican vital statistics data, which, beginning in 2008, for the first time include comparable measures of infant health (i.e., low birthweight (LBW)).

We also address two complications to this analysis. First, comparing infants born to Mexican immigrants in the U.S. to all infants born in Mexico potentially confounds health selection with the effect of migration on the health of populations in migrant-sending communities. That is, the difference in health outcomes between infants born in Mexico and infants born in the U.S. could be due to the fact that immigrants originate from communities advantaged in terms of maternal and infant health, an advantage that could result from migration itself (Kanaiaupuni and Donato 1999). To test this possibility, we limit the sample of Mexican births to those in migrant-sending communities. The difference in rates of low birthweight between infants born to Mexican immigrants and infants born to mothers residing in migrant-sending communities is an estimate of health selection net of context of origin.

A second complication to the standard selection analysis is that it cannot rule out the first hypothesis described above, that the difference in health between infants born in the United States and those born in Mexico could be due to the benefits of migration that accrue to migrants in the United States. We address this possibility using a second source of data, birth histories recorded in Mexican household survey data. We use these data to identify pre-migrants—i.e., women who give birth in Mexico and later migrate to the U.S.—and compare their infants to infants born to non-migrants in Mexico, again differentiating by the migration prevalence in the community of origin. Because births to pre-migrants occur in Mexico, we can rule out the beneficial effects of being a migrant in the U.S. as an explanation for differences in health outcomes between infants born to immigrants and infants born to non-migrant parents in migrant-sending communities.

Methods

Vital statistics data. The data for the first analysis come from the 2008 and 2009 natality files of the Mexican and U.S. vital statistics data, which provides a census of all registered, live

births occurring in the two countries during this time. We downloaded the data from the websites of the Mexican Ministry of Health and the U.S. National Center for Health Statistics. We identified the births occurring to foreign-born Mexican women in the United States using reports of mother's country of birth, which was obtained by special permission from the National Association for Public Health Statistics and Information Systems. Birthweight was recorded for the first time in Mexican vital statistics data in 2008, and as such, 2008 and 2009 are the only two years for which birthweight was recorded and is currently available for both countries. The two years of data include 10,237,886 births (about 7.2 million births in US and 3 million births in Mexico).

The U.S. vital registration system registers 99% of all births occurring in the United States (NCHS 2010). The Mexican Ministry of Health instituted a new vital registration system in 2007, which made registration of birth certificates free and compulsory in order to achieve universal registration of births (Secretaría de Salud 2007). The new vital registration system in Mexico has yet to be comprehensively evaluated, but an initial evaluation was reported in a paper by Buekens and colleagues (2013), who compared estimates of LBW in the vital statistics data to other data sources. They found that the new registration system provided estimates very similar to those using hospital data but slightly lower than those using survey data, which may suggest that the new system captures most hospital births but excludes some home births. However, in supplementary analyses not reported here we found that the rate of LBW is lower in home births than in hospital births. Thus, the biases resulting from this failure of coverage should be minimal.

Survey data. Birth history data come from the Mexican Family Life Survey (MxFLS). The MxFLS is a nationally representative, panel survey of approximately 35,000 individuals in 8,400 households in Mexico. Initial interviews were conducted in 2002 and follow-up interviews were conducted in 2005 and included original respondents who migrated to the United States between 2002 and 2005 (Rubalcava & Teruel 2007). The data were collected by a bi-national team of researchers, including researchers from the Mexican Institute of Public Health, Duke University, and Universidad Iberoamericana.

Essential for our purposes, the MxFLS collected detailed birth history data, including birthweight information, for the last four births to all women between the ages of 15 and 44, as well as detailed migration history information for all adults. The MxFLS also followed and re-interviewed adults who migrated between waves of the survey. About two hundred mothers are pre-migrants based on retrospective and prospective migration information.

Dependent variable. LBW, a key indicator of infant health, is defined as birthweight of less than 2,500 grams (5.5 pounds).

