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The Impact on Health of Recurring Migrations to the United States

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ABSTRACT

Considerable research has focused on whether or not immigrants' health declines to match that of comparable native-born people. This immigrant health convergence is hypothesized to be driven by immigrants' acculturation to American society and habits. This is particularly problematic for a country such as the United States which combines a high number of immigrants, bad health habits among the native born, and an expensive health care system. Previous research in this literature uses the duration of an immigrant's current stay in the United States as the measure of exposure to acculturation. Using the duration of the immigrant's current stay in the United States implicitly assumes one long-term move. However, the largest immigrant group in the United States (Mexicans) is characterized by a pattern of repeated migration trips. This paper separates out the effects of migration duration and lifetime cumulative experience for Mexican immigrants to the United States. The empirical analysis is carried out using data from the Mexican Migration Project. The Mexican Migration Project has been collecting data on Mexican immigrants to the United States since the mid-1980s. Empirical results find that while overall time spent in the United States supports the acculturation hypothesis, single-trip migration duration has the opposite effect. The positive impact of single-trip duration on health is likely caused by recovery time needed to compensate for difficult crossings into the United States which have an even harsher effect on health if the individual undertakes short, repeated migrations. We also find that having Latino friends improves health while Anglo friends cause faster convergence and worse long-term health impacts. Both support the acculturation hypothesis. Results suggest that researchers need to focus on the cumulative impact of time spent in the United States rather than relying on just the duration of the latest trip. This suggests a much larger negative effect of migration on health than studies relying solely on migration duration. In the case of repeated migration patterns, this imposes costs on both the health care systems of the destination (USA) and source (Mexico) countries. Repeated immigration to the United States can result in acculturation which causes bad health habits to be brought back to Mexico, along with the accompanying costs these incur.

INTRODUCTION AND BACKGROUND

Many Western countries have experienced long upward migration trends. This is especially true in traditional immigrant receiving countries such as the United States, Canada, the United Kingdom and Australia. In these cases, the impact on the composition of the population has been quite large. For example, the percentage of the U.S. population which is foreign born increased from 4.7% in 1970 to 13% in 2010 (OECD, 2013). This experience is similar in the United Kingdom (11.3% foreign born) and more dramatic in Australia (26.5%) and Canada (19.6%) (OECD, 2013). In the United States, the largest

immigrant group is from Mexico. The Mexican-born population represents nearly 30% of the foreign-born population in the U.S., which makes it several times bigger than the next largest foreign-born group. (Passel, Cohn and Gonzalez-Barrera, 2012). Unlike immigrants from many other countries, Mexicans do not tend to make one lifelong move to the United States. Instead, the migration flow is cyclical. It can be seasonal, as with migrant agricultural workers. In other cases, the cycles cover a few years at a time (Reyes, 2001; Mendoza, 2008). These migration cycles continue over the span of many years, even decades. Thus, Mexican immigrants are repeatedly exposed to life in the United States, with each cycle being relatively brief.

The United States has also experienced increasing rates of lifestyle related medical conditions. These conditions, such as diabetes and heart disease, are often linked to the problems of rising obesity and sedentary lifestyles in Western countries. The incidence of diabetes among adults in the United States, for example, has doubled in the last 15 years (CDC, 2012). These chronic medical conditions have increased health care costs, lowered worker productivity and diminished people's quality of life. In 2007, the U.S. Center for Disease Control estimated the cost of diabetes to the U.S. economy at $174 billion (CDC, 2011). With many Mexican immigrants engaging in circular migration patterns, declining immigrant health puts a strain on the health systems and economies of both the United States and Mexico. For example, Mexico now ranks sixth in the world in terms of cases of diabetes and has a high rate of obesity. For both the United States and Mexico, public expenditures account for approximately half of health spending so this represents a potentially significant strain on government budgets (World Bank, 2013).

The high cost of these chronic medical conditions alongside the increased number of immigrants has led to a substantial body of research on the health of immigrants. Much of this research has been directed at explaining the "healthy immigrant effect". This effect finds that immigrants, even when poorer and less educated, are often healthier initially than are similarly aged native-born individuals. When tested using data from the United States and Canada, this effect has been found for many, but not all, ethnic groups of immigrants (Ahmed, 2005; Frisbie, Cho and Hummer, 2001). Considerable evidence has been found supporting this effect in the United States, especially among Latino immigrants (LeClere, Rogers and Peters, 1997; Marmot, 1984; Jasso et al., 2004; Jasso et al., 2005; Antecol and Bedard, 2006). Work, such as Deri (2003) and McDonald and Kennedy (2004), find evidence for the healthy immigrant effect in Canada. This phenomenon has also been found with immigrants in Australia (Biddle, Kennedy and McDonald, 2007).

