Health and Migration Within and Across Borders:

A Longitudinal Study of Mexican Internal Migrants and Return US Migrants

By

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DEDICATION

To my husband, Jesus, who supported me infinitely,

and

To my son, Mateo, who joined us halfway in this journey and made it even more fun.

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INTRODUCTION

In 2014, the Mexican federal government issued the *Programa Nacional de Población 2014-2018* (National Population Program), which summarizes the guidelines for the country's current population policy (Consejo Nacional de Población [CONAPO] 2014b). For many decades, Mexico's population policies centered on controlling population growth, but this is no longer a priority given a decelerating trend in the growth of the national population. Today, Mexico's policies address issues related to changes in the country's demographic profile, such as shifts in the age composition of the population, new morbidity and mortality profiles, aging of the population, reconfiguration of familial relations, and new patterns of population mobility (CONAPO 2014a, 2014b).

Two of the six policy objectives outlined in Mexico's National Population Program focus on demographic challenges resulting from international and internal migration. The most important international destination for Mexican migrants is the United States (86.3%), followed by Canada (2.2%), Spain (2.1%), and other countries around the world (9.2%) (INEGI 2015). Mexican migration to the United States initiated in the 19th century and is one of the most important international migration flows in the world (Massey et al. 1987). However, recent census data reveal a sharp rise in return migration to Mexico—from approximately 280,000 in 2000 to almost one million in 2010—resulting from more restrictive US immigration policies, increased deportations, and the 2007 Great Recession (Masferrer and Roberts 2012; Parrado and Gutierrez 2016). In this context, the Mexican National Population Program identifies the need to

be attuned with the social, familial, employment, and health needs of international migrants upon their return and to facilitate their reintegration into society (CONAPO 2014b). This challenge is not exclusive to Mexico. While many migrant-sending countries tend to have policies in place to assist international migrants before they migrate and during their international stay, a critical gap remains in terms of enabling access to and utilization of public services, including health care, upon migrants' return to their origin country (Davies et al. 2011).

For Mexican citizens, internal migration is even more widespread than US migration. About 80 percent of Mexicans with migration experience have relocated domestically (Pan American Health Organization 2005). Like international migration flows, patterns of migration within Mexico are shifting and are causing changes in the spatial distribution of the population. During most of the 20th century, the deteriorating economic and social conditions in rural areas led to high levels of migration from rural areas to the growing urban regions (Chávez Galindo 2001; Sobrino 2010). Since 2000, however, urban-urban moves have surpassed rural-urban movements, thus becoming the dominant internal migration flow (Sobrino 2014). Another important characteristic of domestic population mobility in Mexico is the long-standing presence of indigenous peoples, especially in rural-urban flows (Anguiano 1993; Lizama and de Mola 2010). Indigenous migration has gained relevance in recent years due to its volume and its implications in sending and receiving communities (Cárdenas Gómez 2014; Velasco 2007). In this context, the Mexican National Population Program recognizes the need to improve the quality of life and availability and accessibility to public services in urban centers, while continuing to address rural-urban disparities (CONAPO 2014b).

These recent and ongoing changes to patterns of population mobility have and will continue to have important implications for the Mexican healthcare system. Future changes in

the prevalence of diseases and, more broadly, in the general health status of the population may not just relate to local determinants of health, but may also be impacted by migration (Gerritsen et al. 2013). Because of this, Sobrino (2016) argues that Mexico needs to have strategies that take into account population movements, rather than simply formulating reactive policies. Knowing about the health of people that move in and out of a community (be it a the local, state, or country level) can help focus public health policies toward the correct targets (Ginsburg et al. 2016). This situation calls for research that sheds light on the health of return migrants and internal migrants to inform future public health and social integration policies in Mexico.

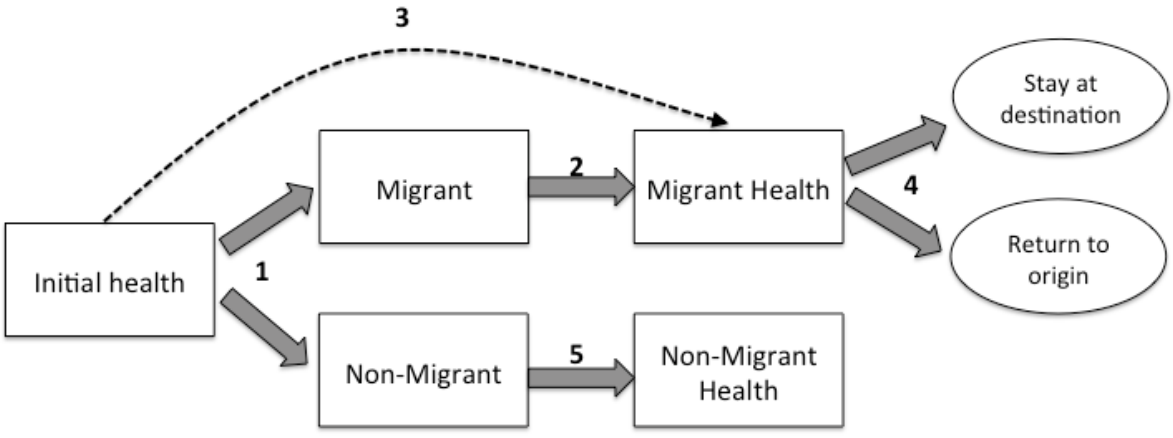
In this dissertation, I follow the Mexican National Population Council's (*Consejo Nacional de Población*) call to identify, analyze, and foresee the impacts of the territorial distribution of the population and of the different migratory flows (CONAPO 2014a). Specifically, I study the health trajectories of Mexican return US migrants and internal migrants, and examine whether their health changes as a result of migration. To do this, I use longitudinal data from the Mexican Family Life Survey to answer three questions that will further our understanding of the role of migration on the health of the Mexican population:

1. Does the health of return US migrants improve or worsen as a result of migration, and does this change differ from that of non-migrants?
2. Does internal migration produce different health trajectories relative to staying in the community of origin, and does it vary for men and women?
3. Does internal migration shape the health disparities between the Mexican indigenous and non-indigenous populations?

CONCEPTUAL FRAMEWORK

Figure 1.1 illustrates the conceptual framework used in this dissertation to study the relationship between health and migration (internal and international). Several mechanisms underlie this relationship. First, individual health status may determine who migrates and who stays. Mechanism 1 illustrates the effect of health selection on subsequent migration. The most often-tested hypothesis, the "healthy migrant hypothesis", suggests that successful migrants are not randomly drawn from the health distribution of the sending community, but are selected based on certain traits, including better physical and mental health (Akresh and Frank 2008; Jasso et al. 2004; Palloni and Ewbank 2004). There is evidence, however, that some migration streams are characterized by negative health selection. Such is the case, for example, of Malawian internal migration where HIV-positive individuals are more likely to move to gain better health care access or return home for care (Anglewicz et al. 2017). Lu (2008) suggests that health selection may operate in similar ways for internal and international migrants, but that selection may be stronger for international migration given the physical and psychological risks and burdens involved with crossing national boundaries.

Figure 1.1 Conceptual Framework



Source: Adapted from Lu and Zhang (2015)

Second, the experience of migration and adjustment to life at the destination may be related to changes in health. Mechanism 2 portrays this migration effect (Jasso 2013). Exposure to new social and health contexts and norms in the destination may have direct or indirect effects on the health of migrants. Risk factors (e.g., discrimination, poor living conditions, poor access to health care) interact with protective factors (e.g., economic gains, social support, healthy behaviors) and can result in the improvement or deterioration of health (Jasso et al. 2004; Riosmena et al. 2014; Riosmena and Jochem 2012; Viruell-Fuentes, Miranda, and Abdulrahim 2012). Migrating internally versus internationally might also impact health differently given the different motivations, costs, patterns, and social capital associated with each migration stream (King and Skeldon 2010; Lindstrom and Lauster 2001; Lozano-Ascencio, Roberts, and Bean 1999; del Rey Poveda 2007; Salt and Kitching 1992).

Third, health outcomes are also likely influenced by pre-migration health status. Mechanism 3 illustrates the link between initial health and post-migration health outcomes. If, for example, migrants are positively selected on health, this pre-migration health advantage might be retained and exhibited in (biased) healthy outcomes after migration relative to the non-migrant population (Jasso et al. 2004; Lu and Zhang 2015; Palloni and Ewbank 2004). This is often one of the explanations used to clarify the epidemiological paradox (Abraído-Lanza et al. 1999; Markides and Coreil 1986; Riosmena, Wong, and Palloni 2013).

Fourth, migrants' health status after migration might determine whether they stay at their destination or decide to return to the origin (Mechanism 4). Some scholars suggest the existence of selective return migration, often called "the salmon bias hypothesis," such that those who experience deteriorating health conditions are more likely to return home than their healthier

counterparts (Abraído-Lanza et al. 1999; Diaz, Koning, and Martinez-Donate 2016; Markides and Eschbach 2005; Palloni and Arias 2004; Turra and Elo 2008).

Finally, to put migrants' health in perspective, it is important to assess the health trajectories of migrants relative to those of the people who stayed behind. Mechanism 5 represents changes in the health of non-migrants. Using non-migrants from the same country of origin as the reference group enables an assessment of whether and how migration produces similar or diverging trajectories from those who stayed behind. In addition, it allows us to infer what the health status of migrants would be had they not left the origin (Acevedo-Garcia and Almeida 2012; Jasso et al. 2004; Spallek, Zeeb, and Razum 2011).

In this dissertation I explore all mechanisms except Mechanism 4. While I study the health of return migrants in Chapter 2, in order to investigate the existence of selective return migration it is necessary to have data on the health of migrants who stayed in the destination country. Unfortunately, this information is not available in the Mexican Family Life Survey. Nevertheless, findings on the health trajectories of return migrants may shed some light on this mechanism. If, as suggested by the salmon bias hypothesis, living in the United States negatively impacts health and/or individuals return to Mexico due to health problems, it follows that return migrants' health will likely be worse upon return than when they left.

SIGNIFICANCE AND CONTRIBUTIONS

While this dissertation focuses on the specific case of Mexico, it fits within larger scholarly and policy conversations regarding the health implications of migration. Migration is one of the three basic components of population change and one of the leading global policy issues of our time. Approximately 232 million people in the world are international migrants and

an additional 740 million have migrated within their countries' borders (International Organization for Migration 2015). While migration has been an integral part of human history, the unparalleled level of migration we see today has profound impacts on the political, economic, social, and cultural lives of individuals in the origin and destination communities. Increasingly, there has also been a concern with the health implications of migration given that epidemiological transitions may be dramatically impacted by migration trends (Davies, Basten, and Frattini 2006; Gerritsen et al. 2013; Ginsburg et al. 2016). Given that health and migration are interrelated processes, studying the link between them sets the foundation for understanding the determinants and consequences of this global social phenomenon.

This dissertation contributes to our understanding of the health-migration association in four ways. First, by using prospective data to identify health selection effects and to assess the independent effects of migration on health over time. In their discussion about immigrants' economic and occupational mobility, White and Glick (2009:112–13) indicate that studies of immigrant success or failure often fail to "distinguish starting point and trajectory." Similar challenges exist in studies of migrant health. Due to data limitations, prior research has primarily relied on cross-sectional data and has assessed the extent of selection bias and of migration effects by examining health *after* migration, thus lacking the temporal component that permits making inferences regarding the relationship between migration and health (Acevedo-Garcia et al. 2012). As Nauman et al. (2015:255) argue, if pre-migration health —not migration itself— determines post-migration health, "attributing post-migration differences in physical health status to the effects of migration would be an erroneous conclusion, resulting in a Type I error."

Prospective data make it possible to distinguish between mechanisms of health selection and the effect of migration on health. This dissertation builds on prior longitudinal studies of the

pre- and post-migration health of internal migrants in Indonesia (Lu 2008, 2010a, 2010b), Malawi (Ginsburg et al. 2016), Thailand (Nauman et al. 2015), and Sub-Saharan Africa (Anglewicz et al. 2017), as well as of international migrants from Mexico (Arenas et al. 2015; Goldman et al. 2014; Rubalcava et al. 2008). Many of these studies have relied on bivariate analyses or on multivariate analyses that control for pre-migration health and demographic and socioeconomic factors. This dissertation makes a contribution by also accounting for changes in other life statuses that might impact changes in health trajectories directly or indirectly (e.g., changes in marital status, employment status, health insurance coverage).

Second, I study the health of both internal and international migrants from the same country and using the same conceptual framework. Domestic and international movements tend to be studied separately, each with different literatures and analyzed using different theoretical and methodological approaches (De Jong et al. 1983; King and Skeldon 2010). Considering only one type of migration, however, "is to look at only one part of the story, and results in a partial and unbalanced interpretation" (King and Skeldon 2010:1640). Existing studies suggest that the relationship between internal migration and health might operate in similar ways as that of international migration and health (Chen 2011; Lu 2008, 2010b; Nauman et al. 2015; Tong and Piotrowski 2012). However, internal and international migration streams originating in the same country tend to draw from different sectors of the population (Quinn and Rubb 2005; Sobrino 2014), and thus selection mechanisms and migration effects might operate differently.

Third, not only do I examine within-person changes in health after migration, but I also evaluate these changes in light of any changes experienced by the non-migrant population during the same period. Being healthy or unhealthy are relative concepts, and therefore the comparison group determines our conclusions about the health of migrants. This is especially relevant when

studying the health of international migrants. Earlier studies largely focused on immigrants in a host society and compared them to the native non-migrant population and/or other immigrant groups (e.g., Akresh and Frank 2008; Angel, Buckley, and Sakamoto 2001; Hummer et al. 2007; Palloni and Arias 2004). However, comparing migrants to the native population in the destination country may confound the effect of migration with the health and socioeconomic disparities between origin and destination (Lu 2010b). As evidenced by prior studies (e.g., Bostean 2013; Gee et al. 2015; Lu 2010b; Nauman et al. 2015; Riosmena et al. 2013; Ullmann, Goldman, and Massey 2011), contrasting individuals from the same country but with different migratory experiences enables probing if "a few decisive variations produce consequential divergences" (Bloemraad 2013:39). That is, whether migration produces differences in health and if there is a continuation of origin health patterns. Comparing changes in the health of migrants and non-migrants during the same period makes it possible to establish if observed changes are indeed related to migration and not a reflection of general population trends.

Fourth, I further disaggregate internal migrants by indigenous status. Mexico has the largest indigenous population in the Western hemisphere (Layton and Patrinos 2006). Similar to indigenous populations around the world, indigenous Mexicans experience significant health disparities relative to the non-indigenous population (Cano Valle 2004; Montenegro and Stephens 2006; Servan-Mori et al. 2014; United Nations Development Program 2010) and have historically constituted a significant portion of internal migration flows (Anguiano 1993; Arizpe 1976; del Rey Poveda 2007). However, indigenous status has been largely ignored the scholarship on migrant health. Therefore, little is known about whether the effects of migration on health operate differently based on indigenous status. The last chapter in this dissertation will contribute to filling this gap in the literature by examining the moderating role of indigenous

status on the relationship between internal migration and health. Findings will have implications for understanding inequalities between indigenous and non-indigenous populations globally.

Migration shapes the composition and structure of the population and it also has an impact on infrastructure and public services such as the health care system due to changes in the demand for services. Findings from this dissertation will make significant scholarly contributions and also help inform policy, particularly in the areas of global health of migrants, internal mobility, and indigenous populations. In addition, the work contained in the following chapters will increase our understanding concerning the impact of different migratory experiences on health outcomes, which will inform the literature in several disciplines, including sociology, public health, and public policy.

CHAPTER 2

THE HEALTH OF RETURN US MIGRANTS: ASSESSING PRE-MIGRATION HEALTH SELECTION AND HEALTH AFTER RETURN

Mexico's *Programa Nacional de Población 2014-2018* (National Population Program) identifies six objectives that will guide the current administration's population policy and develops a series of strategies to achieve the policy objectives. The fourth objective focuses on the socio-demographic challenges resulting from international migration in its different modes, one of which is return migration from the US to Mexico. The number of migrants returning to Mexico has increased by almost 200 percent over the last 20 years (CONAPO 2014b; Gandini, Lozano-Ascencio, and Gaspar Olvera 2015; Passel, Cohn, and Gonzalez-Barrera 2012) and they are increasingly deciding to settle permanently in Mexico upon return (Schultheis and Soto 2017). In this context, the National Population Program states that return migration is a "relatively new phenomenon" that requires public policy actions and interventions to support the economic, social, and cultural integration of returnees and their families (CONAPO 2014b:45).

The health of return migrants is one of the most pressing policy issues to address given the wide disparities between returnees and non-migrants in access to health care (CONAPO 2014b; Mestries 2015; Wassink 2016). In order to inform future public health policies, research is needed on the health status and needs of return migrants (Davies et al. 2011; Mestries 2015; Zimmerman, Kiss, and Hossain 2011). If returnees are less healthy than the general population, policies will need to anticipate the health needs of returning migrants and facilitate access to needed care and services upon arrival. If returnees are healthier than the general population,

policies and strategies must be enabled to provide preventive care and ensure that migrants remain healthy as they reintegrate into Mexican society.

In this chapter, I use three waves of data from the Mexican Family Life Survey to answer the following research questions: Do return migrants and non-migrants differ in early life health and baseline (pre-migration) health? Does return migration impact health over time? Do the health trajectories of return migrants differ from those of non-migrants? The chapter is organized as follows. First, I provide an overview of the flow of return migrants from the US to Mexico and explain the rise in return migration in recent years. Then, I review the literature on return migration and health, including prior findings on selection processes and changes in health over time, as well as how the health of returnees compares to that of non-migrants. I then describe the data and methods, and compare the baseline characteristics of individuals who migrated to the US and returned to Mexico during the period of observation and of those who stayed in Mexico at all times. Next, I discuss the results from multivariate analyses examining health selection, changes in the health of return migrants, and whether the health of return migrants and non-migrants differ over time. I conclude with a summary of findings and policy implications.

BACKGROUND

Recent Rise in Return Migration to Mexico

Migration is not unidirectional or permanent (Durand 2004). Most migrants leave their homelands thinking that they will go back eventually (e.g., when they reach their economic goals, when the political situation changes, when there are more job opportunities, etc.) However, the possibility of return shrinks as migrants spend more time in the host country (Durand 2004). This had largely been the case for Mexican migrants in the US. Before the 21st

century, Mexican return migration was largely based on voluntary considerations (i.e., return due to retirement, upon gaining financial capital or experience, or in response to new economic opportunities in the origin) and was frequently temporary as migrants tended to engage in circular migration (Massey, Durand, and Malone 2002; Massey and Pren 2012; Moctezuma Longoria 2013). However, changing period conditions, including the economic and political climates in the US, shifted Mexican return migration patterns (Parrado and Gutierrez 2016).