Migrant-sending communities. Because U.S. vital statistics data do not record the community of origin of Mexican immigrants, we used several definitions of migrant-sending

communities as approximations for the origin of Mexican immigrants in the United States. First, we limited births to those in the 10 states that make of up the "historic" migrant sending region in center-west Mexico (Durand et al. 2001). Second, we used the municipal migration intensity index, which Mexico's National Population Council (CONAPO) developed as a summary measure of the degree of migratory activity in a municipality (i.e., county). We analyzed births in municipalities in the 75th, 90th, and 95th percentiles of the migration intensity index. The migration intensity index is a summary composite constructed using the following four dimensions of migration measured in Mexican census data: (1) the percent of households in a municipality receiving remittances, (2) the percent of households in a municipality with emigrants departing to the United States in the past five years, (3) the percent of households in a municipality with circular migrants (i.e. migrants who emigrated to the United States and returned to Mexico within the past five years), and (4) the percent of households in a municipality with earlier-departed and returned U.S. migrants (i.e. migrants who were in the United States five years prior to the census and in Mexico at the time of the census). We use the 2000 migration intensity index in lieu of the 2010 migration intensity index because we were interested in identifying municipalities with long histories of migration. Migration patterns in the second half of the 2000s were significantly affected by the 2008 economic recession in the United States and, as such, the 2010 index will be unreliable as a measure of long-term migration.

Analyses. Our analysis proceeds in a series of estimates of the rate of LBW for births to mothers in different groups and a decomposition-style analysis of the selection effect into the parts we estimate are due to context of origin and benefits accruing in the United States. We begin with age-standarized rates to account for difference across groups in age structure and the fact that the risk of low birthweight varies by mother's age. Later, we will also adjust for socioeconomic and health care measures that are recorded in common in the two sources of data. In vital statistics, common measures include mother's education, mother's marital status, timing of prenatal care, and conditions of delivery. A far greater set of social and demographic measures are available in the MxFLS. This step will allow us to differentiate, to the extent possible, sources of good immigrant health arising from social and demographic selection of immigrants as opposed to health selection.

Preliminary results—analysis step 1

We begin by establishing the presence of an epidemiologic paradox in the United States by estimating rates of LBW for U.S. groups in our data, shown in Table 1. Our results are consistent with the epidemiologic paradox which has been widely documented in the literature (e.g., Acevedo-Garcia et al. 2005). Infants born to Mexican immigrant women have a lower rate of LBW than infants born to other U.S. groups. 4.9% of infants born to Mexican immigrant women in 2008 and 2009 were LBW, compared to 5.2% of infants born to white women and 6.1% of infants born to Mexican American mothers.

Table 1 about here

Table 2 shows the rate of LBW for births to Mexican immigrant women and to all women in Mexico, and subsequently, for births to Mexican women living in migrant-sending areas. Mexican immigrant women had a lower rate of LBW than all Mexican women. In 2008 and 2009, the rate of LBW of Mexican immigrant women was 4.9%, compared to 7.4% for all women in Mexico. Using these rates, we then computed a "selection ratio," which is obtained by dividing the rates of LBW of Mexican immigrant women by the rate for women in Mexico. The baseline selection ratio was .66. In other words, the rate of LBW of infants born to Mexican immigrant women was 34% lower than the rate of LBW for births to all women in Mexico.

Table 2 about here

Mexican immigrants do not originate evenly from all of Mexico; the majority of immigrants originate from historic migrant-sending communities, and these communities are not representative of all of Mexico in terms of population health. Indeed, their long histories of migration may have contributed to better population health through the investment of remittance dollars and other pathways (Kanaiaupuni and Donato 1999). Comparing Mexican immigrants to all women in Mexico therefore may confound individual health selection with geographic selection—the non-health related reasons producing geographic clustering in migrant origins. A better comparison group, then, for assessing individual health selection, are women living in migrant-sending communities. Indeed, the rate of low birthweight was lower in each of the geographical areas of migrant origins defined here. It was 7.2% in the historic region and 6.6%, 6.7%, and 6.7% in the municipalities defined by the 75th, 90th, and 95th percentiles of the migration intensity index.

Thus, the selection ratio is smaller when comparing Mexican immigrant women to women in migrant-sending areas. It decreases from 34% to 32% using the regional definition and to 27% and 26% using the migration intensity index definitions. In other words, context (i.e., the fact that most immigrant women originate from communities with advantageous maternal and infant health) may explain between 6% ((34-32)/34) and 24% ((34-26)/34) of what is commonly attributed to health selection. At the same time, the fact that immigrants have lower birth rates than their peers in migrant-sending regions suggests that they are a positively selected group even within their communities of origin.