One of the explanations for this healthy immigrant effect is self-selection. Evidence suggests that healthier individuals migrate (Chiswick, Lee and Miller, 2008; Jasso et al., 2004; Marmot, Adelstein and Bulusu, 1984). Also, immigrants who experience health problems may return home, leaving the remaining immigrant pool to appear healthier in comparison to the native population, the so-called "salmon effect" (Palloni and Arias, 2005; Turra and Elo, 2008). However, research has also found that the healthy immigrant effect lessens with time in the destination country. Several studies have found that the longer an immigrant's migration, the more their health quality begins to converge to that of the native-born population (Antecol and Bedard, 2006; Chiswick, Lee and Miller, 2008; Cobas et al., 1996; Guendelman & Abrams, 1994; Zsembik and Fennell, 2005). Other studies have found factors such as education and language skills appear to

be more important than duration in causing health convergence (Kaushal, 2009; Iversen, Ma and Meyer, 2012).

Health convergence is often viewed as part of overall acculturation by the immigrant. Under the acculturation hypothesis, the immigrant adopts more aspects of the host country's culture over time and loses some of their own.[1] Such aspects can include a less-healthy host country diet, alcohol, cigarettes and other lifestyle choices which reduce health outcomes (Arcia et al, 2001; Biddle, Kennedy and McDonald, 2007; Black and Markides, 1993; Markides, Krause and Mendes de Leon, 1988). Research has shown, in general, that social networks improve health outcomes (Qualls, 2014). Ceteris paribus, people with social support tend to have better physical and mental health. For migrants, the cultural type of social network matters. Maintaining social networks in the destination country with people from the same source culture can mitigate worsened health resulting from acculturation (Curran and Saguy, 2001; Rote and Markides, 2014; Waters and Jimenez, 2005). This is not necessarily true of social networks dominated by the culture of the destination country. In those cases, acculturation could be accelerated.

The literature testing the healthy immigrant effect uses migration duration as the crucial variable driving the changes in health. The hypothesis states that immigrant health should converge towards native-born levels with increased time in the United States. These studies use health data from immigrants currently residing in the destination country (in this case the United States).[2] An implicit assumption underlying this type of data is that the immigrant is making one long-term move to the United States rather than many short-term migration trips (Frisbie, Cho and Hummer, 2001). This is an accurate assumption for many immigrant groups in the United States. However, this is generally not true for Mexican immigrants which are the largest immigrant group in the U.S. The Mexican immigration flow is characterized by repeated trips to the United States, each trip's duration being on average a few years (Reyes, 2001; Mendoza, 2008). This migration pattern is important when testing the healthy immigrant effect because a Mexican immigrant may only have been in the United States for a couple of years (on their current trip) but could have well over a decade of cumulative U.S. experience. Thus, migration duration and cumulative U.S. migration experience may have different health effects for Mexican immigrants.

In this paper, we test the healthy immigrant effect for Mexican immigrants to the United States taking into account this pattern of repeated trips. Unlike the previous literature, we consider health convergence by examining both individual trip duration and cumulative migration experience. Using Mexican Migration Project (MMP, 2012) flow data, we are able to test the effects of single-trip migration duration versus the cumulative effect of many trips to the U.S. We conduct the analysis on samples of migrants with different durations to determine how convergence occurs on short trips versus longer trips. We find that overall, cumulative, experience in the United States does support the hypothesis of health convergence but single trip duration does not exert this negative impact on health. In fact, after controlling for cumulative migration experience in the United States and other factors like age and education, single-trip migration duration was found to improve health.