According to data from the *Encuesta Nacional de Dinámica Demográfica* (ENADID; National Survey of Demographic Dynamics), the number of return migrants almost doubled in the last 20 years, going from 289 thousand between 1992-1997 to 562 thousand between 2004-2009 (CONAPO 2014b). Calculations using the Mexican Census are even higher—from 267 thousand returnees between 1995-2005 to 824 thousand between 2005 and 2010 (CONAPO 2014b). While the estimations vary numerically, data from both the ENADID and the Mexican Census reflect an almost 200 percent increase in the number of return migrants over a 15 to 20 year period. This is in line with findings by Gandini et al. (2015) who, using a variety of census, intercensal, and survey data from Mexico, calculated that return migration to Mexico increased by 200 percent between 2000 and 2010. US data also demonstrate that Mexican migrants are leaving the country in growing numbers. According to the Pew Hispanic Center, 1.4 million Mexicans (including over 300 thousand US-born children) moved back to Mexico between 2005 and 2010; this number is almost twice the number of Mexicans who returned between 1995 and 2000 (Passel et al. 2012)[1]. It is important to note that, of these 1.4 million returnees, the majority

[1] Some studies that used data from Mexico's *Encuesta Nacional de Ocupación y Empleo* (ENOE; National Survey of Occupation and Employment) (e.g., Passel and Cohn 2009; Rendall, Brownell, and Kups 2011) found that return migration flows were stable between 2006 and 2009, and thereafter decreased. Passel et al. (2012:16–17) note that these prior contradictory findings are the result of a design feature of the ENOE which causes it to underestimate return migration flows: "[the survey] is designed to measure movement to and from existing households in

returned voluntarily. Passel et al. (2012) estimate that anywhere between 5 to 35 percent (depending on the data used) were deported; the other 65 to 95 percent returned voluntarily. Similarly, a 2013 study of 600 return migrants living in Jalisco, Mexico found that only 11 percent returned because they were deported (MATT 2013).

Former Mexican President Felipe Calderón (2006-2012) boasted that more migrants were returning to Mexico thanks to increasing employment, health, and educational opportunities created during his administration (López 2012). However, scholars argue that the rise in Mexican return migration over the past 15 years is the combined result of concurrent economic and political conditions in the US (Gandini et al. 2015; Masferrer and Roberts 2012; Parrado and Gutierrez 2016). First, the 2007 Great Recession had a large negative impact on Mexican migrants' employment and earnings, especially for those working in the construction, hospitality, food services, and automotive sectors (Mestries 2015; Parrado and Gutierrez 2016). Between 2009 and 2010, approximately 500 thousand Mexican immigrants in the United States lost their jobs (Mestries 2015). Second, the upsurge and toughening of anti-immigrant policies (targeting especially undocumented migrants) at the federal, state, and local levels created a more hostile environment for immigrants (Menjívar 2014). Fear of deportation has caused high levels of anxiety among Latino immigrants (Rhodes et al. 2015) and has led many of them to voluntarily return to their countries of origin (Mestries 2015). Third, the criminalization of immigrants and the accelerated rise in deportations since the 1990s (reaching unprecedented levels in the mid-2000s) lead to a rise in forced return migration (Golash-Boza 2015; Menjívar 2014; Parrado, Flippen, and McQuiston 2005). Between 1995 and 2015, the total number of deportations increased by over 650 percent (from 50,924 in 1995 to 333,341 in 2015) (Office of Immigration

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Mexico that are part of the sample. It does not include moves by entire households, an important contributor to return migration flow (…) Furthermore, if patterns of return migration changed, ENOE might not capture the trend over time."

Statistics 2017). Because the majority of unauthorized immigrants are Mexican (Passel and Cohn 2009), they also make up the majority of those deported. For example, 73 percent of the immigrants deported in 2015 were from Mexico (Office of Immigration Statistics 2017). In sum, an increasing number of Mexican migrants have returned—voluntarily or forcibly—to Mexico over the past 15 years due to a combination individual and structural-level motivations.

Not only are more migrants returning, but also more of them are deciding to stay permanently in Mexico. Mexican migration to the United States had historically been a circular phenomenon whereby individuals (predominantly working-age men) would migrate temporarily to the US to work, return home to Mexico, and depart again (Massey et al. 2002). The restrictive immigration policies and repressive border controls of the 1980s and 1990s discouraged migrants from going back home. As a result, seasonal and circular migration decreased as migrants decided to settle permanently in the US (Massey et al. 2002). Those who did return to Mexico intended to eventually return to the US, especially those who were deported (Massey and Pren 2012). However, recent qualitative and quantitative research reveals a shift in decision-making patterns of Mexican returnees. For instance, Mestries' (2015) ethnographic research on return migrants in Veracruz, Mexico reveals a new pattern of "definitive return." Similarly, a report by the Migration Policy Institute indicates that between 2005 and 2015 there was an 80 percent decrease in the number of deportees intending to go back to the US (Schultheis and Soto 2017).

In 2012, Mexico's under-secretary for Population, Migration, and Religious Affairs, Gustavo Molar, recognized that the federal government was not prepared for the rise in return migration following the Great Recession:

> *The return of Mexicans is greater than we had estimated… We didn't expect this to happen or to happen so quickly and in such a large scale. [The question now is,] how do we reintegrate [them]? It's a phenomenon that happens in other countries, but in Mexico we expected Mexicans who left [to the United States] to stay there*

longer (author's translation; Garduño 2017)

The rise in return migration to Mexico and returnees' intentions to stay in the country highlight the pressing need to improve reception and services to support return migrants and their families (CONAPO 2014b; Fernández-Niño et al. 2014; Schultheis and Soto 2017). A great number of studies have explored the educational and employment reintegration of Mexican return migrants and the barriers that they face in these areas upon return (e.g., Albo, Ordaz, and Li Ng 2012; Anguiano-Téllez, Cruz-Piñeiro, and Garbey-Burey 2013; Gandini et al. 2015; Gitter, Gitter, and Southgate 2008). However, more research is still needed in the area of health given that the migration experiences of returnees may have a cumulative toll on their physical and mental health and, consequently, on the Mexican health care system (Zimmerman et al. 2011).

Selective Travelers: Return Migrants Health vs. Non-Migrants Health Prior to Migration

It is important to consider selective out-migration when studying the health trajectories of return migrants to ensure that any differences between returnees and non-migrants can be attributable to the experience of migration, and not to differences in pre-migration health (Nauman et al. 2015; Spallek et al. 2011; Ullmann et al. 2011). There is a general consensus in the literature of the existence of health selection among migrants. The "healthy migrant hypothesis" posits that successful migrants are not randomly drawn from the health distribution of the sending country, but are selected based on certain traits, including better physical and mental health (Akresh and Frank 2008; Jasso et al. 2004; Palloni and Morenoff 2001).

Earlier studies predominantly relied on cross-sectional data and assessed health selection by comparing Mexican immigrants in the US (*after* migration) to other immigrants (e.g., Abraído-Lanza et al. 1999; Akresh and Frank 2008), to the native-born population in the US

(e.g., Hamilton 2015; Palloni and Arias 2004), or to non-migrants in Mexico (e.g., Bostean 2013; Riosmena et al. 2013). However, to adequately study pre-migration selection we ideally need prospective data that measures migrants' health before out-migration and also baseline data on the health of their non-migrant counterparts (Anglewicz et al. 2017; Nauman et al. 2015). A prior study by Rubalcava et al. (2008) notably used longitudinal data from the Mexican Family Life Survey and found significant, albeit weak, evidence of positive health selection among individuals ages 15 to 29.

Given the limited available data on migrants' pre-migration health, some scholars have used measures of early life health to assess health selection. For instance, Ullman et al. (2011) used retrospective data from the Mexican Migration Project and found that having excellent self-rated health (compared to fair/poor health) at age 14 was a significant predictor of US migration among male heads of household. Another often-used proxy measure of pre-migration health is height, which is usually fixed at a young age and is a summary indicator of health and nutritional status in early life (Elo and Preston 1992; Fogel 1994). According to Elo and Preston (1992:205), height is "probably the best single indicator of […] dietary and infectious disease history." Research on height and migration provides evidence of selective out-migration, such that being taller is associated with higher odds of US migration (Breslau et al. 2011; Crimmins et al. 2005; Riosmena et al. 2013; Rubalcava et al. 2008; Ullmann et al. 2011). Specifically, Mexican return migrants are, on average, 3 to 6 centimeters taller than non-migrants (Crimmins et al. 2005; Riosmena et al. 2013; Rubalcava et al. 2008; Ullmann et al. 2011). Taken together, prior findings on Mexican migrants to the US suggest that out-migration is related to early life health and potentially related to initial (pre-migration) adult health.

Returning Travelers: Changes in the Health of Return Migrants

Health Deterioration. There are several reasons to expect returnees to have poorer health when they return to their origin country. First, the act of migration and negative experiences while living in the US may have long-term effects on health, even after return to the origin country (Ginsburg et al. 2016; Montes de Oca et al. 2011). Goldman et al. (2014) studied short-term changes in self-rated health among current US migrants and found that health declines appear quickly after arrival to the United States. This quick health deterioration may be related to negative experiences during the process of migration, such as physical risks and emotional stressors when traveling to and trying to enter the US (Donato, Wagner, and Patterson 2008; McGuire and Georges 2003; Montes de Oca et al. 2011). Health may also be impacted by negative experiences and stressors in the post-migration period, such as inadequate access to health care and health insurance (Carrasquillo, Carrasquillo, and Shea 2000; Ku and Matani 2001), adoption of negative health behaviors (Abraído-Lanza, Chao, and Flórez 2005), discrimination and chronic stress (Finch et al. 2001; Non et al. 2017), cumulative disadvantage (Riosmena et al. 2014), and unhealthy living and working conditions (Castañeda et al. 2015).

Evidence of health deterioration among return migrants could also be related to selective return migration. The "salmon bias hypothesis" suggests that migrants who are unhealthy return to their country of origin to receive care and to eventually die among their friends and family (Abraído-Lanza et al. 1999). This hypothesis has often been used to explain immigrant advantages in health status and mortality (Markides and Eschbach 2005; Palloni and Arias 2004; Turra and Elo 2008), especially among older adults. While health only accounts for a small percentage of return migration motivations (MATT 2013; Montoya-Ortiz and González-Becerril 2015), there is some evidence that Mexican return migrants are indeed less healthy than those

who stay in the US (Arenas et al. 2015; Riosmena et al. 2013). If, as suggested by prior research, living in the US negatively impacts health and/or individuals return to the origin due to health problems, then it follows that return migrants' health will likely be worse than when they left.

In addition, poor living and working conditions upon return to Mexico might also impact returnees' health status. Return migrants encounter difficulties finding stable and good paying jobs in Mexico; about a third of those who do find employment, do so in the informal sector, earning minimum wage, and without social security benefits (Albo et al. 2012; Gitter et al. 2008; Mestries 2015). Working-age, recently returned migrants have lower rates of health insurance than non-migrants (Wassink 2016). In sum, poor self-rated health upon return to Mexico may be "the expression of an accumulation of vulnerabilities" (Fernández-Niño et al. 2014:483).

Health Improvements. Living in the US does not necessarily have to be detrimental to health. It is possible for migrants to experience improvements in their health given that health conditions and access to health care in the destination country are often better than in many countries of origin. For example, Huijts and Kraaykamp (2012) compared the health of immigrants living in 31 European countries and found that their self-rated health was positively related to the general health status of the native population in the destination country. Favorable health conditions in the host country may positively influence migrants' health status, and may have long-term effects once they return to their origin country.

Health improvements are also possible because migrants tend to experience large gains in earnings. Durand (2004) argues that for some migrants the only way to achieve social mobility is to return to the origin, as they will almost always be in the lowest ranks of the social ladder if they stay in the host country. Although the origin country may have the same economic and labor conditions, migrants go back with more capital, thereby achieving upward mobility. Indeed, prior

studies of Mexican return migrants indicate that US migration experience has a consistent and positive effect on accumulated personal wealth at middle and old ages, which could potentially provide new opportunities to invest in health (Jasso et al. 2004; Spallek et al. 2011; Wong and Gonzalez-Gonzalez 2010; Wong, Palloni, and Soldo 2007). For example, a study of older adults in Mexico found that greater wealth was associated with less activity limitations among female return migrants (Wong and Gonzalez-Gonzalez 2010). In addition, living in the US can have a positive effect on immigrants' use of health care services, including preventive care and cancer screening (Lara et al. 2005). These better health care practices may continue once migrants return to Mexico, especially if their socioeconomic standing improved.

Shared Beginnings, Different Paths: Health Trajectories of Return Migrants vs. Non-Migrants

Health trajectories are shaped by the social roles, lifestyles, work histories, and health care practices followed by individuals throughout their life course, with international migration being an intervening event that can further shape health (Elder, Gimbel, and Ivie 1991; Jasso 2003; Montes de Oca et al. 2011). To learn whether US migration experience impacts health trajectories, it is not enough to compare returnees' pre- and post-migration health. In addition, one must assess whether the health of migrants and non-migrants diverges over time as a result of migration. Otherwise, we risk misattributing changes in health to US migration when, in reality, returnees' trajectories could potentially be mirroring the origin population's health patterns (Nauman et al. 2015).

Migration is a social pathway that can lead to exposures and outcomes that differ from those of the origin country. As a result, it may set in motion events that lead to divergence from

the health trajectories of the origin (non-migrant) population. Individuals who migrate from developing to developed countries are usually able to improve their socioeconomic and life circumstances due to educational and employment opportunities that would be unavailable in the origin country (White and Glick 2009). This upward mobility, in turn, may lead to more investments in health upon return to the origin and better overall health than their non-migrant counterparts (Jasso et al. 2004; Spallek et al. 2011). At the same time, return migrants may endure occupational risks, intense physical labor, and stressful lifestyles that include discrimination and marginalization in the destination country; such experiences place additional burdens on their health and lead to poorer health outcomes compared to non-migrants (Castañeda et al. 2015; Gee et al. 2015; Montes de Oca et al. 2011). Furthermore, returning home can also be challenging as returnees tend to face difficulties reintegrating into society (Albo et al. 2012; Gitter et al. 2008; Mestries 2015).

Overall, prior research indicates that return migrants either have worse or similar health than non-migrants. For example, there is some evidence that return migrants have worse outcomes than non-migrants in terms of heart disease, obesity, mental health, disabilities, and risky sexual behaviors (Magis-Rodríguez et al. 2009; Ullmann et al. 2011; Wong and Gonzalez-Gonzalez 2010). Other studies found no significant differences in self-rated health, diabetes, activity limitations, or chronic conditions (Bostean 2013; Ullmann et al. 2011). There is no prior evidence, however, that return migrants have better health than non-migrants.

To my knowledge only one prior study has used longitudinal data to compare changes over time in the health of Mexican return migrants and non-migrants. Using data from the first two waves of the Mexican Family Life Survey, Goldman and colleagues (2014) accounted for baseline differences in health and compared the health of current migrants, return migrants, and

never migrants from Mexico. They found that current migrants were more likely to report changes in self-rated health than return migrants and never migrants, and that there were no differences in changes in health between return migrants and never migrants.

There are several differences between Goldman et al.'s (2014) research and the analyses presented in this chapter. First, the return migrant sample in their study includes individuals with any US migration experience (both long-term and temporary) that occurred at any point in time; in contrast, the return migrant sample in my analyses is restricted to individuals who migrated to the US only between interview waves (2002-2012). The association between migration and health may be shaped by the particular socio-historical moment in which the migratory move occurred. Thus, differences in the social, economic, and political climates in the origin and destination at the time of migration may produce migrant cohorts "with varying levels of human capital and initial health stocks over time" (Hamilton, Palermo, and Green 2015:461). Consequently, models that include several cohorts of migrants could potentially under- or overestimate health selection and the effects of migration on health. Because all individuals in this study migrated within the same time period, I am able to adjust for unmeasured contextual factors that could impact the health of returnees. In addition, my models also account for status changes that occurred during the study period (e.g., changes in marital status, employment status, health insurance coverage) that might impact health trajectories directly or indirectly.

HYPOTHESES

In this study I use longitudinal data from the Mexican Family Life Survey to assess health selection and changes in the health of return US migrants. First, I examine if return migrants and non-migrants differed in early life health and baseline (pre-migration) self-rated

health. Drawing from prior research on health selection in US migration, I expect that:

Hypothesis 1a: Height will be a predictor US migration experience.

Hypothesis 1b: Baseline self-rated health will be a predictor of US migration experience.

Next, I assess whether the health of return migrants improved or deteriorated after migration, and if their health trajectories differed from those who stayed in Mexico. The relative health of return migrants versus non-migrants will depend on how much their health improved or worsened during their time in the US and following their return to Mexico, as well as on any changes in the health of non-migrants during the same period. Given what we know about the stressful and negative experiences Mexican migrants face in the US and the difficulties they encounter upon return to Mexico, I expect that:

Hypothesis 2: The health self-rated health of return migrants will deteriorate after migration and their return to Mexico.

Hypothesis 3: The health trajectories of return migrants and non-migrants will be different, with return migrants having poorer health over time.

DATA AND METHODS

Data Source

This study used publicly available data from the Mexican Family Life Survey (MxFLS). The MxFLS is a nationally representative longitudinal survey of the well-being of individuals and families in Mexico over time (Rubalcava and Teruel 2006a). The survey contains data on a variety of social, economic, and demographic indicators at the individual, household, and community levels at three time points. The MxFLS also includes information on internal and international migration trips done between interviews.

The sample design was a probabilistic, stratified, and multi-staged cluster design. The

survey is representative at the national, regional, and urban-rural regional levels. The baseline survey (MxFLS-1) was conducted in 2002 and sampled over 8,400 households in 150 urban and rural communities throughout Mexico (Rubalcava and Teruel 2006a). Localities were randomly chosen from the regions identified in Mexico's National Development Plan 2000-2006. Households within these localities were sampled randomly. Within sampled households, all members ages 15 and older were included in the adult sample (a household member was defined as anyone who usually lives in the household, regardless of familial or blood relations). Approximately 19,800 adult interviews were conducted in the first wave of data collection. The second (MxFLS-2) and third (MxFLS-3) surveys were fielded during 2005-2006 and 2009-2012 and achieved a 90 and 85 percent re-contact rate at the household level, respectively (Rubalcava and Teruel 2006b, 2013).

For the purpose of this study, I restricted the analyses to individuals age 15-50, as US migration was concentrated within this age range. The analytical sample includes data on 12,537 respondents who were interviewed for the first time in MxFLS-1, had complete migration histories, and complete data in key variables.

Measures

The dependent variable was self-rated health. Respondents were asked: "Currently, could you say that your health is very good, good, regular, bad, or very bad?" Responses were reverse coded such that higher scores indicate better health. Self-reported health has criterion and construct validity, and is a robust indicator of morbidity, subsequent disability, and mortality (Fayers and Sprangers 2002; Idler and Benyamini 1997; Jylhä et al. 1998). This measure has been used in prior studies to assess the health status of Mexicans, including men and women,

those with and without US migration experience, rural vs. urban, and elderly populations (e.g., Bostean 2013; Crimmins et al. 2005; Estudillo Becerra et al. 2005; Gallegos-Carrillo et al. 2006; Goldman et al. 2014; Riosmena, Wong, and Palloni 2013; Ullmann, Goldman, and Massey 2011). Self-rated health can be especially useful when studying populations that do not have widespread access to health care services (Wong, Peláez, and Palloni 2005), as is the case of most rural areas in Mexico. Another advantage is that self-rated health measured over time is able to capture continuous and underlying changes in health that may occur before the emergence of a disease or a functional loss (Shaw and Krause 2002).

Migration status was constructed using migration history data collected at each follow-up interview. Respondents were asked: "Since [year of last interview] have you moved for a year or longer outside of the locality/neighborhood where you used to live?" If they answered "yes", respondents were then asked to list all the places where they lived, both within the country and internationally.[2] Using this information, respondents were coded as 1=return migrants if they migrated to the US between interviews and returned to Mexico; otherwise they were coded as 0=non-migrants if they remained in Mexico at all times during the same timeframe. Respondents who had any prior US experience (that is, who migrated to the US at any time between age 12 and the first interview) were excluded from the analyses (N=135).