However, the difference between immigrants and non-migrants in migrant-sending communities may reflect the benefits that accrue to migrants in the United States. To assess this possibility, we will turn next to an analysis of the MxFLS birth history data in which we identify pre-migrants as a key test group. The comparison between pre-migrants and non-migrants within the same communities in Mexico will isolate selection from migration benefits.

Next steps—analysis step 2

We intend to complete the analysis of the MxFLS prior to PAA.

Discussion

Newly available natality files with birthweight records in Mexican vital statistics data allow for a migrant selection analysis of infant health in a census of all registered births occurring in Mexico and the United States in 2008 and 2009. Using these data, we confirmed the presence of a paradox on both sides of the border: infants born to Mexican immigrants have a rate of LBW lower than their counterparts born in Mexico as well as infants born to US-born mothers, including Mexican Americans, other Hispanics, NH Whites, NH Blacks, and NH Asians. If infants born to Mexican immigrants were representative of the sending population, there would be no paradox, at least by this measure of health. Thus, the explanation for the paradox lies not only in how Mexican immigrants are unique in the U.S. context, but also in how they are unique in Mexico. The higher rates of LBW among Mexican immigrants than among infants born in Mexico also suggest the possibility of migrant selection with respect to maternal and infant health.

The idea of immigrant health selection is that migrants are an exceptionally healthy group from among the sending population because the costs and rigors associated with migration demand good health, and the benefits of migration are greater for the healthy (Jasso et al. 2004). The difference in the rate of LBW between immigrants in the U.S. and non-migrants in Mexico can be understood as a selection effect (e.g. see Abraido-Lanza et al. 1999; Palloni and Morenoff 2001).

However, we propose that there are two complications to this analysis. First, Mexican immigrants are also geographically select: the geography of Mexican emigration was clustered within rural communities in the center-west region of the country and was largely stable throughout the second half of the 20th century (Durand et al. 2001). The continuous and clustered flow of migration from select geographic regions means that immigrant women may be healthier than their peers in communities with a low prevalence of migration if migrant-sending areas have distinct population health profiles. One reason migrant-sending regions may have advantageous maternal and infant health profiles is because migrant remittances contribute to socioeconomic and social development in sending communities (Kanaiaupuni and Donato 1999; Hamilton et al. 2009).

We accounted for geographic selection by comparing Mexican immigrants to women in Mexican migrant-sending communities, that is, to those who are most likely to have migrated based on geography. We found that the selection ratio was reduced by up to 26%, depending on the definition of migrant-sending area used. Stated differently, we found that the health advantage of Mexican immigrants arises due to both geographic selection and health selection within geographic regions.

Second, the selection effect may also capture benefits that accrue to migrants living in the United States. To account for this, we propose examining the health outcomes of infants born to pre-migrants, that is, to women in Mexico at the time of birth who later migrate. In next steps, we will analyze birth history data from the Mexican Family Life Survey, which will allow us to compare the rate of LBW to pre-migrants to non-migrants within similar communities.

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Table 1. Rates of low birthweight (LBW) by Race/Ethnicity: U.S. Birth Certificates Data, 2008-2009

	Mexican immigrant	Mexican American	Other Hispanic	White	Black	Asian
Rate of LBW	4.9	6.1	7.2	5.2	11.9	7.1
N	765,932	483,616	333,325	3,914,830	961,394	86,840

Table 2. Rates of LBW and the Selection Ratio for Mexican Women in the U.S. and Mexico: U.S. and Mexican Birth Certificates Data, 2008-2009

| | U.S. | | Mexico | | | |
	Mexican immigrant	All	Historic region	Migration index, 75th percentile	Migration index, 90th percentile	Migration index, 95th percentile
Rate of LBW	4.9	7.4	7.2	6.7	6.6	6.6
Selection ratio (Mex immig: Mex)	n/a	0.66	0.68	0.73	0.74	0.74
N	765,932	3,725,442	1,065,875	404,885	108,297	51,134