While this result is new to the literature, it is not surprising when one considers the nature of Mexican-U.S. migration. The migration flow often involves illegal, dangerous crossings into the United States (Eschbach et al, 1999; Cornelius, 2001; Orrenius, 2004;

Orrenius and Coronado, 2005; Spener, 2001). These crossings can negatively affect an individual's health (Pol and Thomas, 1992). Staying for a few years in the United States on any particular trip allows the immigrant to recuperate from an arduous crossing. Some immigrants hire smugglers (called coyotes) to help them cross the border. The use of and cost of smugglers has increased significantly during the 1990s and 2000s (Gathmann, 2008; Massey, Durand and Malone, 2002). We do not find that crossing with a smuggler provides any better health benefits than crossing without them. Some immigrants are able to receive government welfare benefits after crossing (depending on destination state and documentation). There is a considerable literature discussing whether immigrants are attracted to destinations because of welfare programs (Borjas, 1999; Dodson, 2001; Jackson, Ortmeyer and Quinn, 2012). However, we did not find any evidence that receiving welfare improved immigrant health.[3]

This data set also allows us to examine the impact that social networks have on health convergence (Mendes de Leon and Glass, 2004). In this paper, we build on this work by distinguishing between social networks which stay within the immigrant's culture and those which follow the destination culture. We find evidence that Mexican immigrants with close Latino ties experience better health outcomes than those with close Anglo ties. This offers further support for acculturation. This is consistent with neighborhood effects for Hispanic immigrants found in the literature (Eschbach, Mahnken and Goodwin, 2005; Keegan, John and Fish, 2010; Lee and Ferraro, 2007). Finally, with regards to chronic health conditions, our analysis finds that immigrants with diabetes have worse health outcomes and that the negative health impact is made more severe by longer trip durations. It is likely that the American lifestyle is not amenable to the proper diet and exercise necessary for diabetics.

The hypotheses which are going to be empirically tested are:
H1.) Total cumulative time spent in the U.S. will reduce quality of immigrant health.
H2.) After controlling for cumulative time spent in the U.S. and pre-existing conditions like diabetes, single-trip migration duration will result in better immigrant health.
H3.) Longer trip durations in the United States will exacerbate chronic conditions such as diabetes and result in a poorer health outcome.
H4.) Immigrants with closer relationships to Anglos will acculturate faster and therefore experience reduced health.
H5.) Immigrants with closer relationships to other Latinos will acculturate slower and therefore experience better/less worse health.
H6.) Immigrants using coyotes have better health outcomes because of lowered crossing stress.

The next section of the paper discusses the Mexican Migration Project (MMP) data set used in this analysis and the relevant variables. This is followed by an explanation of the empirical methodology and then by the results. The paper concludes with a discussion of the implications for both the literature and policy.

DATA AND VARIABLES

The data are taken from the Mexican Migration Project (MMP, 2012) which is run jointly by the University of Guadalajara and Princeton University. Each year, the MMP samples around 150-200 households from 3-5 non-repeating Mexican communities. The data set is cross-sectional in the sense that it is collected across different communities in each year. It is also time-series in the sense that it is collected over time (but not for the same communities in each year). This data can thus be used to investigate hypotheses that are expected to vary across communities as well as over time. Interviewers collect a vast array of information about individuals who are present in the surveyed household and individuals who are not present because they have migrated to the U.S.

Due to the nature of the data collection, the individuals used in the analysis are all male heads of household. There are 499 observations in the data set. The MMP data contains detailed migration histories of heads of households encompassing such information as the number of migrations, the duration of the migration, whether the migration was legal or illegal, whether a coyote was used, and the age of the migrant at each migration. The heads of household in this sample are predominantly male. Therefore, in order to provide consistent results the few female head of household observations are dropped. There is some research to suggest that male heads of household are more likely to engage in circular migration patterns than female migrants (Reyes, 2001). The data set also contains personal data on the migrant such as subjective assessments of his overall health before and after the last migration experience, as well as more detailed information about his current health status. Finally, the data set contains variables covering the social, financial, and employment characteristics of the last migration undertaken. Thus, it is a very rich dataset that supports our objective to analyze the health impacts of Mexican-U.S. migration.

The dependent variable used in our analysis is the perceived change in health of the migrating individual before and after his most recent migration. This data was collected between 2007 and 2011 across 20 Mexican communities.[4] The data set contains two variables, one reflecting the quality of health of the individual before the last U.S. migration and one reflecting the quality of health after the last U.S. migration. Each is an ordinal variable measured on a scale of 1 to 4 (poor, regular, good and excellent). The *change in health* variable is defined as *health after the most recent migration* minus *health before the most recent migration*. If there is no perceived change in the level of health, the rank is zero. If health is better upon return to Mexico the rank is positive, ranging from 3 (most improved) to 1 (slightly improved). If health is worse the rank is negative, ranging from -3 (much worse) to -1 (slightly worse). This data is all defined for the migrant's last U.S. trip. While theoretically this variable was coded to range from -3 to +3 (seven categories), the actual responses ranged from -3 to +1 (four categories). Survey respondents did not have major health improvements from migration; on average, the impact on overall health was negative.