Interviewer-measured height captures early life health (Elo and Preston 1992; Fogel 1994) and is measured in centimeters.[3] Because the decision to migrate is not random, I adjusted for a variety of personal, socioeconomic, and health care variables that are related to selective out-migration and that also shape health outcomes. Personal characteristics include gender,

[2] Only 10 survey participants migrated to countries other than the United States. These observations were removed from the analyses.
[3] Twenty-two observations were missing interviewer-measured height. In these cases I used self-reported height. I deleted 578 observations that were missing all height data.

indigenous status, age, marital status, and children in the household. Gender is a dichotomous variable where 1=female and 0=male. Indigenous status is also dichotomous and was coded as 1 if respondents self-identified as members of an indigenous group; otherwise it was coded as 0. Age is measured in years.[4] Marital status is a dichotomous variable where 1=currently married or in a civil union and 0=else. I also include a continuous variable measuring the number of children ages 0-14 living in the household.

Socioeconomic status is an important predictor of both health (Preston and Taubman 1994) and US migration (Donato and León-Pérez 2017). Educational attainment was measured in four categories: elementary school or less (reference), middle school, high school, and college or more. Employment status was coded as 1=employed for pay and 0=else.

Migration capital adjusts for out-migration selectivity and is measured with indicators at the individual and community levels. At the individual level, migrant relatives was coded as 1 if any of their family members were living in the US, otherwise it was coded as 0. Having relatives in the US not only has implications for the likelihood of out-migration, but also impacts the health status of non-migrants (Creighton et al. 2011; Hildebrandt and McKenzie 2005; Kanaiaupuni and Donato 1999). In addition, because migration decisions are influenced by the place of origin (Durand and Massey 2003; Riosmena and Massey 2012; Rubalcava et al. 2008), I include variables for rural/urban origin community and region of origin. Following the definition used by the Mexican National Institute of Statistics and Geography (INEGI), rural origin was coded as 1 if the community of origin had a population of less than 2,500; otherwise it was coded as 0. Region of origin was coded in four categories based on the migrant sending regions identified by Durand and Massey (2003): historical (reference), border, central, and southeast.

[4] Although a quadratic term for age was statistically significant, the effect size was very small and did not improve the model fit. Thus, I opted for a simpler and more parsimonious model.

Given that changes in health can be influenced by access to health care, I also included controls for health insurance coverage and health care utilization. Health insurance was coded as 1 if respondents indicated having public or private health insurance; otherwise they were coded as 0. Health care utilization was coded as 1 if they reported having visited a doctor, health care professional, hospital, or clinic in the last four weeks; otherwise they were coded as 0.

Analytic Strategy

First, I estimated baseline descriptive statistics for the complete sample and for return migrants and non-migrants, and computed two-tailed t-tests and chi-square tests to assess significant differences in the means and proportions for return migrants and non-migrants. Next, I estimated a series of logistic regression models to assess if return migrants were positively selected on health. I computed models where the likelihood of having US migration experience by the time of the last interview was a function of early life health (measured by height) and adult health (measured by baseline self-rated health.) Following Crimmins et al. (2005), Rubalcava et al. (2008), and Ullman et al. (2011), models controlled for gender, age, education, and rural origin.

Next, I estimated a series of individual growth curves within a linear mixed model (i.e., multilevel) framework. The goal was to assess if changes in self-rated health over time (from the first to the last interview) were related to changes in US migration experience. Repeated measures can be considered as having a hierarchical structure in which observations are nested within individuals. Growth curves allow the modeling of within-person change and between-person differences in outcomes across various measurement waves (Shek and Ma 2011). Models allow both the intercept and time trend to vary for individuals, which means that subjects are

allowed to have starting points and rates of change over time that are different from the group (Hedeker and Gibbons 2006; Singer and Willet 2003). The ability to include time-varying predictors allows each subject to be his or her own control.

Data were reorganized into a long form in order to have one observation per measurement occasion for each subject. The outcome captured changes in self-rated health over time. The key independent variable was US migration experience, which was time-variant. At Time 1 (baseline measure), all subjects were coded "0". At Time 2, subjects who migrated to the US and returned to Mexico between the first and second interviews were coded "1", otherwise they were coded "0". A similar strategy was used to code Time 3. Because I was interested in studying changes that occurred between interviews, I used interview wave as the variable that reflects the passage of time, with values of "0" for the first interview, "1" for the second interview, and "2" for the third interview. Therefore, the intercept represents the value of self-rated health at occasion 0 (baseline) and the slope captures changes in self-rated health across measurement occasions (Singer and Willet 2003).

Following Singer and Willet's (2003) model-building strategy, I first conducted preliminary analyses (not shown) to determine if there was systematic variation in the outcome and where the variation existed. An unconditional means model (empty model with only a random intercept) revealed an intraclass correlation of 0.35, indicating that 35 percent of the variation in self-rated health was due to differences between persons; the rest of the variation occurred within persons. I then added parameters to this unconditional model and used it as a baseline to compare fit between models of increasing complexity. Linear growth curve models with random intercepts and random linear slopes provided the best fit. Below I describe the hierarchical models with the key independent variables.

The level-1 is organized around the observation. It captures intra-individual patterns of change in self-rated health associated with US migration experience (Singer and Willet 2003). The level-1 equation for individual *i* at occasion *j* is the following:

$$Y_{ij} = \pi_{0i} + \pi_{1i}TIME_{ij} + \pi_{2i}Migration_{ij} + \varepsilon_{ij}$$

Where π_{0i} represents the initial self-rated health for individual *i* at occasion *j,* π_{1i} represents the mean linear rate of change for individual *i* at occasion *j*, π_{2i} represents change in migration status for individual *i* at occasion *j*, and ε_{ij} is an error term representing the deviation of individual *i* from the average level of self-rated health at occasion *j.*

The level-2 is organized around the individual. It captures between-person differences in initial status and growth rate by adding random effects to the level-1 parameters for the intercept and the slope (Hedeker and Gibbons 2006). To assess whether the rate of change varies across individuals based on US migration experience, I included an interaction between the slope and migration experience (captured in the level-2 equation by adding migration status as a predictor of the slope parameter). The level-2 equations are the following:

$$\pi_{0i} = \gamma_{00} + \varsigma_{0i}$$

$$\pi_{1i} = \gamma_{10} + \gamma_{11}Migration_{ij} + \varsigma_{1i}$$

$$\pi_{2i} = \gamma_{20}$$

where the initial level of self-rated health for individual *i* (π_{0i}) is the product of an intercept γ_{00} representing the population-level average of self-rated health and a random error term for the deviation of individual *i* from the average level of self-rated health (ς_{0i}); the linear rate of change in self-rated health for individual *i* (π_{1i}) is the product of an intercept corresponding to the

average rate of change (γ_{10}), a parameter representing the migration status of individual *i* at occasion *j* (γ_{11}), and a random error term for the deviation of individual *i* from the average rates of linear change (ς_{1i}); finally, change in migration status is the product of an intercept corresponding to the average change (γ_{20}).

A more parsimonious representation of this model, and one that corresponds to the presentation of results in Table 4, is the following combined level-1 and level-2 equation:

$$Y_{ij} = \left[\gamma_{00} + \gamma_{10}TIME_{ij} + \gamma_{20}Migration_{ij} + \gamma_{11}TIME_{ij} \times Migration_{ij}\right] + [\varsigma_{0i} + \varsigma_{1i}TIME_{ij} + \varepsilon_{ij}]$$

To test if personal characteristics, socioeconomic status, migration capital, and health care variables were related to the initial status and to the rate of change in self-rated health, subsequent models introduced covariates to each parameter (i.e., to the intercept and the slope). Time-variant control variables include marital status, children living in the household, employment status, and health care access. Remaining variables are time-invariant and reflect the status characteristics of respondents at the baseline interview. Table 2.1 provides a summary of the coding of all variables used in the analyses. All analyses were weighted using MxFLS longitudinal weights that expand the sample to the Mexican population in 2002 (year of the first interview) and take into account unequal probabilities of selection and household non-response.

An advantage of multilevel models is their robustness to missing or incomplete data across time (because of attrition or missing data only in some data points) as the models are computed using all the information available for each subject (Hedeker and Gibbons 2006). Nevertheless, panel attrition is of concern as it may be related to observed disparities in health (Kim and Miech 2009; Liang et al. 2008). Therefore, following prior longitudinal studies on racial/ethnic and health disparities (e.g., Brown, O'Rand, and Adkins 2012; Gubernskaya 2015;

Warner and Brown 2011), growth curve models adjust for biases related to attrition and mortality by controlling for the number of waves a respondent completed and whether the respondent died during the period of observation.

Table 2.1 Coding of Variables Used in the Analyses of Return Migration and Health

Variable	Type	Coding	Time-Variant*
Self-rated health	Continuous	Ranges from 1=very bad to 5=very good	Yes
Migration status	Dichotomous	1=return migrant; 0=non-migrant	Yes
Early life health			
Height	Continuous	Centimeters	---
Personal characteristics			
Female	Dichotomous	1=female; 0=male	No
Indigenous	Dichotomous	1=self-identified as member of an indigenous group, 0=otherwise	No
Age	Continuous	Years	Yes
Married	Dichotomous	1=married or in a civil union; 0=otherwise	Yes
Children in household	Continuous	Number of children ages 0-14 living in the household	Yes
Socioeconomic status			
Education	Categorical	Elementary school or less (reference); middle school; high school; college or more	No
Employed	Dichotomous	1=employed for pay; 0=otherwise	Yes
Migration capital			
Migrant relatives	Dichotomous	1= has relatives living in the United States; 0=otherwise	No
Rural origin	Dichotomous	1=origin community with 2,500 inhabitants or less; 0=otherwise	No
Region of origin	Categorical	Historical region (reference); border region; central region; southeast region	No
Health care access and utilization			
Health insurance	Dichotomous	1=had public or private health insurance; 0=uninsured	Yes
Doctor visit	Dichotomous	0=otherwise	Yes

* Yes= Time-variant variable in growth curve models; No= Time-invariant variable in growth curve models (measured at the first interview)

RESULTS

Characteristics of the Sample

Table 2.2 presents weighted means and proportions of the baseline variables for the complete sample and by migration status, including significant differences computed by two-tailed t-tests and chi-square tests. By the last interview, two percent of respondents were return migrants—that is, they migrated to the US between interviews, lived there for a year or more, and returned to Mexico. This is in line with recent national estimations of Mexican return migration (Gandini et al. 2015; Parrado and Gutierrez 2016). Mean values for the health variables provide initial support for Hypotheses 1a and 1b: return migrants reported significantly better baseline health and were significantly taller than non-migrants.

Sixty percent of the complete sample was female and 12 percent was indigenous. At the first interview, respondents were approximately 32 years old, most were married, and had an average of 1 to 2 children living in the household. Respondents had, on average, low educational attainment, with over two-thirds reporting middle school education or less. In terms of employment, sixty percent of the sample reported working for pay. With regard to migration capital, a third of all respondents indicated having relatives in the US. Almost a third were from rural communities, and the majority came from the central region of Mexico. Finally, forty-three percent of the sample had health insurance and sixteen percent indicated having utilized health care services within the last four weeks.

Return migrants and non-migrants differed significantly in most variables except indigenous status and some education and region of origin categories. Compared to non-migrants, return migrants were predominantly male, younger, married, and had more children living in the household. Returnees also had higher levels of education and had a higher rate of

employment at the time of the first interview. Returnees were also predominantly from rural communities and from the historical migrant-sending region. These descriptive findings are consistent with prior findings on the demographic, socioeconomic, and social characteristics of Mexican migration to the US (Massey et al. 2002). Finally, return migrants had substantially lower rates of health insurance and health care utilization than non-migrants.

Table 2.2 Weighted Means and Proportions for Baseline Study Variables for Complete Sample, Return Migrants, and Non-Migrants

	Complete Sample	Return Migrants	Non-Migrants	Sig.
Migrated to US between interviews	0.02	---	---	
Self-rated health	3.55	3.66	3.54	**
Early life health				
Height (cm)	158.17	163.24	158.04	***
Personal characteristics				
Female (ref=male)	0.61	0.32	0.61	***
Indigenous (ref=non-indigenous)	0.12	0.10	0.12	
Age (years)	31.75	25.33	31.92	***
Married (ref=not married)	0.64	0.39	0.65	***
Children in household (count)	1.72	2.06	1.71	***
Socioeconomic status				
Education				
Elementary school or less	0.40	0.34	0.40	
Middle school	0.32	0.41	0.32	**
High school	0.17	0.16	0.17	
College	0.11	0.08	0.11	**
Employed (ref=unemployed)	0.60	0.71	0.60	***
Migration capital				
Migrant relatives (ref=none)	0.33	0.53	0.33	***
Rural origin (ref=urban)	0.26	0.31	0.25	***
Region of origin				
Historical	0.25	0.46	0.24	***
Border	0.19	0.08	0.19	***
Central	0.41	0.38	0.41	
Southeast	0.16	0.08	0.16	***
Health care access and utilization				
Health insurance (ref=uninsured)	0.43	0.22	0.44	***
Doctor visit (ref=no)	0.16	0.04	0.16	***
Unweighted N	12,537	252	12,285	

Note: Asterisks indicate significant differences between return migrants and non-migrants, where * p<.05, ** p<.01, and *** p<.001.

Assessing Positive Health Selection

Table 2.3 presents odds ratios from logistic regression models predicting US migration experience. The outcome captures whether respondents migrated to the US between interviews. Model 1 includes baseline self-rated health, which captures adult pre-migration health, and all control variables. As expected, the odds ratio for self-rated health is positive and significant, indicating that the likelihood of US migration increases as self-rated health increases. Women are less likely than men to emigrate to the US, and the probability of migration decreases as people age. Those that have middle school education or higher are less likely to migrate than their counterparts with elementary school education or less. Finally, US migration is more likely from rural areas than urban areas. The effects of the covariates are in line with findings in prior studies of Mexican migration to the US (e.g., Donato 2010; Donato and León-Pérez 2017; Durand and Massey 2003; Massey, Durand, and Malone 2002).

Table 2.3 Odds Ratios Predicting US Migration Experience

	Model 1	Model 2	Model 3
Self-rated health T1	1.13***	---	1.09***
Height (cm)	---	1.03***	1.03***
Age T1 (years)	0.93***	0.93***	0.93***
Female (ref=male)	0.30***	0.43***	0.43***
Education (ref=elementary)			
Middle school	0.82***	0.78***	0.77***
High school	0.52***	0.47***	0.46***
College or more	0.58***	0.52***	0.51***
Rural origin (ref=urban)	1.19***	1.20***	1.21***

Notes: Unweighted N= 12,537; ***p < 0.001

Model 2 includes height, which captures early life health. As hypothesized, height is also a significant predictor, such that the likelihood of having US migration experience increases by 3 percent with every additional centimeter of height. These results are similar to those found in

previous studies of height and Mexico-US migration (Breslau et al. 2011; Crimmins et al. 2005; Riosmena et al. 2013; Rubalcava et al. 2008; Ullmann et al. 2011). The effects of the covariates remained significant as in the previous model.

Model 3 includes baseline self-rated health and height, as well as all covariates. Both health variables are significant, indicating that early life health and adult health have positive and independent effects on the probability of US migration. In sum, bivariate and multivariate results provide support for hypotheses 1a and 1b, indicating the existence of positive selection among Mexicans with US migration experience in terms of height and pre-migration self-rated health.

Changes in Self-Rated Health After Migration

Table 2.4 presents results from linear growth curves modeling changes in self-rated health from the first to the last interview (from 2002 to 2012). Coefficients under the intercept (Panel A) represent the effects of the variables on initial self-rated health (measured at the first interview). Coefficients under the linear slope (Panel B) represent effects on the rate of change as measured at each subsequent interview.

Model 1 contains estimates for the effect of migration status on the initial level and rate of change in self-rated health, while adjusting for panel attrition covariates. This is the baseline model presented in the equations described above. These results provide initial evidence of differences by migration status in the intercept and the rate of change. Models 2 to 5 of Table 2.4 add personal characteristics, socioeconomic status, migration capital, and health care variables in a stepwise fashion to the baseline equation. Significance tests (not shown) indicate that the model fit is significantly improved across models compared to the baseline model. Given that the estimates are largely similar across models, I focus on the results from the full model (Model 5).

Table 2.4. Linear Growth Curves Modeling Association between Return Migration and Self-Rated Health, 2002-2012

	Model 1		Model 2		Model 3		Model 4		Model 5	
	B	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*
Fixed Effects										
A. Intercept	3.825***	0.036	4.000***	0.036	3.714***	0.039	3.702***	0.040	3.675***	0.027
Return migrant	0.568**	0.185	0.596***	0.182	0.553**	0.182	0.533**	0.181	0.628**	0.174
Female			-0.125***	0.012	-0.094***	0.012	-0.097***	0.012	-0.079***	0.012
Indigenous			-0.073***	0.017	-0.046**	0.017	0.004	0.017	0.006	0.017
Age			-0.011***	0.000	-0.008***	0.000	-0.008***	0.000	-0.008***	0.000
Married			-0.010	0.012	0.006	0.012	-0.001	0.012	0.005	0.012
Children in household			-0.024***	0.004	-0.013***	0.004	-0.009**	0.004	-0.011***	0.003
Middle school					0.142***	0.015	0.117***	0.015	0.114***	0.015
High school					0.287***	0.019	0.254***	0.020	0.252***	0.020
College					0.362***	0.021	0.335***	0.021	0.325***	0.021
Employed					0.017	0.011	0.018	0.011	0.018	0.011
Migrant relatives							-0.037**	0.012	-0.031*	0.012
Rural origin							-0.079***	0.012	-0.071***	0.012
Border region							0.164***	0.016	0.159***	0.016
Central region							-0.049**	0.015	-0.037*	0.015
Southeast region							-0.002	0.018	0.002	0.018
Health insurance									0.045***	0.011
Doctor visit									-0.210***	0.013
B. Linear slope	-0.002	0.004	0.085***	0.012	0.099***	0.017	0.082***	0.019	0.125***	0.034
Return migrant	-0.224*	0.102	-0.302***	0.100	-0.266**	0.100	-0.240*	0.099	-0.303**	0.092
Female			-0.007	0.008	-0.012	0.009	-0.011	0.009	-0.012	0.009
Indigenous			0.038**	0.012	0.038***	0.012	0.040**	0.013	0.033**	0.012
Age			-0.001***	0.000	-0.002***	0.000	-0.002***	0.000	-0.001***	0.000
Married			-0.028**	0.009	-0.032***	0.009	-0.030**	0.009	-0.029***	0.009
Children in household			0.006*	0.003	0.006*	0.003	0.005*	0.003	0.005*	0.003

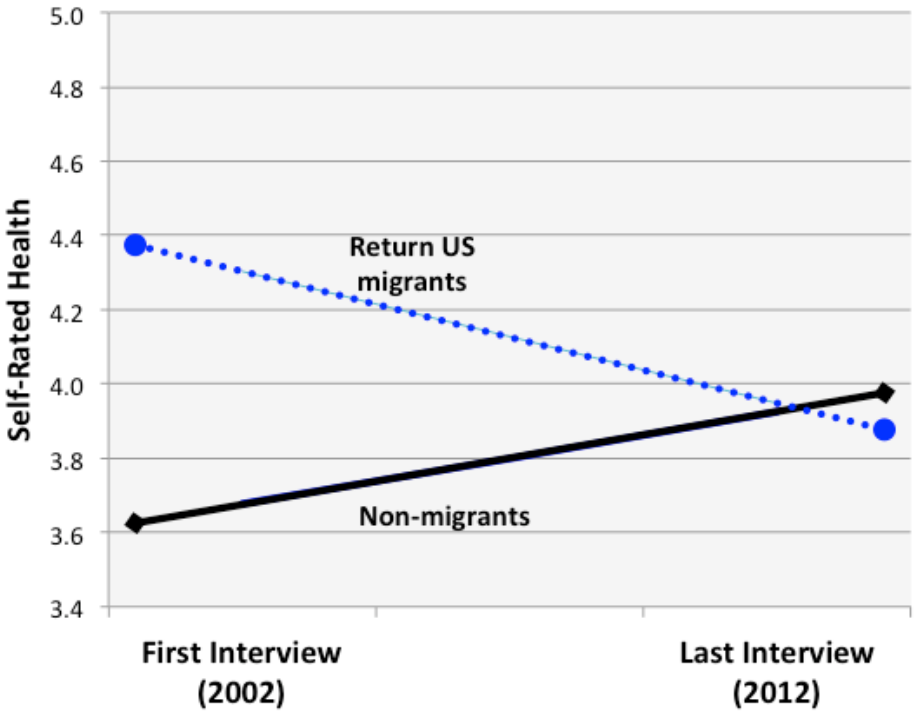
Table 2.4. (continued)