There are two independent variables regarding migration experience: trip duration and total experience. Migration trip duration is the number of months from the last migration to the United States. Total migration experience is the sum of all migration durations (including the last trip). This is a measure of the cumulative amount of time the migrant has spent in the United States.[5] To alleviate concern over possible

multicollinearity caused by including both trip duration and total experience in the analysis, the variance inflation factor test was employed. The VIF statistics were all less than three, which indicate no evidence of significant multicollinearity in the analysis. There are two social network variables included in the analysis (Anglo or Latino). These two variables measure how close the immigrants' relationships were to Anglo and Latino people during their last trip to the U.S. The Anglo and Latino variables are scaled from zero to three with three representing the closest relationships. The responses for the relationship variables are: none (0), workplace only (1), friendship (2) and very close (3). These four variables are all directly related to the acculturation and social networks hypotheses as discussed in the first section of the paper.[6]

A health condition variable, *diabetes*, was included on its own and as part of an interaction term multiplied by duration of the last migration. We chose this health condition (as opposed to cancer for example) because it seems most directly related to obesity caused by lifestyle issues. Including this interaction term tests the hypotheses that a diabetic might expect a worsened health outcome after the last migration that would be more severe the longer the migration duration. Other health conditions such as hypertension and heart disease were tested but only diabetes was found to be significant (and thus included in the analysis).

There are several control variables included in the analysis. There is a variable measuring whether the last migration was legal or illegal and another variable measuring whether a coyote was used to cross the border. These are intended to control for the impact of the stress of the crossing on health. Education level and English skills are intended primarily as proxies for income, although there is some evidence they may also relate to acculturation. Age at time of last migration is important to control for, as older migrants are likely to have more health difficulties. The analysis also includes seven migration cohort variables to control for varying government policies and national level conditions during different time periods. These cohort variables split the sample by year of migration, following (Antecol and Bedard, 2006). These cohorts test such things as whether there are any differences in reported health changes for recent migrations as opposed to migrations occurring thirty years ago, or whether health reporting was affected by either the increased border controls following 9/11 or the Great Recession in 2008. There is research suggesting that both of these events might represent structural shifts changing migration patterns (Andreas, 2003; Buehn and Eichler, 2013; Massey and Penn, 2012). These cohort effects help to control for the changing nature of migration patterns over time due to such shifts. Year dummies and timetrend variables were also tested to control for changing migration patterns over time but they were not significant.

In the regressions, we split the sample into different timeframes, using the duration of the last migration as the separating variable. This was to test the effect of throwing out outliers on the high end. Our reasoning was that migrants who stay for 20 years may not be directly comparable to migrants who stay for only 2 years and that including duration as an explanatory variable may not fully capture these differences. Table 1 contains summary statistics for variables used in this paper.

TABLE 1. DESCRIPTIVE STATISTICS

Variable Name	Mean	Std. Dev.	Minimum	Maximum
Change in health over last U.S. trip (<0 worse, >0 better)	-0.21	0.55	-3	1
Duration of last U.S. trip (months)	38.23	72.84	1	726
Total cumulative time in U.S. (months)	73.57	93.66	1	780
Coyote hired last trip (=1 if yes)	0.40	0.49	0	1
Age at last U.S. trip (years)	32.92	11.82	1	85
Documented last U.S. trip (=1 if yes)	0.39	0.49	0	1
Education (years)	5.32	4.00	0	28
Relations with anglos (=3 if very close)	1.32	0.68	0	3
Relations with latinos (=3 if very close)	1.47	0.72	0	3
English skills (=4 if fluent)	1.21	1.36	0	4
Diabetes (=1 if yes)	0.11	0.31	0	1
Immigrated in 1981 or before	0.35	0.48	0	1
Immigrated in 1980-1986	0.11	0.31	0	1
Immigrated in 1985-1991	0.19	0.39	0	1
Immigrated in 1990-1996	0.15	0.36	0	1
Immigrated in 1995-2001	0.12	0.33	0	1
Immigrated in 2000-2008	0.07	0.25	0	1
Immigrated after 2007	0.01	0.08	0	1