	Model 1		Model 2		Model 3		Model 4		Model 5	
	B	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*
Middle school					-0.011	0.011	-0.012	0.011	-0.007	0.011
High school					-0.025	0.014	-0.024	0.014	-0.017	0.014
College					0.002	0.015	0.003	0.015	0.016	0.016
Employed					-0.010	0.009	-0.009	0.009	-0.008	0.009
Migrant relatives							0.017*	0.009	0.016	0.009
Rural origin							0.013	0.009	0.007	0.009
Border							0.019	0.011	0.021	0.011
Central							0.007	0.011	0.001	0.011
Southeast							-0.006	0.013	- 0.007	0.013
Health insurance									-0.042***	0.008
Doctor visit									-0.008	0.011
Panel Attrition Controls										
Measurement occasions	-0.115***	0.013	-0.040*	0.012	-0.025*	0.012	-0.014	0.012	-0.015	0.011
Died	-0.392***	0.047	-0.108*	0.045	-0.080	0.044	-0.061	0.044	-0.055	0.043
Random Effects										
Level 1 residual	0.212***	0.002	0.210***	0.002	0.209***	0.002	0.208***	0.002	0.206***	0.002
Level 2 intercept	0.232***	0.005	0.199***	0.004	0.190***	0.004	0.183***	0.004	0.178***	0.004
Level 2 slope	0.080***	0.002	0.080***	0.002	0.080***	0.002	0.080***	0.002	0.080***	0.002
-2 log likelihood	103,969.8		102,664.1		102,030.8		101,605.8		100,724.7	

Notes: *N*= 12,537 individuals and 33,290 observations. *p < 0.05; **p < 0.01; ***p < 0.001

Rather than narrowing the gap between return migrants and non-migrants, adding all covariates to the Model 5 (Table 2.4) equation actually widens the differences between the groups in both initial health and the rate of change. This indicates that migration status has an independent effect on self-rated health trajectories. For ease of interpretation, Figure 2.1 graphically represents the predicted self-rated health trajectories of return migrants and non-migrants after adjusting for all covariates (based on estimates from Model 5 of Table 2.4).

Figure 2.1 Self-Rated Health Trajectories for Return Migrants and Non-Migrants: Growth Curve Estimates



As illustrated in Figure 2.1, at the time of the first interview (before migration), return migrants reported better self-rated health than those who stayed in Mexico. This provides additional evidence supporting Hypothesis 1b, which expected better initial self-rated health among return migrants. However, as shown by the negative slope for return migrants and

consistent with Hypothesis 2, returnees experienced an accelerated negative change in health over time relative to non-migrants. By the time of the last interview (after migration), return migrants reported worse health than their non-migrating counterparts. Non-migrants, on the other hand, experienced positive changes in self-rated health during the same period of time. This finding provides support for Hypothesis 3, which expected the health trajectories of return migrants and non-migrants to be different, with return migrants having poorer health over time.

Findings on the association of self-rated health with the control variables in Model 5 of Table 2.4 are in line with prior research. With regard to personal characteristics, women reported worse health than men at the first interview, but they did not differ in their rate of change. There were no initial differences in self-rated health by indigenous status, but over time indigenous respondents experienced a positive change relative to their non-indigenous counterparts. As would be expected, initial health and rate of change in self-rated health was negatively related to age, such that older respondents started off with worse health and experienced a faster decline in health than younger respondents. While initial health did not differ by marital status, being married was related to health deterioration over time. On the other hand, having more children in the household is related to worse initial health, but each additional child had a positive effect on change in health over time. In terms of socioeconomic status, having a higher educational attainment was related to better initial health but education was not related to the rate of change. Employment status was not related to the intercept or the slope.

The control variables measuring migration capital were significant predictors of initial health, but were not related to the rate of change. Respondents who had relatives living in the US reported worse health at the first interview than those who did not have migrant relatives. This is consistent with Kanaiaupuni and Donato (1999) who found that US migration has disruptive

effects on the health of the people who stay behind. Rural residents had worse initial health than their urban counterparts, as would be expected given the large rural-urban disparities in Mexico (Secretaría de Salud 2007). There were also differences in initial health by region of origin: compared to respondents from the historical migration region, those from the border region reported better initial health whereas those from the central region reported worse initial health. There were no significant differences in initial health between the historical and southeast regions. Those with health insurance had better initial health than the uninsured, but their health worsened significantly over time. Lastly, having utilized health care services in the four weeks before the first interview was negatively related to initial health, but health care utilization did not impact changes in health over time.

Comparing the random effect parameters between Models 1 and 5 shows that accounting for personal characteristics, socioeconomic status, migration capital, and health care variables reduced the within-person variance (level-1 residual) and the between-person variance in the initial status (level-2 intercept). However, they did not impact the between-person variance in the rate of change (level-2 slope).

DISCUSSION

Using longitudinal data from the Mexican Family Life Survey, the overall purpose of this chapter was to compare the health trajectories of Mexican return migrants and non-migrants in order to establish whether US migration experiences impacts health over time. I approached this issue by investigating two distinct mechanisms present in the migration-health relationship: health selection and the migration effect on health (Jasso 2013; Lu and Zhang 2015).

I first estimated logistic regression models to test for positive health selection. My aim

was to assess whether return migrants and non-migrants differed in early life health and pre-migration adult health. With a few exceptions (e.g., Rubalcava et al. 2008), earlier studies have mostly relied on cross-sectional data and have assessed health selection by assessing the health of Mexican immigrants in the US *after* migration and comparing it to other US immigrants (e.g., Akresh and Frank 2008), to the native-born population in the US (e.g., Hamilton 2015; Palloni and Arias 2004), or to non-migrants in Mexico (e.g., Bostean 2013; Riosmena et al. 2013). Using prospective data, I found that both early life health and adult pre-migration self-rated health are independently and positively related to US migration. Specifically, being taller and reporting better initial self-rated health were significant predictors of having US migration experience. These results hold even after adjusting for age, gender, education, and rural origin. Findings provide support for the healthy migrant hypothesis and contribute to the growing scholarship on the Hispanic health paradox which examines the "better-than-expected" health of Hispanic immigrants, particularly Mexicans (Markides and Coreil 1986).

Next, I estimated linear growth curve models to assess if and how the health of return migrants changed over time and whether their trajectories differed from those of non-migrants. Results indicate that the self-rated health of return migrants worsens after migration. Non-migrants, on the other hand, experienced health improvements during the same period. While returnees reported substantially better pre-migration health than non-migrants, the return migrant/non-migrant disparity disappeared after migrants' return. It is important to note that the return migrants in my sample had relatively short US trips.[5] Prior studies have suggested that health deteriorates as a consequence of negative acculturation (Antecol and Bedard 2006; Kimbro, Gorman, and Schachter 2014; Lara et al. 2005); however, the process of acculturation

[5] I only had information about the trip duration for approximately 60 percent of return migrants. These individuals stayed in the United States an average of 3 years.

unfolds over many years. Similar to Goldman et al.'s (2014) results, my findings demonstrate that self-rated health deteriorates quickly after US migration and return. This suggests that the experiences during the migration process, in the immediate post-migration stage, and as migrants try to reincorporate to Mexican society upon return have a rapid and negative toll on health (Goldman et al. 2014).

Several limitations need to be acknowledged. First, we do not know why migrants returned to Mexico. The health of return migrants likely varies depending on their experiences in the destination country and their reason for return (Davies et al. 2011). Some may go back to Mexico in good health, as in the case of migrants who had good jobs and access to health and social services in the US. However, health may have been impacted negatively if they acquired unhealthy lifestyles, received low wages, lived in poor housing, and/or had difficulty accessing health services. In this case, migrants may return less healthy than when they left. While some scholars have argued that migrants return to their origin countries due to poor health (i.e., "the salmon bias" hypothesis), recent evidence from the US suggests that health is mostly a motivation or predictor of the return of elderly migrants, not of return migrants as a whole (Van Hook and Zhang 2011). Rather, return migration tends to be more related to economic integration and social capital than to health and aging (Van Hook and Zhang 2011). Similar results have been found in studies of return migrants conducted in Mexico (INEGI 2015; MATT 2013; Mestries 2015), Macedonia (Petreski 2016), and Germany (Sander 2007).

Health upon return may also be related to whether it was a voluntary or forced return. Deportees are usually more disadvantaged than voluntary returnees in terms of health status and health care access. As Fernández-Niño et al.'s (2014) research shows, deportation inflicts a serious disruption in the lives of migrants, especially those who had a long residence and an

established a life in the US. Migrants who are deported after having just crossed the border may still be experiencing the health consequences of a long and dangerous trip. Future studies should compare the health trajectories of voluntary and deported return migrants.

Another limitation is that the sample size of return migrants is not sufficiently large enough to consider differences by gender or other social attributes. Prior research indicates that migrant women are less healthy at arrival to the destination than men, that risk profiles and health behaviors vary by gender, and that women lose their immigrant health advantage at a faster rate than men (Abraído-Lanza et al. 2005; Lopez-Gonzalez, Aravena, and Hummer 2005; Read and Reynolds 2012). However, we know little about gender differences in health upon return to the origin. This is an empirical question that should be addressed by future studies.

Despite these limitations, this research convincingly provides support for the long-standing presumptions regarding the healthy migrant effect and the deteriorating effects of migration. The findings have important implications for the Mexican health care system. As the results show, migrants tend to be selected from the healthier population, but by the time they return to Mexico their poorer health reflects the cumulative toll of migration. While their health upon return is similar to that of the non-migrant population, there is evidence that returnees tend to live in precarious conditions in Mexico, have high rates of underemployment and unemployment, and low rates of health insurance (Albo et al. 2012; Mestries 2015; Parrado and Gutierrez 2016; Wassink 2016). All of this could further deteriorate their health and increase their risk of long-term morbidity or mortality.

In light of the current anti-immigrant climate and policies fostered by the Trump administration, it is likely that the number of migrants returning to Mexico and staying there permanently will increase substantially in the coming years. Having public health interventions

in place to address the health needs of migrants upon return is important for the returnees' and for general population's sake. Negative behaviors and health conditions acquired at the destination can be spread to the origin areas through return migration, a mechanism Ginsburg and colleagues (2016) call the "propagation effect." While some steps have been taken to increase health care access for Mexican migrants (CONAPO 2014b; The World Bank 2015), there is a need to improve access to health and social services for migrants at all phases of the migration process, including the return phase (Davies et al. 2011; Zimmerman et al. 2011). In addition, returnees should be included in future plans to provide universal health care coverage in Mexico (Fernández-Niño et al. 2014). The Mexican health care system must be prepared to facilitate access to health care upon return, including having a system in place for returnees to access services, obtain health assessments and preventive care, identify health problems, and facilitate referral (Davies et al. 2011).

CHAPTER 3

HEALTH BEFORE AND AFTER INTERNAL MIGRATION: THE CASE OF MEXICAN MEN AND WOMEN

The majority of migration streams worldwide occur within national boundaries (International Organization for Migration 2015). These domestic movements are largely responsible for the redistribution of a country's population (Bell and Muhidin 2009; White and Lindstrom 2005). Research on internal migration is predominantly concerned with studying who moves (e.g., Todaro 1980), where they move to (e.g., Liang and White 1996), its impact on development (e.g., Bell et al. 2015; Lindstrom and Lauster 2001), fertility patterns (e.g., Kulu 2005; Lee and Pol 1993), and, more recently, migrant health. Due to data limitations, most prior studies on the health of internal migrants have used cross-sectional data, relying mostly on observed post-migration health status and, in some cases, on retrospective data (Anglewicz et al. 2017). More recently, however, prospective studies of internal migrants in Indonesia (Lu 2008, 2010b), Malawi (Ginsburg et al. 2016), Sub-Saharan Africa (Anglewicz et al. 2017), Tanzania (Unwin et al. 2010), and Thailand (Nauman et al. 2015) have provided important insight into mechanisms of selection and changes in health following internal migration.

The current study contributes to this growing literature by using longitudinal data to study the health trajectories of Mexican internal migrants. Internal migration in Mexico is six times larger than international migration (Romo Viramontes, Téllez Vázquez, and Ramírez López 2013), yet it is underrepresented in the academic literature (Canales and Montiel 2007). Sobrino's (2014) review of the Mexican internal migration scholarship reveals that most research

has focused on four broad areas: estimating the volume of migration, examining migration flows based on origin and destination, the socio-demographic characteristics of internal migrants, and employment and earnings outcomes. Comparatively less attention has been given to the health of Mexican internal migrants.

The aim of this chapter is to investigate two processes involved in the relationship between internal migration and health: health selection effects (that is, differences in health between migrants and non-migrants before migration) and migration effects (that is, differences in pre- and post-migration health). In addition, I assess whether the changes in health experienced by migrants are different from those experienced by non-migrants during the same period (i.e., between-group differences) and whether changes observed among migrants differ based on distinct migratory conditions (i.e., within-group differences). These kinds of comparisons require longitudinal data that measure the pre- and post-migration health of migrants, as well as baseline and follow-up data for non-migrants (Anglewicz et al. 2017; Ginsburg et al. 2016; Spallek et al. 2011).

I use three waves of data from the Mexican Family Life Survey to answer four research questions about the health of Mexican internal migrants: Are migrants healthier than non-migrants before migration? Does internal migration impact health trajectories? Do the health trajectories of migrants differ from those of non-migrants? Are the characteristics of the migration trip related to post-migration health? I examine the health of men and women separately because the nature and patterns of Mexican internal migration, and migration in general, vary substantially across gender (Curran and Rivero-Fuentes 2003; Donato and Gabaccia 2015; INEGI 2015; Sobrino 2010). Consequently, there is evidence that the effects of internal migration on health vary across gender as well (e.g., Malmusi, Borrell, and Benach

2010; Wheaton and Crimmins 2013; Wong and Gonzalez-Gonzalez 2010; Wong, Palloni, and Soldo 2007; Zhang et al. 2015).

The chapter is organized as follows. First, I provide an overview of Mexican internal migration, including historical patterns and the characteristics of internal migrants. Then, I review the literature on internal migration and health, including prior findings on selection processes and changes in health over time. I also describe what we know about post-migration health differences between internal migrants and non-migrants, as well as post-migration health differences among migrants based on age at migration, motivations, and destination. I then describe the data and methods, and compare the baseline characteristics of male and female study participants. Next, I discuss the results from linear growth curves examining changes in pre- and post-migration health and results from lagged dependent variable regressions assessing the association between post-migration health and the characteristics of the migration trip. I conclude with a summary and implications of the findings.

BACKGROUND

Characteristics of Mexican Internal Migration

Early internal migration in Mexico was facilitated by the construction of more than 12,000 miles of railways during the period of the Porfiriato (1876-1911) (Andalón et al. 2013). The construction of the railroad boosted the domestic economy, created many jobs, and enabled internal mobility. Rural-urban moves dominated Mexican internal migration flows during the first half of the 20th century as a result of the deterioration of economic and social conditions in rural areas and the fast urbanization and industrialization of the country (Sobrino 2010). During this time, migrants moved from less developed to more developed areas—mostly from “el

campo" (the fields) to the three largest metropolitan areas in Mexico— at a record rate as the manufacturing, construction, and service sectors grew and the demand for labor increased (Canales and Montiel 2007; Chávez Galindo 2001; Sobrino 2014). Over the decades, the rapid urbanization of the country and Mexico's growing role in the global economy led to the diversification of internal migration flows. In 2015, urban-urban moves constituted 67 percent of migration flows and rural-urban moves, 16 percent (Sobrino 2016). Although rural-urban migration has steadily dropped since the last decades of the 20th century, internal mobility is still prevalent among rural communities who increasingly see labor migration as a necessity rather than an option (del Rey Poveda 2007).

Approximately half a million Mexicans migrate internally every year (Sobrino 2010). Internal migrants are selected on gender, age, and education. While men have historically dominated migration from Mexico to the US (Durand and Massey 2003), women have had a long-standing presence in migration flows within Mexico (Sobrino 2014). Female participation in internal migration spiked in the 1940s and women have dominated domestic migration flows since the 1980s (Curran and Rivero-Fuentes 2003). Today, both rural-urban and urban-urban migration streams are predominantly female (Sobrino 2016). Women's internal migration tends to be characterized by long duration moves and steady employment (Curran and Rivero-Fuentes 2003). Male internal migrants, on the other hand, tend to move to destinations closer to and smaller than their places of origin, mostly seeking seasonal and more flexible employment such as construction work, daily wage laborers, and street vendors (Curran and Rivero-Fuentes 2003; Sobrino 2014). These gender differences in migration experiences result in different networks and resources for prospective migrants (Curran and Rivero-Fuentes 2003), and may similarly result in different health trajectories.

While internal migration flows in other countries are usually dominated by young migrants, migration age profiles in Mexico tend to be dispersed across the age spectrum (Bernard, Bell, and Charles-Edwards 2014). In fact, Bernard et al.'s (2014) cross-national research revealed that the age at which migration peaks in Mexico is one of the oldest. Still, internal migration tends to happen relatively early in an individuals' work trajectory given that the search for better job opportunities is one of the main drivers of domestic relocations in Mexico (Sobrino 2014, 2016).

In terms of education, Mexican internal migrants tend to have higher levels of educational attainment than migrants to the US (Quinn and Rubb 2005; Villarreal 2016). Mexicans with higher levels of education tend to favor internal migration over international migration because their credentials and qualifications may not be adequately rewarded by the jobs available to them in the US (Quinn and Rubb 2005). Men and women with college education are the most likely to relocate domestically (Romo Viramontes et al. 2013), but there is also an important presence of low-skilled migration (Pérez-Campuzano and Santos-Cerquera 2013). There is a regional educational selectivity whereby individuals with college degrees or more dominate urban-urban migration streams and those with low educational attainment dominate rural-urban streams (Pérez-Campuzano and Santos-Cerquera 2013; Sobrino 2014), a pattern that Sobrino (2016:63) calls the "territorial redistribution of human capital". The educational level of migrants maps on to the types of jobs they perform. Almost 50 percent of internal migrants are employed in the service sector (which includes transportation, communication, professional, financial, and government jobs); the rest work in the trade (21%), manufacturing (17%), construction (8%), and agricultural (5%) sectors (Téllez Velázquez, López Ramírez, and Romo Viramontes 2014).

Pre-Migration Health: Evidence of Health Selection?

The scholarship on migrant health suggests that successful migrants are not randomly drawn from the health distribution of the sending community, but are selected based on certain traits, including better physical and mental health (Ginsburg et al. 2016; Jasso et al. 2004; Lu and Zhang 2015; Palloni and Morenoff 2001). This positive selection effect, commonly known as the "healthy migrant effect," suggests that migrants are healthier than the people who stay behind. While there is strong support for the existence of positive health selection among international migrants worldwide (Akresh and Frank 2008; Darmon and Khlat 2001; Huijts and Kraaykamp 2012; Ro, Fleischer, and Blebu 2016), the evidence among internal migrants is inconclusive. For example, Lu's (2008) and Nauman et al.'s (2015) longitudinal studies uncovered evidence of positive selection in Indonesia and Thailand, respectively, but only among young adults. In the US, Halliday and Kimmitt (2008) found evidence of health selectivity, but only among men under 60 years old; women's health was not related to their subsequent mobility. A prospective study of mortality in Sub-Saharan African countries found no consistent patterns of health selection among internal migrants and concluded that selection effects "vary across the continent and within each country" (Ginsburg et al. 2016:69). To my knowledge, there are only two studies assessing health selection among Mexican internal migrants: Arenas (2008) found evidence of positive selection but only among migrants ages 40 and over, while Deb and Seck (2009) found no evidence of selection[6].

Overall, the mixed findings regarding health selection in internal migration might

[6] A third study by Andalón and colleagues (2013) also examines health selectivity and internal migration in Mexico, but the authors study migration at the household level. Their measure of pre-migration health is the sum of the number of reported illnesses by all adult household members. Therefore, they are not assessing whether an individual's health predicts migration. Rather, they explore whether the health of all household members is related to the subsequent migration of at least one member.

indicate that the strength and direction of selection depends on the contextual characteristics of the migration flow. For instance, in a recent study of internal migration and health in Malawi, Anglewicz and colleagues (2017) found a significantly higher prevalence of HIV among migrants than non-migrants. This negative health selection can be linked to the specific characteristics of that country's migration stream whereby HIV-positive individuals are more likely to move to gain better health care access or return home for care (Anglewicz et al. 2017). There is also evidence that health selection is reduced as migration becomes more prevalent. For example, Tong and Piotrowski (2012) found that positive health selection among Chinese internal migrants decreased over time. Because internal migration in China was discouraged for a long time, the authors conclude that the decline in health selectivity could be linked to the development of migrant networks and the reduction in the costs of migration over time (Tong and Piotrowski 2012).

Post-Migration Health: Differences between Internal Migrants and Non-Migrants

While there are some conflicting findings, cross-sectional and longitudinal studies largely suggests that there are few (if any) differences in post-migration health between internal migrants and non-migrants. Cross-sectional evidence of better health among migrants is primarily found in studies of Chinese internal migration (e.g., Chen 2011; Hesketh et al. 2008; Zhang et al. 2015). Research from other countries mostly reveals null findings. For example, Wheaton and Crimmins' (2013) and Wong and Gonzalez-Gonzalez's (2010) studies of Mexican older adults found no significant differences between internal migrants and non-migrants in the prevalence of chronic health conditions including overweight, hypertension, diabetes, or disability; results were similar for men and women. A study of internal migrants in Catalonia, Spain only found

differences between native residents and poor female migrants; native residents were similar to all rich migrants and poor male migrants (Malmusi et al. 2010). Longitudinal research largely supports the findings from these cross-sectional studies. For example, prospective studies from Malawi (Nauman et al. 2015), Thailand (Nauman et al. 2015), and Indonesia (Lu 2010b) found no significant differences in physical or self-rated health over time between internal migrants and non-migrants.

It is important to note, however, that studies of cardiovascular health have consistently identified worse health among rural-urban migrants relative to rural non-migrants. For example, a review of studies of cardiovascular health in low- and middle-income countries indicates that rural-urban migrants exhibit more cardiovascular risk factors than rural non-migrants (Hernández et al. 2012). Longitudinal studies of rural-urban migrants in Tanzania (Unwin et al. 2010) and Kenya (Poulter et al. 1990) confirm these findings. However, while rural-urban migrants tend to have worse cardiovascular health profiles than rural non-migrants, their health is usually better than that of urban non-migrants (Miranda, Gilman, and Smeeth 2011), which suggests that these findings may be more indicative of the negative effects of urban exposure than of migration *per se* (Sobngwi et al. 2004; Wheaton and Crimmins 2013).

Post-Migration Health: Differences Among Migrants

The findings from prior studies do not suggest that internal migration has no effects on individuals' health—rather, that there is no significant difference in the degree of change over time in self-rated health between migrants and non-migrants. However, there might be differences among migrants in the rate of change based on the particular characteristics of their migration trip, such as age at the time of migration, why they migrated, who they migrated with,

and where they migrated to. These characteristics might be able to capture other sources of selection, as well as explain observed differences in post-migration health among migrants. In addition, potential gendered effects of migration might also come to light when considering the conditions under which migration occurred (Donato 2010; Wheaton and Crimmins 2013; Wong and Gonzalez-Gonzalez 2010).

Age is related to pre-migration health and may also play an important role in shaping health outcomes after migration. Indeed, Miranda and colleagues (2011) found that age at migration accounts for some of the variability in post-migration cardiovascular risk among migrants in Peru. Because health tends to deteriorate as individuals age, those who migrate at younger ages usually have better post-migration health than those who migrate at relatively older ages (Angel et al. 2010; Palloni and Morenoff 2001). In terms of gender, women tend to be less mobile during childbearing years due to social norms and household responsibilities (Kanaiaupuni 2000), which could potentially lead to gender differences in post-migration health.

It is also important to consider the motivation that drives the decision to migrate (Arenas 2008; De Jong et al. 1983). There is evidence that migration motivations shape academic trajectories (Hagelskamp, Su, and Hughes 2010), and the same might be true about health trajectories. In Mexico, the top two reasons for internal migration are work (especially for men) and family (especially for women) (INEGI 2015; Sobrino 2014). Education also plays an important role in influencing migration decisions for both men and women (Canales and Montiel 2007; Sobrino 2010). Recent national data also reveal an increase in migration motivated by the rising insecurity in many regions of the country (INEGI 2015). Motivations are related to pre-migration health given that economic migrants (especially low-skilled) are usually healthier than those who migrate for family reasons (Lu 2008). Over time, however, migrating for family

reasons might be protective for migrants' well-being given that family members can serve as a source of social support (Lu 2010a, 2010b).

Finally, there is ample evidence that moving to urban destinations is associated with post-migration health. Urban areas potentially offer opportunities for health improvements such as access to levels of household consumption and standards of living that might be unattainable in the community of origin (Hernández et al. 2012; International Organization for Migration 2015; Lu 2010b; del Rey Poveda 2007; Sobngwi et al. 2004; Tong and Piotrowski 2012). At the same time, urbanization is associated with less physical activity, poorer health behaviors, and a growing prevalence of non-communicable diseases (International Organization for Migration 2015; Patel and Burke 2009). In Chen's (2011) study of Chinese internal migration, urban-to-urban migrants experienced physical and mental health deterioration with increasing length of residence in the urban destination compared to local residents; there were no significant differences between local residents and rural-to-urban migrants. Studies have found that urban migration has a greater (negative) effect on men's health and women's (Torun et al. 2002; Wheaton and Crimmins 2013). A study of Mexican older adults found that living in urban areas was protective for women with internal migration experience compared to those with no migration experience (Wong and Gonzalez-Gonzalez 2010). In sum, prior research suggests that there may not be important differences in post-migration health between internal migrants and non-migrants, but we can potentially find post-migration health differences among internal migrants based on the conditions of their trip.

HYPOTHESES

Based on the prior review of the literature, I tested the following hypotheses:

Hypothesis 1: There will be no health selection among migrants. In other words, internal migrants and non-migrants will not differ in baseline health.

Hypothesis 2: Changes in the health of migrants will not be different from changes in the health of non-migrants.

Hypothesis 3: Post-migration health will be related to the characteristics of the migration trip, such that (a) younger migrants will have better post-migration health than those who migrated at older ages, (b) migrating for family-related reasons will be related to better post-migration health, and (c) migrating to a city will be related to worse post-migration health.

DATA AND METHODS

Data Source

This study uses publicly available data from the Mexican Family Life Survey (MxFLS). The MxFLS is a nationally representative longitudinal survey of the well-being of individuals and families in Mexico over time (Rubalcava and Teruel 2006a). The survey contains data on a variety of social, economic, and demographic indicators at the individual, household, and community levels at three time points. The MxFLS also includes information on internal and international migration trips done between interviews.

The sample design was a probabilistic, stratified, and multi-staged cluster design. The survey is representative at the national, regional, and urban-rural regional levels. The baseline survey (MxFLS-1) was conducted in 2002 and sampled over 8,400 households in 150 urban and rural communities throughout Mexico (Rubalcava and Teruel 2006a). Localities were randomly chosen from the regions identified in Mexico's National Development Plan 2000-2006. Households within these localities were sampled randomly. Within sampled households, all members ages 15 and older were included in the adult sample (a household member was defined

as anyone who usually lives in the household, regardless of familial or blood relations). Approximately 19,800 adult interviews were conducted in the first wave of data collection. The second (MxFLS-2) and third (MxFLS-3) waves of the survey were fielded during 2005-2006 and 2009-2012 and achieved a 90 and 85 percent re-contact rate at the household level, respectively (Rubalcava and Teruel 2006b, 2013).

For the purpose of this study, I restricted the analyses to individuals age 15-50 as internal migration was concentrated within this age range. In addition, individuals who migrated internationally between interviews were excluded from the analyses. The analytical sample includes data on 14,629 respondents who were interviewed for the first time in MxFLS-1, had complete migration histories, and complete data in key variables.

Measures

The dependent variable was self-rated health. Respondents were asked: "Currently, could you say that your health is very good, good, regular, bad, or very bad?" Responses were reverse coded such that higher scores indicate better health. Self-reported health has criterion and construct validity, and is a robust indicator of predicting morbidity, subsequent disability, and mortality (Fayers and Sprangers 2002; Idler and Benyamini 1997; Jylhä et al. 1998). This measure has been used in many studies of internal migration and health (e.g., Andalón et al. 2013; Anglewicz et al. 2017; Arenas 2008; Hesketh et al. 2008; Malmusi et al. 2010; Tong and Piotrowski 2012). Self-rated health has also been used to assess the health status of Mexicans, including men and women, those with and without migration experience, rural vs. urban, and elderly populations (e.g., Bostean 2013; Crimmins et al. 2005; Estudillo Becerra et al. 2005; Gallegos-Carrillo et al. 2006; Goldman et al. 2014; Riosmena, Wong, and Palloni 2013;

Ullmann, Goldman, and Massey 2011). This measure can be especially useful when studying populations that do not have widespread access to health care services (Wong et al. 2005), as is the case of most rural areas in Mexico. Another advantage is that self-rated health measured over time is able to capture continuous and underlying changes in health that may occur before the emergence of a disease or a functional loss (Shaw and Krause 2002).

The key independent variable was internal migration between interviews. This variable captures whether respondents made any domestic migration trips that lasted more than one year at any time between the first and last interviews. To code for internal migration experience, I used the migration history data collected at each follow-up interview: "Since [year of last interview] have you moved for a year or longer outside of the locality/neighborhood where you used to live?" If they answered "yes", respondents were then asked to list all the places where they lived, both within the country and internationally. Using this information, I created two dichotomous variables: internal migrants and non-migrants. Internal migrants include respondents who relocated domestically at any time between interviews. Non-migrants stayed in their communities of origin between interviews. As mentioned earlier, individuals who migrated internationally between interviews were excluded from the analyses.

The first analysis estimates baseline health and changes in health over time. These models adjust for personal, socioeconomic, and health care factors that may be related to observed disparities in self-rated health. Personal characteristics include age, indigenous status, marital status, and children in the household. Age captures life course position and was measured in years. Indigenous status is a dichotomous variable and was coded as 1 if the respondent self-identified as being part of an indigenous group; otherwise it was coded as 0. Marital status is also a dichotomous variable where 1=currently married or in a civil union and 0=else. I also include a

variable measuring the number of children ages 0-14 living in the household.

Socioeconomic status is an important predictor of both health (Preston and Taubman 1994) and internal migration (Quinn and Rubb 2005). Educational attainment was coded into four categories: elementary school or less (reference), middle school, high school, and college or more. Employment status was coded as 1=employed for pay and 0=else.

Migration capital adjusts for out-migration selectivity and is measured with indicators at the individual and community levels. Following Lu (2008) and Tong and Piotrowski (2012), I controlled for previous migration experience which is a dichotomous variable measuring whether an individual ever moved between age 12 and the first interview. Because migration decisions are influenced by the place of origin (Durand and Massey 2003; Riosmena and Massey 2012; Rubalcava et al. 2008), I also included measures capturing rural/urban community of origin and state of origin. Following the definition used by the Mexican National Institute of Statistics and Geography (INEGI), rural origin was coded as 1 if the community of origin had a population of less than 2,500; otherwise it was coded as 0. Migrant sending state was coded as 1 if the respondent was from a state with high rates of domestic out-migration (as identified by Chávez Galindo [2001]), otherwise it was coded as 0.

Finally, models adjust for variables that capture access to health insurance and health care services as they may contribute to health disparities. Health insurance is a dichotomous variable were 1=had public or private health insurance and 0=not insured. Health care utilization is also a dichotomous variable were 1=visited a doctor, health care professional, hospital, or clinic in the four weeks before the interview and 0=else.

The second analysis focuses on the post-migration health of migrants and uses the characteristics of the migratory trip as the predictors of interest. I operationalized age at

migration into categories (15-24 years [reference], 25-34 years, 35-44 years, and 45 -years or older) to observe potential curvilinear effects. Urban destination is a dichotomous variable where 1=migrated to a city and 0=else. Motivation captures the main reason that motivated the move and was coded into six categories: family (e.g., to be closer to family, marriage/union, pregnancy, death of spouse/partner); work/education (work or education/training of respondent or other household member); independence (to become independent of family or move to own house); health (of respondent, spouse, or other person); safety (insecurity, political instability, or natural disasters); and other reasons.

Analytic Strategy

Linear Growth Curves. My first two research questions are concerned with whether internal migrants differed from non-migrants in baseline self-rated health and changes in self-rated health over time. To investigate this, I estimated a series of individual growth curves within a linear mixed model (i.e., multilevel) framework. The goal was to assess if changes in self-rated health over time (from the first to the last interview) were related to changes in internal migration experience. Repeated measures can be considered as having a hierarchical structure in which observations are nested within individuals. Growth curves allow the modeling of within-person change and between-person differences in outcomes across various measurement waves (Shek and Ma 2011). Models allow both the intercept and time trend to vary across individuals, which means that subjects are allowed to have different starting points and rates of change over time (Hedeker and Gibbons 2006; Singer and Willet 2003). The ability to include time-varying predictors allows each subject to be his or her own control.

Data were reorganized into a long form in order to have one observation per

measurement occasion for each subject. The outcome captured changes in self-rated health over time. The key independent variable was internal migration experience, which is time-variant. At Time 1 (baseline measure), all subjects were coded "0". At Time 2, subjects who migrated domestically between the first and second interviews were coded "1", otherwise they were coded "0". A similar strategy was used to code Time 3. Because I was interested in studying changes that occurred between interviews, I used interview wave as the variable that reflected the passage of time, with values of "0" for the first interview, "1" for the second interview, and "2" for the third interview. Therefore, the intercept represents the value of self-rated health at occasion 0 (baseline) and the slope captures changes in self-rated health across measurement occasions (Singer and Willet 2003).

The level-1 is organized around the observation. It captures within-person patterns of change in self-rated health associated with internal migration experience (Singer and Willet 2003). The level-1 equation for individual *i* at occasion *j* is the following:

$$Y_{ij} = \pi_{0i} + \pi_{1i}TIME_{ij} + \pi_{2i}Migration_{ij} + \varepsilon_{ij}$$

where π_{0i} represents the initial self-rated health for individual *i* at occasion *j,* π_{1i} represents the mean linear rate of change for individual *i* at occasion *j*, π_{2i} represents change in migration status for individual *i* at occasion *j*, and ε_{ij} is an error term representing the deviation of individual *i* from the average level of self-rated health at occasion *j.*

The level-2 is organized around the individual. It captures between-person differences in initial status and growth rate by adding random effects to the level-1 parameters for the intercept and the slope (Hedeker and Gibbons 2006). To assess whether the rate of change varies across individuals based on internal migration experience, I included an interaction between the slope

and migration experience (captured in the level-2 equation by adding migration status as a predictor of the slope parameter). The level-2 equations are the following:

$$\pi_{0i} = \gamma_{00} + \varsigma_{0i}$$

$$\pi_{1i} = \gamma_{10} + \gamma_{11} Migration_{ij} + \varsigma_{1i}$$

$$\pi_{2i} = \gamma_{20}$$

where the initial level of self-rated health for individual *i* (π_{0i}) is the product of an intercept γ_{00} representing the population-level average of self-rated health and a random error term for the deviation of individual *i* from the average level of self-rated health (ς_{0i}); the linear rate of change in self-rated health for individual *i* (π_{1i}) is the product of an intercept corresponding to the average rate of change (γ_{10}), a parameter representing the migration status of individual *i* at occasion *j* (γ_{11}), and a random error term for the deviation of individual *i* from the average rates of linear change (ς_{1i}); finally, change in migration status is the product of an intercept corresponding to the average change (γ_{20}).

A more parsimonious representation of this model is the following combined level-1 and level-2 equation:

$$Y_{ij} = \left[\gamma_{00} + \gamma_{10} TIME_{ij} + \gamma_{20} Migration_{ij} + \gamma_{11} TIME_{ij} \times Migration_{ij}\right] + [\varsigma_{0i} + \varsigma_{1i} TIME_{ij} + \varepsilon_{ij}]$$

To test if personal characteristics, socioeconomic status, migration capital, and health care variables were related to the initial status and to the rate of change in self-rated health, subsequent equations introduced covariates to each parameter (i.e., to the intercept and the slope). Time-variant control variables include marital status, children living in the household,

employment status, and health care access. Remaining variables are time-invariant and reflect the status characteristics of respondents at the baseline interview.

An advantage of multilevel models is their robustness to missing or incomplete data across time (either due to attrition or data that are missing on only certain data points) as they estimate the models using all the information available for each subject (Cnaan, Laird, and Slasor 1997; Hedeker and Gibbons 2006). Still, panel attrition is a concern given that it may be associated with observed disparities (Kim and Miech 2009; Liang et al. 2008). Thus, following prior longitudinal studies on racial/ethnic and immigrant health disparities (e.g., Brown, O'Rand, and Adkins 2012; Gubernskaya 2015; Warner and Brown 2011), I included two additional control variables to correct for biases related to differential attrition and mortality: the number of waves a respondent was interviewed and whether the respondent died during the study period.

Lagged Dependent Variable OLS Regressions. My third research question asked if the characteristics of the migration trip shape post-migration health. To answer this, I estimated lagged dependent variable (LVD) models using ordinary least-squares regressions to predict post-migration self-rated health. By including the lag of the dependent variable as an explanatory variable, this approach adjusts for prior health as well as for the effects of unmeasured characteristics (Rao and Miller 1971; Wooldridge 2002). Therefore, it allows for more stringent tests of effects than cross-sectional models. This method was used by Lu (2010b) and Nauman et al. (2015) to study changes in the health of Indonesian and Thai internal migrants, respectively.

In this analysis I focused on the internal migrant sample and restricted the analyses to complete cases, leading to a final sample of 1,100 migrants[7] (378 men and 722 women). The LVD regressions model post-migration self-rated health as a function of age at migration, urban

[7] Seventy-three and 90 observations were dropped from the male and female samples, respectively, due to missing data in the variables used in the analysis. The majority of dropped observations (more than 75%) were missing data on the dependent variable.

destination, and migration motivations, while adjusting for pre-migration self-rated health and other covariates. The majority of respondents migrated only once between interviews (77 percent of men and 78 percent of women). For those who migrated more than once, I used the characteristics of the last migration trip they undertook.[8] Table 3.1 provides a summary of the coding of all the variables used in the linear growth curves and LVD regressions.