EMPIRICAL METHODOLOGY

This paper examines factors affecting the change in the perceived level of health of the migrant over the last U.S. migration. As discussed in the previous section, the dependent variable (*changehealth*) is an ordinal variable where each observation is ranked in terms of degree. Our interest is in predicting the probability of an improved or worsened health outcome as a function of such factors as duration of migration versus overall migration experience, stress of the migration, health conditions (e.g. diabetes), social interaction, etc. Hence, a natural estimation technique to use is ordered logistic regression.[7]

An ordered logit is a version of the commonly used logistic analysis. In a multinomial logit, there is nothing specific about the ordering of the outcomes. The dependent variable is dichotomous, and one could recode the numbering of the dependent variable (1=2, 2=1) without changing the results (only the interpretation). However, in our case, outcomes are in a specific order from worst to best health outcomes. We need a method which takes account of this characteristic of the dependent variable, and this is why we employ an ordered logit versus the unordered multinomial logit. Unlike OLS, when interpreting any type of logistic analysis one cannot use the coefficients for magnitudes. The results of a logit are best interpreted when presented in terms of odds ratios. If the odds ratio is greater (less) than one, then a one-unit increase in the explanatory variable increase (decrease) the likelihood that health will be improved. For example, an odds ratio value of 1.23 would be interpreted as a one unit change in the explanatory variable increasing the likelihood of health increase by 23%, whereas an odds ratio of .89 would be interpreted as an 11% likelihood of health decrease.

The ordered logit assumes that there is an ordered ordinal variable, *Y*, which is a function of another unobserved, continuous, variable *Y**.[8] *Y**, in turn, is a function of a

vector of independent variables. This continuous variable has various threshold (or cut) points which define threshold categories.[9] The value of the observed variable, Y, depends on which threshold category the particular data point is in. Hence, the degree of health change can vary depending on some unobserved, continuous, subjective health index which is a function of variables like duration of the migration, etc. To simplify, assume that there are three ordered category ranks for Y.

$$Y_i = 1 \; if \; Y_i^* \leq \rho_i \tag{1}$$

$$Y_i = 2 \; if \; \rho_1 \leq Y_i^* \leq \rho_{i2} \tag{2}$$

$$Y_i = 3 \; if \; Y_i^* \geq \rho_2 \tag{3}$$

Further, assume that:

$$Y_i^* = \sum_{k=1}^{K} \beta_k X_{ki} + \varepsilon_i = Z_i + \varepsilon_i \tag{4}$$

The *ologit* model estimates Z (the βs) and the ρs (the "cut points") using the observed Y and X sample and computes the probability that Y will take on a particular value (from equations (1)-(3)) assuming a logistic distribution of the disturbance term.

RESULTS

The results show strong support for the paper's hypotheses that last trip duration and cumulative migration experience produce different results. The results of the empirical analyses are in Table 2. The cumulative migration experience variable generates significant odds ratios less than one. The implication is that Mexican immigrants who have spent more of their life in the United States have a higher probability of worsened health. This might occur because they adopt cultural lifestyles and dietary habits that are less healthy. This acculturation hypothesis is usually tested by a last trip duration variable which does not account for cumulative migration experience. However, when we test last trip duration, while controlling for cumulative migration experience and other control factors like pre-existing conditions and age of the immigrant, we find it to have a positive effect on health. This is consistent with a view that longer trip durations (ceteris paribus) provide Mexican immigrants a chance to recover from the health shock of crossings which are often difficult. It is notable that the only sample segment yielding insignificant results is the one which includes migrants with trip durations of two years or less. This suggests that relatively short duration trips are not long enough to recover health from the crossing.

The contrasting results discussed above are illustrated in Figure 1. Each succeeding sample segment adds migrants whose last trip was of longer duration. These longer trip durations raise the average cumulative experience in the United States. [10] As the mean cumulative experience increases, the graph shifts up, indicating a greater probability of worsened health (acculturation). Think of these graphical segments as "isoexperience" lines each representing a certain level of cumulative US experience. Higher segments (to the northeast) represent increased cumulative US experience. Along any given isoexperience line, however, the longer the duration of the last trip, the *lower* the

probability of worsened health, and this is true for all isoexperience lines. So, migrants with longer cumulative experience in the US (over possibly many trips), have worse health outcomes than do migrants with shorter cumulative experience (as indicated by the upward shifts of the isoexperience lines), but in all cases the longer the duration of the last trip, the more time they have to recover and the better their immediate health outcome (the lower the probability of worsened health).