All analyses were stratified by gender because the nature of Mexican internal migration patterns, and migration in general, vary greatly across men and women (Ariza and D'Aubeterre 2009; Curran and Rivero-Fuentes 2003; Donato and Gabaccia 2015; Sobrino 2014). Different processes, motivations, and social norms influence and shape men and women's migration outcomes; therefore, it is likely that the effects of migration on health are different by gender. All analyses were weighted using MxFLS longitudinal weights that expand the sample to the Mexican population in 2002 (year of the first interview) and take into account unequal probabilities of selection and household non-response.

[8] I decided to use the characteristics of the last migration (instead of the first) because two-thirds of those respondents were living in their destination at the time of the last interview.

Table 3.1 Coding of Variables Used in the Analyses of Internal Migration and Health

Variable	Type	Coding	Time-Variant*
Self-rated health	Continuous	Ranges from 1=very bad to 5=very good	Yes
Migration status	Dichotomous	1=internal migrant; 0=non-migrant	Yes
Personal characteristics			
Female	Dichotomous	1=female; 0=male	No
Indigenous	Dichotomous	1=self-identified as member of an indigenous group, 0=otherwise	No
Age	Continuous	Years	Yes
Married	Dichotomous	1=married or in a civil union; 0=otherwise	Yes
Children in household	Continuous	Number of children ages 0-14 living in the household	Yes
Socioeconomic status			
Education	Categorical	Elementary school or less (reference); middle school; high school; college or more	No
Employed	Dichotomous	1=employed for pay; 0=otherwise	Yes
Migration capital			
Prior migration experience	Dichotomous	1=migrated internally at any time between age 12 and first interview; 0=otherwise	No
Rural origin	Dichotomous	1=origin community with 2,500 inhabitants or less; 0=otherwise	No
Migrant sending state	Dichotomous	1=high internal migration sending state; 0=otherwise	No
Health care access and utilization			
Health insurance	Dichotomous	1=had public or private health insurance; 0=uninsured	Yes
Doctor visit	Dichotomous	1=visited doctor, health care provider, hospital, or clinic in last 4 weeks; 0=otherwise	Yes
Characteristics of migration trip			
Age at migration	Categorical	15-24 years (reference); 25-34 years; 35-44 years; 45 year or older	---
Urban destination	Dichotomous	1=migrated to a city; 0=otherwise	---
Motivation	Categorical	Family (reference); work or education; independence; health; safety; other	---

* Yes= Time-variant variable in growth curve models; No= Time-invariant variable in growth curve models (measured at the first interview)

RESULTS

Characteristics of the Sample

Table 3.2 presents weighted means and proportions for the baseline variables by gender. All descriptive statistics represent respondents' status at the time of the first interview. The last column indicates if the means/proportions for men and women are significantly different. Men reported significantly better self-rated health at the first interview than women. Ten percent of men and 13 percent of women migrated domestically between interviews. This difference is significant and is in line with national estimations of internal migration based on the Mexican census (Téllez Velázquez et al. 2014).

The average age for both samples was 32 years. Twelve percent of men and 11 percent of women were indigenous. Women had slightly higher rates of marriage and more children living in the household than men, and the differences were significant. Men had significantly higher levels of education than women, and twice as many men than women were employed at the time of the first interview. More women than men had prior migration experience (26 percent vs. 22 percent). Approximately a quarter of both samples were from rural origins and 40 percent were from states with high rates of domestic out-migration. Finally, with regard to health care, only 10 percent of men saw a doctor in the last four weeks compared to 20 percent of women, but more men reported having health insurance than women.

Table 3.2 Weighted Means and Proportions for Baseline Study Variables By Gender

	Men	Women	Sig.
Self-rated health	3.62	3.50	***
Internal migration between interview	0.10	0.13	***
Personal characteristics			
Age	31.84	31.85	
Indigenous status	0.12	0.11	
Married	0.63	0.65	***
Children living in household	1.62	1.76	***
Socioeconomic status			
Education			
Elementary school or less	0.33	0.44	***
Middle school	0.33	0.31	
High school	0.19	0.16	***
College or more	0.15	0.09	***
Employed	0.87	0.43	***
Migration capital			
Prior migration experience	0.22	0.26	***
Rural origin	0.24	0.26	
Migrant sending state	0.40	0.39	
Health care access and utilization			
Health care utilization	0.10	0.20	***
Health insurance status	0.45	0.43	*
Unweighted N	6,292	8,337	

Note: Asterisks denote significant differences between men and women, where *** p < .001 (two-tailed tests)

Are Mexican Internal Migrants Healthier than Non-Migrants Before Migration?

Table 3.3 provides results from linear growth curves of self-rated health by gender. In this section I describe the results from panel A ("Intercept"), which presents the coefficients for the parameters predicting the intercept—that is, the initial level of self-rated health. Model 1 presents the results for the male sample. The coefficient for internal migration is not significant, indicating that male internal migrants did not differ significantly from male non-migrants in

initial (pre-migration) self-rated health. Consistent with prior literature, older individuals and indigenous respondents had worse initial health than their younger and non-indigenous counterparts, respectively. Marital status and the number of children living in the household were not significantly related to men's initial health. In terms of socioeconomic characteristics, education, but not employment status, was positively associated with initial health status. Although prior migration experience was not related to initial health, the community-level migration capital variables were significant predictors: those from rural origin communities and from migrant sending states reported worse baseline health than their counterparts from urban communities and from states with lower levels of internal out-migration. Health care utilization prior to the first interview was related to worse initial health, while having health insurance was related to better initial health.

Panel A of Model 2 (Table 3.3) presents results for the intercept of female sample. The coefficient for internal migration was also not significant for women; thus, female migrants and non-migrants did not differ in initial self-rated health. The covariate effects on women's baseline health were mostly similar to those found in the male sample, with only one exception: in contrast to men, indigenous status was not significantly related to women's initial health. In sum, I found no evidence of positive health selection among male or female internal migrants, thus providing support for Hypothesis 1.

Table 3.3 Linear Growth Curves of Self-Rated Health Trajectories for Mexican Men and Women Across Three Waves (2002-2012)

	Men Model 1		Women Model 2	
	B	*SE*	*B*	*SE*
Fixed Effects				
A. Intercept	3.761***	0.043	3.861***	0.034
Internal migration	-0.009	0.075	-0.100	0.066
Age	-0.006***	0.001	-0.010***	0.001
Indigenous status	-0.086***	0.026	-0.020	0.023
Married	0.023	0.022	-0.022	0.017
Children living in household	-0.010	0.006	-0.006	0.005
Middle school	0.115***	0.023	0.128***	0.018
High school	0.281***	0.027	0.239***	0.024
College	0.280***	0.029	0.357***	0.028
Employed	0.026	0.027	0.004	0.014
Prior migration experience	-0.007	0.012	-0.008	0.012
Rural origin	-0.072***	0.019	-0.080***	0.016
Internal migration sending state	-0.079***	0.018	-0.071***	0.015
Health care utilization	-0.249***	0.025	-0.178***	0.016
Health insurance status	0.089***	0.016	0.038**	0.014
B. Linear slope	0.215***	0.055	0.066	0.050
Internal migration	0.047	0.043	0.010	0.037
Age	-0.003***	0.001	-0.002*	0.001
Indigenous status	0.061**	0.020	0.027	0.017
Married	-0.023	0.017	-0.017	0.013
Children living in household	0.012*	0.005	0.003	0.004
Middle school	-0.006	0.017	0.003	0.013
High school	-0.045*	0.020	0.016	0.017
College	0.041	0.022	0.025	0.021
Employed	0.005	0.024	-0.019	0.011
Prior migration experience	-0.004	0.012	-0.004	0.012
Rural origin	-0.010	0.014	0.011	0.012
Internal migration sending state	0.017	0.013	0.001	0.011
Health care utilization	-0.030	0.021	0.004	0.014
Health insurance status	-0.069***	0.013	-0.016	0.011
Panel attrition controls				
Number of waves completed	-0.004	0.015	0.015	0.015
Died during study period	0.021	3.189	1.444	0.564
Random Effects				
Level 1 residual	0.215***	0.003	0.232***	0.003
Level 2 intercept	0.121***	0.005	0.115***	0.004
Level 2 slope	0.058***	0.003	0.048***	0.002
-2 log likelihood	52,094.0		66,748.3	
Unweighted *N*	6,292		8,337	

*p < 0.05; **p < 0.01; ***p < 0.001

Do the Health Trajectories of Migrants Differ from Those of Non-Migrants?

Panel B ("Linear Slope") in Table 3.3 presents growth parameters predicting the slope—that is, the rate of change in self-rated health across interview waves. We begin with the effects for the male sample in Model 1. The significant and positive coefficient for the linear slope indicates that, on average, there was a positive change in men's health over time. Internal migration was not significant, suggesting that the rate of change for internal migrants was not significantly different from the rate of change for non-migrants. Of the control variables, age, high school education, and health insurance were related to health deterioration over time; indigenous status and children in the household were associated with positive changes in health.

The growth parameters for the female sample are presented in Panel B of Model 2 (Table 3.3). Interestingly, the slope for women was not significant suggesting that, on average, the self-rated health of women did not significantly change over the study period. Again, internal migration was not statistically significant. The only predictor of women's slope was age. In sum, the results for the linear slope provide support for Hypothesis 2, which expected no significant differences in the health trajectories of migrants and non-migrants.

All findings presented in Table 3.3 were confirmed by several sensitivity analyses, including estimating the models for the complete sample, restricting the analyses to a younger cohort, relaxing the age restrictions to study all adults, and estimating separate models by rural and urban origin.

Do the Characteristics of the Migration Trip Shape Post-Migration Health?

In the previous analyses I found that changes in health over time were not significantly different *between migrants and non-migrants*. In the following analyses I explore if changes in

health are different *among migrants* based on the particular characteristics of the migration trip.

Table 3.4 presents weighted descriptive statistics by gender for the variables capturing the characteristics of the migration trip. Recall, for those who migrated more than once, I used the characteristics of their last migration. The last column indicates whether the means and percentages are significantly different between men and women. Both men and women migrated, on average, only once between interviews and over 70 percent of migrants were living in their destination at the time of the last interview.

Table 3.4 Weighted Characteristics of the Migration Trip

	Men	**Women**	Sig.
Number of trips between interviews	1.4	1.3	
Interviewed at destination	71.1%	73.3%	
Age at migration			
15-24 years	28.0%	26.0%	
25-34 years	40.9%	37.4%	
35-44 years	25.2%	26.2%	
45 years or older	9.5%	12.9%	
Urban destination	64.8%	62.8%	
Motivation			
Family	26.2%	27.3%	*
Work/Education	32.5%	23.6%	**
Independence	27.1%	29.6%	
Health	2.2%	1.6%	
Safety	3.2%	5.2%	
Other	8.8%	12.7%	
Unweighted N	378	722	

Notes: For those who migrated more than once between interviews, I used the characteristics of their last migration. Asterisks denote significant differences between men and women where *p < 0.05; **p < 0.01; ***p < 0.001

Consistent with the Mexican census (INEGI 2015), both male and female migration were concentrated within the 15-44 years age range and most migrated to cities. Finally, there are some expected and unexpected gendered patterns in migrants' motivations. Men predominantly migrated for work or education, followed by family reasons and independence. Women's top

motivation was independence, followed by family and work/education. Approximately 2 percent of both samples migrated due to health-related reasons, 3 percent of men and 5 percent of women migrated due to safety concerns, and the rest for other reasons.

Next, I present results of models predicting the relationship between post-migration self-rated health and the characteristics of the migration trip, net of pre-migration health.[9] Table 3.5 shows unstandardized coefficients from lagged dependent variable regressions for men (Model 1) and women (Model 2). Overall, these regression models are a better fit for migrant men than women: they explain 26 percent of the variance in post-migration self-rated health for men and 16 percent of the variance for women.

We begin with the results for male migrants presented in Model 1. As would be expected, pre-migration health is positively and significantly related to the outcome, such that better pre-migration health is related to better post-migration health. Variables that capture the characteristics of the last migration were important predictors of men's post-migration health. Age at migration was negatively related to post-migration health and the relationship was linear. Migrating to an urban destination versus a rural destination was related to better post-migration health. Men who migrated for work/education, independence, and other reasons reported significantly worse post-migration health than those who migrated for family reasons, but those who migrated due to safety concerns reported better post-migration health. In terms of the covariates, the significant and negative coefficient for the number of migrant trips indicates that for every additional trip, men's post-migration self-rated health score decreased by 0.179 ($p<.01$). Living in the destination at the time of the last interview, education, rural origin, and migrant sending state were not significantly related to men's post-migration health.

[9] Sensitivity analyses (not show) confirmed that results hold when models are restricted to individuals who migrated only once between interview and when restricted to those who migrated several times.

Table 3.5 Lagged Dependent Variable OLS Regressions Predicting Post-Migration Self-Rated Health for Internal Migrants by Gender

	Men		Women	
	Model 1		Model 2	
	B	*SE*	*B*	*SE*
Pre-migration health	0.277***	0.066	0.145***	0.042
Characteristics of migration trip				
Age at migration (ref=15-24)				
25-34 years	-0.327**	0.097	0.010	0.070
35-44 years	-0.355**	0.110	0.151	0.078
45 years or older	-0.867***	0.151	-0.135	0.094
Motivation (ref=family)				
Work/Education	-0.306**	0.098	-0.082	0.071
Independence	-0.226*	0.102	-0.037	0.071
Health	0.297	0.243	-0.436*	0.201
Safety	0.594*	0.251	-0.295*	0.126
Other	-0.424*	0.146	-0.199*	0.089
Urban destination	0.278***	0.080	0.021	0.056
Control variables				
Number of trips between interviews	-0.179**	0.056	-0.078	0.041
Interviewed at destination	-0.130	0.083	-0.108	0.058
Education (ref=elementary or less)				
Middle school	0.131	0.107	0.333***	0.062
High school	-0.066	0.132	0.399***	0.078
College or more	0.220	0.123	0.465***	0.084
Rural origin	-0.125	0.106	0.029	0.069
Migrant sending state	-0.037	0.083	-0.063	0.056
Constant	3.330***	0.295	2.930***	0.188
R-square	0.26		0.16	
N	378		722	

Notes: For those who migrated more than once between interviews, I used the characteristics of their last migration. *p < 0.05; **p < 0.01; ***p < 0.001

Model 2 in Table 3.5 provides coefficients for the female migrant sample. Results suggest that women's post-migration self-rated health is shaped by somewhat different factors than men's. Again, pre-migration health was a significant and positive predictor of post-migration health. In contrast to men, age at migration and urban destination were not significantly related to the outcome, which suggests that women's post-migration health did not vary significantly

across age groups or by rural/urban destination.

Migration motivation was a significant predictor for women but the effects were different from those observed among men. In contrast to the effects observed in the male sample, there were no statistically significant differences in post-migration health between women who migrated for family reasons and those who migrated for work/education or independence. Health-related motivations were not significant for men, but they were significant and negative for women, indicating that migrating due to health reasons worsened women's health after migration compared to migrating for family-related motives. While migrating for safety concerns was positively related to men's post-migration self-rated health, it had a negative effect for women. Although the number of trips was not significant at $p<.05$ for women, note that it was marginally significant at $p=.056$. Education was not associated with men's post-migration health, but it was a highly significant predictor for women such that having higher levels of education positively impacted female post-migration self-rated health.

In sum, I found partial support for my hypotheses regarding the relationship between the characteristics of the migration trip and post-migration health. I only found support in the male sample for Hypothesis 3a, which expected younger migrants to have better post-migration health than those who migrated at older ages. I found support in both samples for Hypothesis 3b, which expected family motivations to be related to better post-migration health compared to other motivations. There was just one exception: men who migrated for safety-related reasons had better post-migration health than those who migrated for family reasons. Hypothesis 3c expected individuals who migrated to cities to have worse health than those who migrated to other smaller destinations. Surprisingly, urban destination was related to *better* post-migration self-rated health among men; it was not a significant predictor for women.

DISCUSSION

The purpose of this chapter was to study the self-rated health trajectories of male and female internal migrants and non-migrants in Mexico. Using longitudinal data from the Mexican Family Life Survey, I first estimated linear growth curves to explore if migrants were healthier than non-migrants before migration, and whether the health trajectories of migrants and non-migrants differed over time. Next, I estimated lagged dependent variable OLS regressions to explore if the characteristics of the migration trip were related to post-migration self-rated health. All analyses were stratified by gender to investigate if internal migration impacts the health of men and women differently. Three key findings emerged from this research.

First, I found no evidence of a healthy migrant effect among Mexican internal migrants. In other words, internal migrants were not healthier than non-migrants before migration. Results held for both men and women. Similar results were found in prior studies of internal migrants in Mexico (Andalón et al. 2013) and Sub-Saharan Africa (Ginsburg et al. 2016).

Second, the health trajectories of migrants and non-migrants were similar over time. This finding does not imply that the health of migrants did not change after migration; rather, there were no significant differences between migrants and non-migrants in the degree of change in self-rated health over time. This is consistent with the results of other prospective studies of internal migration and health (e.g., Anglewicz et al. 2017; Nauman et al. 2015).

Third, while the aggregate rate of change during the study period was similar for internal migrants and non-migrants, I did find variation in post-migration health among migrants based on the particular characteristics of the migrant trip. Additionally, there were important differences by gender. Age at migration was negatively related to men's post-migration self-rated health, but not related to women's. Moreover, men who migrated to a city reported better post-

migration health than those who migrated to a rural destination. Urban destination was not associated with women's post-migration self-rated health. The motivation that drove the decision to migrate was a significant predictor of men and women's post-migration health. Men who migrated due to family-related reasons reported better post-migration health than those who migrated for work/education, independence, or other motivations. Only moving for safety-related reasons improved men's post-migration health more than family-related moves. Different patterns emerged among female migrants. The effects of family, work/education, and independence motivations were not significantly different for women, but migrating due to health and safety reasons were associated with worse post-migration self-rated health than migrating for family reasons.

A few limitations need to be acknowledged. First, I did not account for any socioeconomic and behavioral changes that occurred after migration and which could potentially impact post-migration health status. There is evidence that internal migrants tend to experience gains in socioeconomic standing after migration (e.g., Adamtey et al. 2015; Flippen 2013; Lu 2010b). In the case of Mexico, internal migrants enjoy a wage advantage relative to non-migrants (Parrado and Gutierrez 2016). At the same time, health behaviors tend to change after migration, both positively and negatively. For instance, internal migration is related to declines in physical activity, increased weight gain, and improvements in diet (Torun et al. 2002; Unwin et al. 2010). Future research should explore whether socioeconomic and behavioral mechanisms mediate the effect of migration on self-rated health.

In addition, the effects of post-migration changes in socioeconomic status, health behaviors, and social ties may become apparent over longer periods of time. Most longitudinal studies are limited by the short duration between follow-up interviews. While this short window

between consecutive waves helps reduce attrition, it also precludes the assessment of health effects that may take longer to manifest (Lu and Zhang 2015). Therefore, following migrants for longer periods of time may help uncover potential long-term effects of migration.

Another limitation is that I only focused on migration effects on self-rated health. Although self-rated health is a highly validated measure of health and it has been used in many prior studies of internal migration (e.g., Anglewicz et al. 2017; Arenas 2008; Deb and Seck 2009; Hesketh et al. 2008; Malmusi et al. 2010; Tong and Piotrowski 2012), future studies should examine if migration has different effects on objective health measures and mental health.