Of particular interest is the movement from the end of the second to beginning of the third segment. These are labeled points A and B, respectively. Suppose point A represents "Jose" and point B, "Pablo". Jose has, on average, less total time in the United States than Pablo. Note that the durations of their last trips to the U.S. are similar, but we see that the likelihood of worse health from migration is higher for Pablo than for Jose because he has spent more of his life in the United States, is less healthy, and needs a longer time to recover his health than does Jose.

FIGURE 1. DURATION OF LAST TRIP AND HEALTH OUTCOME
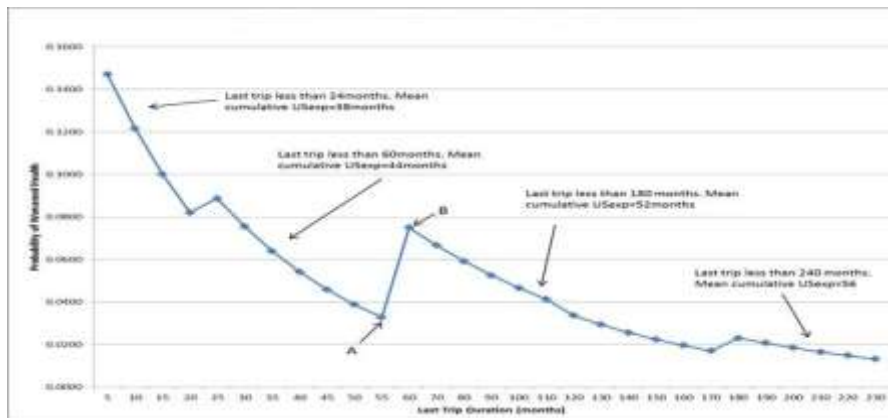
The social network variables also provide support for the acculturation hypothesis and the importance of social networks. Our analysis consistently finds having closer relationships with Anglos raises the odds of worsened health (odds ratios significantly less than 1). As predicted by our earlier hypotheses, Mexican immigrants with closer Anglo relationships are likely to more quickly adopt Anglo habits and lifestyles. The positive health effect of having closer Latino friends has only weak support in the results, on the other hand. While consistently generating odds ratios greater than one (suggesting a probability of better health), the variable is only significant in two of the five samples. The low significance may be because many immigrants have family members with them; and these family members are not counted as relationships in the survey. Thus, many of the Mexican immigrants in the survey have close Latino relationships just because of their family living arrangement. But our results clearly suggest that the cultural type of the social network matters for the health of the immigrant.

The results suggest that taking longer trips to the United States takes a toll on individuals with chronic conditions such as diabetes. The coefficients on the interactive

variable (diabetes*trip duration) generate odds ratios less than one across the sample segments and are significant in the majority of cases. On the other hand, the coefficients on the stand-alone diabetes variable were not significantly different from zero and thus did not have a direct impact on the odds ratios of changed health. This suggests that prolonged, continuous exposure to living in America, more than just the mere presence of diabetes, aggravates health problems for immigrants' suffering from diabetes. Given the extremely high prevalence of obesity and diabetes in the United States, this is not surprising.

The coefficients on coyote use generated significant odds ratios less than one, suggesting a probability of worsened health. This was surprising as it was expected that hiring a coyote would reduce the negative health impact of crossing. Perhaps we were undervaluing the degree of stress involved in a coyote-assisted illegal crossing. With the increase in crime at the border, coyotes often now take immigrants through territory controlled by Mexican gangs/cartels such as the Gulf and Zetas. Coyotes pay "tolls" for the right to smuggle people through their territories (Beaubian, 2011). With the control of territory changing rapidly, gangs frequently kidnap illegal immigrants if the coyote did not pay the right gang (Beaubian, 2011; Marosi, 2010). These victims are then either ransomed to their families or sold into forced labor. In addition, the cost of hiring a coyote has risen significantly and individuals hiring a coyote often need to borrow money (Gathmann, 2008). The MMP data suggest that individuals hiring a coyote remitted, on average, 10% more home to Mexico than individuals who did not hire a coyote. The remittances sent by coyote users were also four times more likely to be used for debt repayment, than remittances sent by non-coyote users. Therefore, it is possible that in addition to the crossing stress, migrants hiring a coyote are sending more money back home and living on less in the United States which is having a negative impact on health.[11]

There were also several control variables used in the analysis. As expected, age at migration generated significant odds ratios less than one. Older migrants have a more difficult time crossing and the impact on their health will be more negative than on younger people. Also, with age, health declines regardless of the migration decision. The cohort effect variables were generally not significant, suggesting that there are not strong health effects from crossing during different time periods. Education, English skills and documentation were also generally not significant. These were included as proxies for income. In this paper's data set, the average immigrant had seven years of education with the majority of observations falling in the three to nine year range. Fewer than seven percent of the sample completed high school. With education levels in this range, it is likely that employers would exhibit pooling behavior when considering Mexican immigrants' education which would reduce its return and yield it insignificant (Docquier and Rapoport, 1998; Quinn and Rubb, 2005). The lack of significance found with respect to the documentation variable could be the result of the coyote use variable being included in the analysis. Someone using a coyote is making an illegal crossing. However, we decided to keep both coyote use and documentation in the analysis as coyotes relate only to the crossing experience while documentation also has wage effects while in the United States. In addition, most of this sample was undocumented so the lack of significance in that variable is not entirely surprising.

TABLE 2. ORDERED LOGIT RESULTS FOR CHANGE IN HEALTH SEGMENTING SAMPLE BY MAXIMUM DURATION OF LAST MIGRATION

Explanatory Variable	Full Sample Odds Ratios	20 years or less Odds Ratios	15 years or less Odds Ratios	10 years or less Odds Ratios	5 years or less Odds Ratios	2 years or less Odds Ratios
Duration of last U.S. trip	1.007	1.011	1.013	1.013	1.036	1.045
	(.003)*	(0.006)*	(0.007)**	(0.007)*	(0.0142)***	(0.0291)
Total cumulative time in U.S.	0.991	0.992	0.994	0.993	0.994	0.992
	(.003)***	(0.003)***	(0.003)**	(0.003)**	(0.003)**	(0.004)**
(Diabetes*duration) interaction term	0.988	0.973	0.971	0.998	0.960	0.791
	(.004)***	(0.007)***	(0.009)***	(0.021)	(0.031)	(0.066)***
Diabetes	0.732	1.396	1.397	0.777	1.342	14.77
	(0.338)	(0.750)	(0.782)	(0.508)	(1.05)	(19.43)**
Coyote hired last trip	0.292	0.260	0.269	0.224	0.241	0.103
	(0.153)**	(0.154)**	(0.162)**	(0.147)**	(0.171)**	(0.088)***
Age at last U.S. trip	0.975	0.970	0.97	0.969	0.972	0.967
	(.014)*	(0.014)**	(0.014)**	(0.014)**	(0.015)*	(0.017)*
Documented last U.S. trip	0.518	0.441	0.475	0.423	0.562	0.248
	(0.282)	(0.274)	(0.305)	(0.290)	(0.413)	(0.218)
Education	0.974	0.965	0.965	0.967	0.976	0.977
	(0.038)	(0.038)	(0.038)	(0.038)	(0.041)	(0.045)
Relations with anglos	0.666	0.616	0.595	0.594	0.515	0.55
	(0.144)*	(0.137)**	(0.134)**	(0.136)**	(0.126)***	(0.147)**
Relations with latinos	1.282	1.345	1.307	1.333	1.243	1.644
	(0.226)	(0.246)	(0.244)	(0.253)	(0.254)	(0.388)**
English skills	1.323	1.258	1.227	1.200	1.181	1.090
	(0.168)**	(0.163)*	(0.161)	(0.158)	(0.169)	(0.170)
Number of Observations	509	499	496	480	432	335
Chi-squared	64.38	61.73	47.92	37.8	41.6	44.26
Prob > chi2	0.0000	0.0000	0.0001	0.0026	0.0008	0.0003

Notes: Odds ratios show the likelihood of changed health as a result of a 1 unit change in the explantory variable. A result greater than 1 indicates a greater likelihood of improved health.

A result less than 1 indicates a reduced likelihood of improved health, a value of 1 indicates no change in health. Standard errors are shown in parentheses.

Significance levels of 10%, 5% and 1% are shown by *, **, and ***, respectively. Cohort effects are included but not listed in table.