Notwithstanding the limitations, this research makes several contributions. First, scholarship on the internal migration-health relationship has predominantly focused on moves within countries in East and Southeast Asian (e.g., Chen 2011; Li et al. 2006, 2007, Lu 2008, 2010a, 2010b; Nauman et al. 2015) and Africa (e.g., Anglewicz et al. 2017; Ginsburg et al. 2016; Unwin et al. 2010). The research presented here contributes to this growing literature by assessing the effects of internal migration among the Mexican population.

Second, all analyses were stratified by gender, which contributes to our understanding of the gendered effects of migration on health. Few prior studies have explicitly assessed gender differences in the health effects of internal migration (e.g., Malmusi et al. 2010; Wheaton and Crimmins 2013; Wong and Gonzalez-Gonzalez 2010; Zhang et al. 2015). My findings reveal that migration motivations, age at migration, and urban destination shape the health of male and female migrants differently.

Third, the analyses presented here highlight the importance of including non-migrants in studies of migrant health. While the self-rated health of internal migrants improved during the study period, their health trajectories mirrored those of non-migrants. Had we only assessed the

health trajectories of migrants, we could have arrived at the erroneous conclusion that internal migration is positive for Mexicans' health, when in reality their health trajectories reflected patterns in the general population.

CHAPTER 4

DOES INTERNAL MIGRATION SHAPE THE HEALTH OF INDIGENOUS MEXICANS?

There are over 370 million indigenous peoples[10] living in approximately 90 countries around the world (Gracey and King 2009). While their health has improved over the last century, indigenous peoples are still highly disenfranchised and experience wide health disparities relative to non-indigenous populations within the same country (Anderson et al. 2016; United Nations 2005; World Health Organization 2002). Compared to non-indigenous populations, indigenous groups around the world have a lower life expectancy; higher rates of infant, child, and maternal mortality; and higher rates of infectious and chronic diseases, alcohol and drug abuse, and depression (Anderson et al. 2016; Valeggia and Snodgrass 2015). Some scholars have suggested that the high prevalence of migration among indigenous peoples may contribute to their health disparities (King, Smith, and Gracey 2009; Nettleton, Napolitano, and Stephens 2007). However, there is little empirical research about whether and how migration shapes the health of indigenous populations (Stoddard et al. 2011).

Indigenous migrants are substantially underrepresented in the migrant health literature (Zúñiga et al. 2014). While indigenous peoples have historically comprised a substantial part of migration streams around the world, their experiences are often lost in the data because they are usually aggregated into larger groups (Yescas 2010). For example, in the case of internal

[10] Defining "indigenous" is sometimes contentious because it can carry political and social connotations. Still, there is a general agreement that indigeneity is inherently social and encompasses major components of cultural identity (King et al. 2009; Nettleton et al. 2007; Valeggia and Snodgrass 2015). Based on Martínez Cobo's (1981) definition for the United Nations, indigenous status involves self-identification as descendants of pre-invasion and pre-colonial societies, and the desire to preserve and transmit their culture and traditions to future generations.

migration, indigenous migrants are often grouped within the rural migrant category; in the case of international migration, they are rarely separated from others from the same country of origin despite their distinct linguistic and cultural characteristics (Yescas 2010).

In this chapter I investigate the relationship between indigenous health and migration by studying the case of the Mexican indigenous population. Specifically, I use longitudinal data from the Mexican Family Life Survey to examine the health trajectories of Mexican indigenous peoples and assess if internal migration has an impact on indigenous health disparities. Most of what we know about the health of indigenous peoples is based on research from Australia, Canada, and the US. Indigenous populations make up 2.8 percent of the population in Australia (Australian Bureau of Statistics 2017), 4.9 percent in Canada (Statistics Canada), and 1.7 percent in the US (Norris, Vine, and Hoeffel 2012). Comparatively, in Mexico there are 68 indigenous groups with over 12 million individuals constituting over 10 percent of the national population (Comisión Nacional para el Desarrollo de los Pueblos Indígenas 2016). This makes Mexico the country with the largest indigenous population in the Western Hemisphere (Layton and Patrinos 2006) and an adequate case study.

This research is motivated by three questions. First, are indigenous Mexicans less healthy than their non-indigenous counterparts at the baseline interview? Second, do the health trajectories of indigenous Mexicans differ from those of non-indigenous Mexicans? Finally, does internal migration impact the health trajectories of indigenous Mexicans? The chapter is organized as follows. First, I provide an overview of the determinants of indigenous health worldwide. Then, I focus on the specific case of indigenous Mexicans, describing the health disparities they experience and patterns of internal migration. Having reviewed the existing literature, I present my hypotheses and describe the data and methods that I used. Next, I

compare the baseline characteristics of indigenous and non-indigenous survey participants. I then describe the results from linear growth curves assessing health disparities over time between indigenous and non-indigenous individuals and whether the relationship between indigenous status and health is moderated by internal migration. I conclude with a summary of findings and policy implications.

BACKGROUND

Determinants of Indigenous Health

Similar to other marginalized groups, most of the health inequalities experienced by indigenous peoples are shaped by low socioeconomic status, discrimination, poverty, and marginalization (Gracey and King 2009; Maxwell et al. 2015; Montenegro and Stephens 2006; Nettleton et al. 2007). However, indigenous groups tend to experience a greater burden of disease, disability, and death than other poor, marginalized groups (Gracey and King 2009; Valeggia and Snodgrass 2015). What makes the experiences and health outcomes of indigenous populations different?

Scholars suggest that the unique socio-historical experiences of indigenous peoples place additional burdens on their health. First, the legacy of colonialism still manifests itself both ideologically in the belief that indigenous peoples are inferior and structurally through institutions such as the health care system that may not respect traditional health practices (Cea Herrera 2004; Stephens et al. 2005). Second, the loss of land and traditional subsistence patterns can be directly related to changes in diet and physical activity levels (Gracey and King 2009). Along the same lines, loss of cultural practices and historical trauma may impact mental health across generations (Stone et al. 2006; Whitbeck et al. 2004). Third, many indigenous peoples,

particularly older generations and those living in remote areas, are still monolingual in their native languages, which limits their access to health care services (Flood and Rohloff 2018).

Prior scholarship has suggested that migration is another social determinant of indigenous health (King et al. 2009; Nettleton et al. 2007). Specifically, the high prevalence of migration among indigenous populations may be a risk factor that negatively impacts their health and well-being. While they migrate looking to improve their living conditions, indigenous peoples are among the most vulnerable and marginalized migrants. Compared to their non-indigenous counterparts, indigenous migrants receive lower wages, occupy lower status jobs, are exposed to poorer living conditions, and experience discrimination in access to the labor market, housing, and health care (Gamlin and Hawkes 2015; Holmes 2006; Montenegro and Stephens 2006). Migration may also affect indigenous health through residential instability, stress, loss of social networks and social support, and isolation (Cohen 1999; King et al. 2009; Nettleton et al. 2007).

The Health of Indigenous Mexicans

In Mexico, indigenous status is based on self-identification as a member of an Amerindian ethnic group and/or speaking an indigenous language (INEGI 2010). Mexico is one of several countries that have revised their Constitutions to legally recognize the right to self-determination of indigenous peoples and their right to preserve their cultural, linguistic, and territorial integrity (de la Peña 2005; Valeggia and Snodgrass 2015). In spite of this political recognition, the indigenous population in Mexico has been historically disenfranchised and has consistently lagged in most social, economic, and health indicators. In recent years their socioeconomic standing has worsened, as evidenced by the growing number of indigenous individuals living in extreme poverty (International Work Group for Indigenous Affairs 2016).

Indigenous Mexicans face stark inequalities from birth to old age in morbidity and mortality relative to their non-indigenous counterparts (Cano Valle 2004; Juárez-Ramírez et al. 2014; Montenegro and Stephens 2006; United Nations Development Program 2010). In terms of morbidity, they are predominantly afflicted by "diseases of poverty" (Stevens 2004), especially gastrointestinal diseases, pneumonia, influenza, and measles (Cano Valle 2004). The prevalence of communicable diseases among Mexican indigenous peoples is almost double the national rate (United Nations Development Program 2010). Malnutrition is also endemic among this population. Indigenous children ages 0-5 have a significantly higher rates of stunting and underweight than non-indigenous children (Cano Valle 2004; Rivera et al. 2003). Indigenous populations have higher rates of mortality in all population groups, especially the most vulnerable. For example, infant and maternal mortality rates for some indigenous groups are two to eight times the national rates (Gamlin and Hawkes 2015; Montenegro and Stephens 2006).

Recent studies have assessed changes in the health of indigenous Mexicans over the past twenty years. Similar to patterns observed among indigenous populations worldwide (Valeggia and Snodgrass 2015), prior longitudinal studies suggest that the health status of Mexican indigenous peoples has improved over the years. For example, Servan-Mori et al. (2014) found that the prevalence of stunting in indigenous children decreased by 42 percent between 1988 and 2012, and the rate of infant mortality was reduced by 34 percent between 2000 and 2010. Leyva-Flores et al. (2013) found that indigenous Mexicans' health insurance coverage through the federal program *Seguro Popular*[11] rose from 14 percent in 2006 to 62 percent in 2012, and that their use of hospital services for childbirth increased from 64 to 76 percent during the same period. Although these are important health achievements, they have not been enough to close

[11] The Mexican federal government established the *Seguro Popular* in 2002 to provide health insurance coverage for low-income individuals without social security (The World Bank 2015).

the inequalities between the indigenous and non-indigenous populations; rather, health disparities still persist in stunting, infant mortality, health insurance coverage, and health care utilization (Leyva-Flores et al. 2014; Servan-Mori et al. 2014)

Migration of Indigenous Mexicans

Migration has become an important element—sometimes even a rite of passage—in the lives of Mexican indigenous peoples (Anguiano 1993; Arizpe 1976). Indigenous groups tend to live in underserved rural communities with the highest rates of poverty, illiteracy, infant mortality, and lack of potable water and public services (Anguiano 1993; Pan American Health Organization 2005). Poverty, subpar living conditions, loss of lands, social unrest, and changing economic landscapes motivate indigenous peoples to leave their communities of origin, crossing municipal, state, and national boundaries in search of a better life.

While some indigenous groups have traditionally migrated to the US, indigenous Mexicans are overall more likely to migrate domestically and have historically constituted a substantial part of internal migration streams in Mexico, both to rural and urban destinations (Arizpe 1976; Davis, Stecklov, and Winters 2002; Lindstrom and Lauster 2001; del Rey Poveda 2007). Indigenous migrants comprise the overwhelming majority of all agricultural workers in Mexico (Anguiano 1993; Juárez-Sánchez 2015; Zabin and Hughes 1995). Interestingly, indigenous migrants sometimes fill the jobs that are left behind by those who migrate to the US. For instance, Juárez-Sánchez's (2015) ethnographic research revealed that agricultural employers in Puebla, Mexico hire low-skilled indigenous migrants to substitute workers who have emigrated to the US. Agricultural migrant workers, in general, tend to work in precarious conditions and their subsistence is based on temporary jobs according to the harvest seasons

(Anguiano 1993; Juárez-Sánchez 2015; Velasco-Ortiz 2014).

There are also important indigenous migration streams to urban destinations. In fact, it is estimated that one out of three Mexican indigenous peoples live in urban areas (United Nations 2008). When they move to urban centers, indigenous migrants tend to work as construction workers, domestic workers, or vendors in the informal sector (Anguiano 1993; United Nations 2008; United Nations Development Program 2010). Rural-to-urban migration often serves as a step prior to US migration, providing individuals with skills that are valuable in the US labor market. It also operates as a first step toward acculturation to an urban environment. Many indigenous migrants do not speak Spanish and do not know how to drive a car. Consequently, a first internal migration, especially to northern border states, serves as a "school for *el Norte*" (Zabin and Hughes 1995:413).

Even though domestic migration is more prevalent than international migration among indigenous Mexicans (Davis et al. 2002), existing scholarship on the health of Mexican indigenous migrants has focused almost exclusively on US migration. This research provides important insights into the relationship between migration and the health of indigenous Mexicans. For instance, indigenous migration is associated with a higher risk for sexually transmitted illnesses (Espinoza et al. 2014; Maier 2007), increased alcohol and drug use (Pinedo et al. 2014, 2016), poor self-rated health (Holmes 2006), and higher depressive symptoms (Salgado et al. 2014). These findings are based on cross-sectional research and, thus, it is not possible to establish if indigenous migrants' health was directly and negatively impacted by migration, or if they experienced poor health before migrating. To my knowledge, most of the existing research on the health of Mexican indigenous migrants is based on research collected at the destination or after they have returned to their origin community. While we do not know

about indigenous peoples' pre-migration health, there is evidence that individuals who migrate from more deprived to less deprived areas (as is the case of indigenous migrants) are healthier than their non-migrant counterparts in the sending community (Norman, Boyle, and Rees 2005).

HYPOTHESES

The present study builds on prior research and contributes to the scholarship by using nationally representative and longitudinal data to study indigenous health disparities over time and examine whether the health of indigenous Mexicans varies by internal migration experience. Drawing from previous research on internal migration and on indigenous health, I expect that:

Hypothesis 1: Indigenous respondents will have worse initial health than their non-indigenous counterparts.

Hypothesis 2: Indigenous migrants will have better initial health than indigenous non-migrants.

Hypothesis 3: Health trajectories will vary across groups based on indigenous and migration status, with indigenous migrants having the worst health over time.

DATA AND METHODS

Data Source

This study uses publicly available data from the Mexican Family Life Survey (MxFLS). The MxFLS is a nationally representative longitudinal survey of the well-being of individuals and families in Mexico over time (Rubalcava and Teruel 2006a). The survey contains data on a variety of social, economic, and demographic indicators at the individual, household, and community levels at three time points. The MxFLS also includes information on internal and international migration trips done between interviews.

The sample design was a probabilistic, stratified, and multi-staged cluster design. The

survey is representative at the national, regional, and urban-rural regional levels. The baseline survey (MxFLS-1) was conducted in 2002 and sampled over 8,400 households in 150 urban and rural communities throughout Mexico (Rubalcava and Teruel 2006a). Localities were randomly chosen from the regions identified in Mexico's National Development Plan 2000-2006. Households within these localities were sampled randomly. Within sampled households, all members ages 15 and older were included in the adult sample (a household member was defined as anyone who usually lives in the household, regardless of familial or blood relations). Approximately 19,800 adult interviews were conducted in the first wave of data collection. The second (MxFLS-2) and third (MxFLS-3) waves of the survey were fielded during 2005-2006 and 2009-2012 and achieved a 90 and 85 percent re-contact rate at the household level, respectively (Rubalcava and Teruel 2006b, 2013).

For the purpose of this study, I restricted the analyses to individuals ages 15 to 50 as internal migration was concentrated within this age range. In addition, individuals who migrated internationally between interviews were excluded from the analyses. The analytical sample includes data on 14,671 respondents who were interviewed for the first time in MxFLS-1, had complete migration histories, and complete data in key variables.

Measures

The dependent variable was self-rated health. Respondents were asked: "Currently, could you say that your health is very good, good, regular, bad, or very bad?" Responses were reverse coded such that higher scores indicate better health. Self-reported health has criterion and construct validity, and is a robust indicator of morbidity, subsequent disability, and mortality (Fayers and Sprangers 2002; Idler and Benyamini 1997; Jylhä et al. 1998). This measure can be

especially useful when studying populations that do not have widespread access to health care services (Wong et al. 2005), as is the case of indigenous peoples in Mexico and around the world. Prior studies have confirmed that this measure is positively associated with mobility, physical health, and emotional well-being among indigenous populations (Bombak and Bruce 2012; Díaz et al. 2008; Herman et al. 2001). Another advantage is that self-rated health measured over time is able to capture continuous and underlying changes in health that may occur before the emergence of a disease or a functional loss (Shaw and Krause 2002).

The two key independent variables were indigenous status and internal migration between interviews. The survey asked the following question to capture indigeneity: "Do you consider yourself part of an indigenous group?" Respondents were coded as 1=indigenous if they answered yes. This operationalization is consistent with the criteria used by the Mexican census to identify indigenous populations (INEGI 2010). Internal migration captures whether respondents made any domestic migration trips that lasted more than a year at any time between the first and last interviews. To code for internal migration experience, I used the migration history data collected at each follow-up interview: "Since [year of last interview] have you moved for a year or longer outside of the locality/neighborhood where you used to live?" If they answered "yes", respondents were then asked to list all the places where they lived, both within the country and internationally. Using this data, I created two dichotomous variables: internal migrants and non-migrants. Internal migrants include respondents who relocated domestically at any time between interviews. Non-migrants stayed in their communities of origin during the entire study period. Individuals who migrated internationally between interviews were excluded from the analyses.

Models controlled for personal, socioeconomic, and health care factors that may be

related to observed disparities in self-rated health. Personal characteristics include age, gender, marital status, and children in the household. Age captures life course position and was measured in years. Gender is a dichotomous variable and was coded as 1=female and 0=male. Marital status is also a dichotomous variable where 1=currently married or in a civil union and 0=else. I also include a variable measuring the number of children ages 0-14 living in the household.

Socioeconomic status is an important predictor of both health (Preston and Taubman 1994) and internal migration (Quinn and Rubb 2005). Educational attainment was drawn from the first interview and was coded as 1 if the respondent had middle school education or more, and 0 if they had elementary school or no formal education. Employment status was coded as 1=employed for pay and 0=else.

Migration capital adjusts for out-migration selectivity and is measured with indicators at the individual and community levels. Following other longitudinal studies of internal migration (e.g., Lu 2010b; Tong and Piotrowski 2012), I controlled for previous migration experience which is a dichotomous variable that captures whether an individual ever moved between age 12 and the first interview. Because migration decisions are influenced by the place of origin (Durand and Massey 2003; Riosmena and Massey 2012; Rubalcava et al. 2008), I also included variables capturing rural/urban community of origin and state of origin. Following the definition used by the Mexican National Institute of Statistics and Geography (INEGI), rural origin was coded as 1 if the community of origin had a population of less than 2,500; otherwise it was coded as 0. Migrant sending state was coded as 1 if the respondent was from a state with high rates of domestic out-migration (as identified by Chávez Galindo [2001]).

Finally, models adjusted for variables that capture access to health insurance and health care services as they may contribute to health disparities. Health insurance was coded as 1 if

respondents has public or private health insurance; otherwise they were coded as 0. Health care utilization was coded as 1 if they reported having visited a doctor, health care professional, hospital, or clinic in the four weeks prior to the interview; otherwise they were coded as 0.

Analytic Strategy

First, I estimated baseline descriptive statistics for the complete sample and for the indigenous and non-indigenous subsamples, and computed two-tailed t-tests and chi-square tests to assess significant differences in the means and proportions of indigenous and non-indigenous respondents. Next, I estimated a series of individual growth curves within a linear mixed model (i.e., multilevel) framework. Growth curves allow the modeling of within-person change and between-person differences in outcomes across various measurement waves (Shek and Ma 2011). The goal was to assess if indigenous status was related to the initial level of self-rated health and to change in self-rated health over time (from the first to the last interview), and if internal migration between interviews moderated the relationship.

The outcome captured changes in self-rated health scores over time. Analyses included a time measurement that captured changes in health since the initial assessment, with values of "0" for the first interview, "1" for the second interview, and "2" for the third interview. Therefore, the intercept represents the value of self-rated health at occasion 0 (baseline) and the linear slope represents the rate of change in the self-rated health across occasions (Singer and Willet 2003). Models allow both the intercept and time trend to vary for individuals, which means that subjects are allowed to have starting points and rates of change over time that are different from the group (Hedeker and Gibbons 2006; Singer and Willet 2003).