CONCLUSIONS

The paper's results show the importance of considering both migration trip duration and cumulative migration experience when investigating migration health outcomes. This has not been addressed by previous studies looking at acculturation and thus adds value to that literature. This may be especially important for migration flows such as those from Mexico to the United States which are cyclical. Interestingly, after controlling for overall migration experience, the impact on health of single-trip duration can actually be positive as it allows time for recovery from a difficult crossing.   Studies that test only migration duration, and are thus possibly misspecified, may produce confused results.

The paper also highlights interesting relationships between migrants' social networks and their long-term health. In particular, the commonly held view that "the more social networks the better" may need to be qualified for Mexican immigrants. Having more Anglo friends, which we would expect the longer the cumulative stay in the United States, may speed up acculturation and have negative long-term effects on health. The cultural type of social network makes a substantial difference on health.   Thus, encouraging "enclave effects" may be a positive thing for immigrant health. Another indirect negative impact of migration duration on health can occur for immigrants with conditions such as

diabetes as their health seems to deteriorate with longer cumulative time spent in the United States.

Research which relies solely on migration duration to understand health outcomes of migration underestimates the negative health impacts on Mexican immigrants. Our results show that repeated brief trips have a short-term negative impact on health from the difficulty of crossing and a long-term cumulative negative impact from acculturation. Given the large number of Mexican immigrants engaging in circular migration to the United States, this poorer health has implications for both the Mexican and American public health systems. The health care systems and government budgets need to prepare for this challenge.

If more crossings were legal, the brief trips would not have such a pronounced negative health impact, the recovery time would be lessened and migrants could take advantage of labor market changes and maintain stronger cultural connections to their home communities in Mexico. Repeat migration makes "immigrant replenishment" possible. This helps maintain a strong home culture among the immigrant groups living in the destination country (Waters and Jimenez, 2005). Strong cultural connections also benefit the family members remaining back home in Mexican communities. By maintaining a strong Mexican social network, immigrants may be able to slow the acculturation process and may experience improved health outcomes.

This paper also presents opportunities for future research. While the Mexico-U.S. migration flow is very large, it is still only one migration flow. Future studies could focus on other immigrant groups and/or different destination countries. This would be especially useful for other immigrant groups that display a pattern of repeat migration. The focus on repeat migration, which is one of the core contributions of the paper, is also a limitation as it does not deal with permanent movers. At a fundamental level, studies such as these show us the need to collect more micro level, panel data sets on immigrants and their health outcomes.

ENDNOTES

[1] For a more theoretical discussion of acculturation and culture, readers are directed to Abraido-Lanza et al (2006) and Hunt, Schneider and Comer (2004).

[2] The measures of "health" in the convergence and acculturation literature are often self-reported, and thus highly subjective, although in some studies more objective variables are used, such as body mass index (BMI). Increasing BMI is correlated with an increased rate of diabetes, heart disease and other chronic ailments.

[3] Welfare benefits was dropped as an explanatory variable in the analyses as it was consistently insignificant.

[4] The 2007 survey was the first year the MMP asked this health question.

[5] Redstone and Massey (2004) point out that self-reported migration duration variables could contain errors. However, there is no evidence that any significant errors exists in the MMP migration duration variable.

[6] Other social network variables were tested in the paper as well. We attempted to test variables regarding whether immigrants lived with relatives in the United States and who paid for the migration but it did not have enough observations to run. We were able to rest variables regarding the immigrant's membership in social clubs and sports organizations in the United States but they were both insignificant.

[7] This was estimated using the ologit command in Stata.

[8] This discussion is adapted from Hamilton (2003).

[9] The results were also robust to relaxing the proportional odds assumption on which the ordered logit is based. This was tested with a generalized ordered logistic model, gologit2 command in Stata. More information on this method can be found in Williams (2006).

[10] For each of our sample segments (segmented by duration of last trip) we ran regressions and used the coefficients to interpolate the probability of worsened health (holding all other independent variables at their mean values). For example, the first segment in the graph (with trip duration less than 2 years) has four values corresponding to predicted probabilities of health worsening for trip duration values of 5, 10, 15 and 20 months. For the next segment, predicted probabilities were generated at 25, 30, 35, 40, 45, 50 and 55 months of migration duration. Each successive segment sample includes the previous group then adds those with longer migration durations which raises the average cumulative U.S. experience across each segment.

[11] This could also be an issue of selection, that migrants concerned that the trip will be too difficult for their health are more likely to hire a coyote. However, we are already controlling for age and migration experience which are two of the most important factors in the decision whether or not to hire a coyote.

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