Repeated measures can be considered as having a hierarchical structure in which

observations are nested within individuals. Therefore, each subject is his or her own control. In the models presented here, the level-1 was organized around the observation and captures intra-individual patterns of change in self-rated health associated with the passage of time (Singer and Willet 2003). The level-1 equation for individual *i* at occasion *j* is the following:

$$Y_{ij} = \pi_{0i} + \pi_{1i} TIME_{ij} + \varepsilon_{ij}$$

where π_{0i} represents the initial self-rated health for individual *i* at occasion *j*, π_{1i} represents the mean linear rate of change for individual *i* at occasion *j*, and ε_{ij} is an error term representing the deviation of individual *i* from the average level of self-rated health at occasion *j*.

The level-2 model was organized around the individual. It captures between-person differences in initial status and growth rate by adding random effects to the level-1 parameters for the intercept and the time variable (Hedeker and Gibbons 2006). To assess whether initial health and the rate of change vary by indigenous status and internal migration experience, I included both variables as predictors of the intercept and the slope parameter. Further, I added an interaction between indigenous status and internal migration to the growth parameters to assess if the effect of indigenous status on initial health and on the rate of change varies by internal migration experience. The level-2 equations are the following:

$$\pi_{0i} = \gamma_{00} + \gamma_{01} Indigenous_i + \gamma_{02} Migration_{ij} + \gamma_{03} Indigenous * Migration_{ij} + \varsigma_{0i}$$

$$\pi_{1i} = \gamma_{10} + \gamma_{11} Indigenous_i + \gamma_{12} Migration_{ij} + \gamma_{13} Indigenous * Migration_{ij} + \varsigma_{1i}$$

where the initial level of self-rated health for individual *i* (π_{0i}) is the product of an intercept γ_{00} representing the population-level average of self-rated health, the main effects and interaction effects of indigenous status and internal migration ($\gamma_{01}, \gamma_{02}, \gamma_{03}$), and a random error term for the deviation of individual *i* from the average level of self-rated health (ς_{0i}). The linear rate of

change in self-rated health for individual *i* (π_{1i}) is the product of an intercept corresponding to the average rate of change (γ_{10}), parameters representing the indigenous status of individual *i* (γ_{11}) and the internal migration status of individual *i* at occasion *j* (γ_{12}), an interaction effect between indigenous status and internal migration (γ_{13}), and a random error term for the deviation of individual *i* from the average rates of linear change (ς_{1i}).

To test if personal characteristics, socioeconomic status, prior migration, and health care variables were related to initial health and to the rate of change in health, subsequent models introduced covariates to the growth parameters. Time-variant control variables include marital status, children living in the household, employment status, and health care variables. Remaining covariates are time-invariant and reflect the status characteristics of subjects. Table 4.1 provides a summary of the coding of all variables used in the linear growth curves.

An advantage of multilevel models is their robustness to missing or incomplete data across time (because of attrition or missing data only in some data points) as the models are computed using all the information available for each subject (Hedeker and Gibbons 2006). Nevertheless, panel attrition is of concern as it may be related to observed disparities in health (Kim and Miech 2009; Liang et al. 2008). Therefore, following prior longitudinal studies on racial/ethnic and health disparities (e.g., Brown, O'Rand, and Adkins 2012; Gubernskaya 2015; Warner and Brown 2011), growth curve models adjust for biases related to attrition and mortality by controlling for the number of waves a respondent completed and whether the respondent died during the period of observation. All analyses were weighted using MxFLS longitudinal weights that expand the sample to the Mexican population in 2002 (year of the first interview) and take into account unequal probabilities of selection and household non-response.

Table 4.1 Coding of Variables Used in the Analyses of Internal Migration and Indigenous Health

Variable	Type	Coding	Time-Variant*
Indigenous	Dichotomous	1=self-identified as member of an indigenous group, 0=otherwise	No
Self-rated health	Continuous	Ranges from 1=very bad to 5=very good	Yes
Migration status	Dichotomous	1=internal migrant; 0=non-migrant	Yes
Personal Characteristics			
Female	Dichotomous	1=female; 0=male	No
Age	Continuous	Years	Yes
Married	Dichotomous	1=married or in a civil union; 0=otherwise	Yes
Children in household	Continuous	Number of children ages 0-14 living in the household	Yes
Socioeconomic status			
Education	Categorical	1=secondary education or more; 0=otherwise	No
Employed	Dichotomous	1=employed for pay; 0=otherwise	Yes
Migration capital			
Prior migration experience	Dichotomous	1=migrated internally at any time between age 12 and first interview; 0=otherwise	No
Rural origin	Dichotomous	1=origin community with 2,500 inhabitants or less; 0=otherwise	No
Migrant sending state	Dichotomous	1=high internal migration sending state; 0=otherwise	No
Health care access and utilization			
Doctor visit	Dichotomous	1=visited doctor, health care provider, hospital, or clinic in last 4 weeks; 0=otherwise	Yes
Health insurance	Dichotomous	1=had public or private health insurance; 0=uninsured	Yes

* Yes= Time-variant variable in growth curve models; No= Time-invariant variable in growth curve models (measured at the first interview)

RESULTS

Characteristics of the Sample

Table 4.2 presents weighted means and proportions for all baseline study variables. Descriptive statistics are presented for the complete sample and for the indigenous and non-indigenous subsamples, including significant differences from two-tailed t-tests and chi-square tests. Twelve percent of respondents indicated being members of an indigenous group. Indigenous respondents reported significantly worse initial health than their non-indigenous counterparts, which provides initial support for Hypothesis 1. Eleven percent of the sample migrated internally between interviews. The proportion of indigenous migrants was smaller than that of non-indigenous migrants (8 percent vs. 12 percent, respectively).

Indigenous and non-indigenous respondents were significantly different in all variables except employment status and health care utilization. Over half of both subsamples were female. The indigenous sample was slightly older, had a larger proportion of married individuals, more children living in the household, and lower educational attainment. Almost 60 percent of both groups were employed. A larger proportion of non-indigenous respondents had prior internal migration experience. More than half of indigenous respondents were from rural origin communities and from migrant sending states. Almost the same proportions of indigenous and non-indigenous respondents visited a doctor in the four weeks before the interview, but less than a third of the indigenous sample had health insurance compared to almost half of the non-indigenous sample.

Table 4.2 Weighted Means and Proportions for Baseline Study Variables for Complete Sample and By Indigenous Status

	Complete Sample	Indigenous	Non-Indigenous	Sig.
Indigenous status	0.12	----	----	
Self-rated health	3.55	3.39	3.57	***
Internal migration between interviews	0.11	0.08	0.12	***
Personal characteristics				
Female	0.55	0.53	0.55	
Age	31.35	32.71	31.17	***
Married	0.64	0.69	0.63	***
Children living in household	1.61	2.02	1.56	***
Socioeconomic status				
Secondary education or more	0.59	0.41	0.61	***
Employed	0.60	0.57	0.60	
Migration capital				
Prior internal migration experience	0.24	0.22	0.25	***
Rural origin	0.25	0.52	0.21	***
Migrant sending state	0.40	0.56	0.38	***
Health care access and utilization				
Health care utilization	0.16	0.15	0.16	
Health insurance status	0.44	0.28	0.46	***

Notes: Unweighted *N*=14,671. Asterisks denote significant differences between indigenous and non-indigenous respondents where *** p < .001 (two-tailed tests)

Assessing Indigenous Health Disparities in Baseline Health and Changes in Health

Table 4.3 presents the results from linear growth curves modeling self-rated health trajectories across interview waves. Following the equations presented earlier, each model includes coefficients predicting initial levels of self-rated health (i.e., the intercept) and the rate of change in self-rated health over time (i.e., the linear slope).

Model 1 examines the independent effects of indigenous status and internal migration on self-rated health trajectories across the study period, net of the effects of all covariates. We begin by describing Panel A, which includes the effects of the independent and control variables on

initial self-rated health. As expected in Hypothesis 1, the coefficient for indigenous status is significant and negative, indicating that indigenous respondents reported worse initial health than non-indigenous respondents. Internal migrants did not differ significantly from non-migrants in baseline health. Consistent with findings in the health literature, women and older individuals had worse initial health than men and younger individuals. Initial self-rated health decreased for every additional child living in the household. Having higher levels of education was related to better initial health, but employment status was not a significant predictor. Although prior migration experience was not related to initial health, the community-level migration capital variables were significant predictors: those from rural origin communities and from migrant sending states reported worse baseline health than their counterparts from urban communities and from states with lower levels of emigration. Visiting a doctor prior to the interview was related to worse initial health, while having health insurance was related to better initial health.

Next, Panel B in Model 1 (Table 4.3) shows results from the growth parameters predicting change in health. The significant and positive coefficient for the linear slope indicates that, on average, there was a positive change in self-rated health over time. Interestingly, the self-rated health of indigenous respondents improved significantly more than that of their non-indigenous counterparts, as indicated by the significant and positive coefficient. Internal migration between interviews did not have an impact on the rate of change. Of the control variables, age, being married, and having health insurance were related to worse health over time. While having more children was related to worse initial self-rated health, this variable was associated with a positive change in health.

Table 4.3 Linear Growth Curves Modeling Association between Indigenous Migration and Self-Rated Health Across Three Waves, 2000-2012

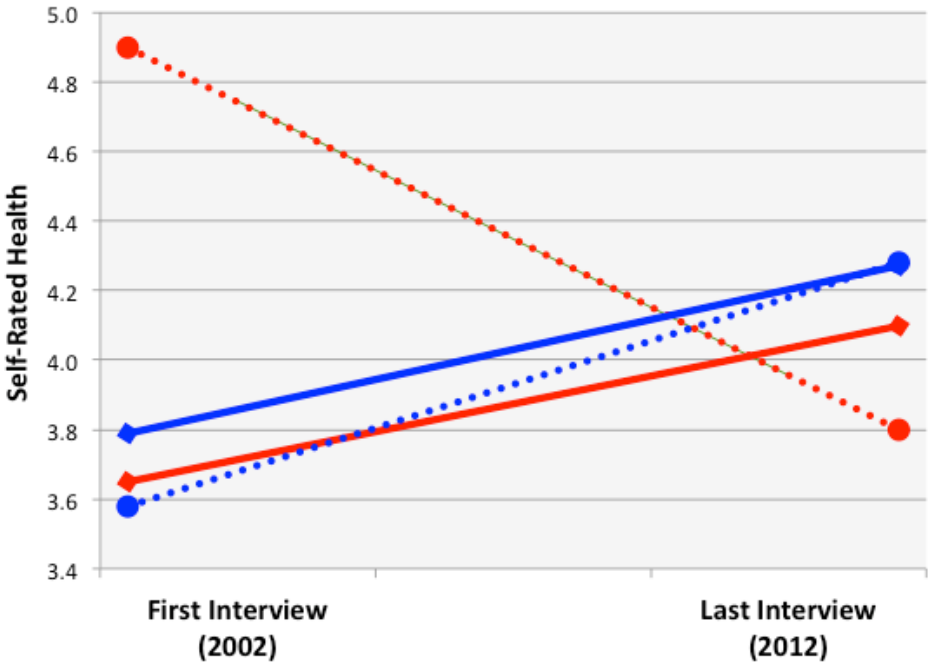
	Model 1		Model 2	
	B	*SE*	*B*	*SE*
Fixed Effects				
A. Intercept	3.926***	0.047	3.926***	0.047
Indigenous status	-0.033*	0.185	-0.037*	0.017
Internal migration	-0.011	0.055	-0.093	0.057
Indigenous × Internal migration	----	----	1.007***	0.201
Female	-0.080***	0.012	-0.080***	0.012
Age	-0.009***	0.001	-0.009***	0.001
Married	0.008	0.012	0.007	0.012
Children living in household	-0.015***	0.003	-0.015***	0.003
Secondary education or higher	0.190***	0.013	0.190***	0.013
Employed	0.006	0.011	0.006	0.011
Prior migration experience	-0.007	0.012	-0.008	0.012
Rural origin	-0.074***	0.012	-0.074***	0.012
Migrant sending state	-0.063***	0.011	-0.067***	0.011
Health care utilization	-0.227***	0.013	-0.227***	0.013
Health insurance status	0.072***	0.011	0.072***	0.011
B. Linear slope	0.137***	0.036	0.138***	0.036
Indigenous status	0.039**	0.102	0.041**	0.013
Internal migration	-0.011	0.031	0.032	0.032
Indigenous × Internal migration	----	----	-0.529***	0.111
Female	-0.015	0.012	-0.015	0.012
Age	-0.001*	0.001	-0.001*	0.001
Married	-0.029**	0.012	-0.029**	0.012
Children living in household	0.005*	0.003	0.005*	0.003
Secondary education or higher	0.004	0.013	0.004	0.013
Employed	-0.004	0.011	-0.004	0.011
Prior migration experience	-0.004	0.012	-0.004	0.012
Rural origin	0.001	0.012	0.001	0.012
Migrant sending state	0.007	0.008	0.008	0.008
Health care utilization	0.009	0.013	0.009	0.013
Health insurance status	-0.047***	0.011	-0.047***	0.011
Panel attrition controls				
Number of waves completed	-0.007	0.010	-0.007	0.010
Died during study period	-0.005	2.443	-0.004	2.441
Random Effects				
Level 1 residual	0.212***	0.002	0.210***	0.002
Level 2 intercept	0.102***	0.005	0.102***	0.003
Level 2 slope	0.040***	0.002	0.040***	0.001
-2 log likelihood	120,524.5		120,482.3	

Notes: *N*= 14,671 individuals; 35,656 observations. *p < 0.05; **p < 0.01; ***p < 0.001

The Impact of Internal Migration on Indigenous Health

Model 2 in Table 4.3 includes an interaction term between indigenous status and internal migration. The interaction is a significant predictor of both the intercept and the slope, which suggest that internal migration does shape indigenous health trajectories. To facilitate interpretation of the interaction effects, Figure 4.1 presents self-rated health trajectories by indigenous and migration status using the coefficients from Model 2. At the first interview (before migration), indigenous migrants reported substantially better self-rated health than all non-indigenous respondents and than indigenous non-migrants, thus providing support for Hypothesis 2. It is interesting to note that there is no evidence of positive health selection among non-indigenous migrants—in fact, they reported worse initial health than their non-migrant counterparts.

Figure 4.1 Self-Rated Health Trajectories by Indigenous and Migration Status: Growth Curve Estimates



Over time, there was a consistent improvement in self-rated health among indigenous non-migrants and the non-indigenous population, but especially among indigenous non-migrants such that by the time of the last interview the disparity between indigenous non-migrants and non-indigenous respondents disappeared. During this same time period, however, indigenous migrants experienced a steep decline in health, such that at the time of the last interview they reported substantially worse health than all other groups. Therefore, I also find support for Hypothesis 3, which expected health trajectories to vary by indigenous and migration status, and that indigenous migrants would have the worst health over time. In sum, results from the linear growth curves indicate that internal migration is a risk factor for indigenous Mexicans.

DISCUSSION

The goal of this chapter was to assess the role of internal migration on the health of indigenous peoples. I used longitudinal data from the Mexican Family Life Survey to examine the health trajectories of Mexican indigenous peoples relative to the non-indigenous population, and to examine if migrating internally impacts indigenous health disparities. Results from linear growth curve models revealed three main findings. First, I found that indigenous respondents reported worse initial self-rated health than their non-indigenous counterparts. In Mexico, indigenous background is related to poorer morbidity and mortality outcomes (Gamlin and Hawkes 2015; Montenegro and Stephens 2006; United Nations Development Program 2010). Therefore, indigenous subjects' poor perception of their health is consistent with the poor health outcomes (relative to the non-indigenous population) and with research on indigenous populations in the US, Canada, Australia, and New Zealand (Bombak and Bruce 2012).

Second, the self-rated health of all study participants improved significantly over the

study period; however, indigenous respondents experienced a greater positive change in health than their non-indigenous counterparts. This finding is consistent with prior longitudinal studies that found reductions in the prevalence of stunting among indigenous children, a drop in indigenous infant mortality rates, and a substantial rise in indigenous health insurance coverage during the same period as the current study (Leyva-Flores et al. 2013; Servan-Mori et al. 2014).

Third, changes in the health of indigenous respondents varied significantly by internal migration experience. Six percent of indigenous respondents migrated internally between the first and the last interview. Consistent with the healthy migrant hypothesis (Jasso et al. 2004; Palloni and Ewbank 2004), indigenous migrants reported significantly better initial health than non-migrants. Also notable is that the initial health of indigenous migrants was better than that of non-indigenous migrants. A possible explanation could be related to the types of jobs that are occupied by indigenous and non-indigenous internal migrants. Indigenous migrants tend to work in physically intensive occupations such as agriculture and construction (Anguiano 1993; Velasco-Ortiz 2014; Zabin and Hughes 1995). Non-indigenous migrants, on the other hand, are employed primarily in the trade, service, and manufacturing sectors (Pérez-Campuzano and Santos-Cerquera 2013). In spite of their better initial health, the self-rated health of indigenous migrants deteriorated substantially after migration, whereas the health of indigenous non-migrants and non-indigenous respondents improved during the study period.

There are several limitations to this study. First, results may not apply equally across indigenous groups. Mexico has 68 indigenous groups who live across a variety of social and economic contexts. Spanish proficiency also varies across indigenous groups: there are indigenous individuals who only speak Spanish and do not speak their indigenous language, while there are others who speak no Spanish at all (Albertani 1999). Spanish-speaking ability

and proficiency may influence health outcomes given that those who do not speak Spanish experience additional barriers in accessing health care services and discrimination in health care settings (Flood and Rohloff 2018). Future studies should compare indigenous individuals by ethnic group and language spoken and examine if there are differences in their health outcomes.

Another limitation is that the findings may not be generalizable to all indigenous populations. Indigenous groups around the world are not only very diverse, but also live in extremely different local environments and national contexts (International Work Group for Indigenous Affairs 2016). Despite their poor health outcomes and marginalization, indigenous peoples in Mexico have political recognition and have been afforded linguistic, cultural, and territorial rights. Therefore, their experiences and outcomes will be different from those of indigenous peoples in other countries who have little or no recognition from their governments and/or who experience active suppression of their political aspirations and cultures (Kirmayer and Brass 2016). More research is needed on the effects of migration on the health of indigenous groups across different social and political contexts.

Bearing these limitations in mind, this study makes several contributions to the literature on indigenous populations and to the migrant health scholarship. First, findings contribute to our understanding of how indigenous populations assess their health relative to non-indigenous peoples. Little research has been conducted on self-rated health among indigenous populations in general and particularly among indigenous Mexicans (Bombak and Bruce 2012). Drawing from a review of the literature on self-rated health and indigenous populations worldwide, Bombak and Bruce (2012) conclude that the self-rated health disparities between indigenous and non-indigenous peoples are likely produced by more than material deprivation. In this study, I found that the indigenous disparity in self-rated health holds even after accounting for differences in

education, employment, and health care factors. Future studies should explore the mechanisms that underlie this disparity, including the roles of stress, discrimination, environmental conditions, and structural barriers.

To my knowledge, this is the first longitudinal study to assess the existence of the healthy migrant effect among indigenous migrants and the impact of internal migration on indigenous health trajectories. While my research focused on the case of indigenous Mexicans, it fits within a larger global conversation about indigenous populations. Migration plays an important part in the lives of indigenous groups, yet our understanding of the health effects of migration on indigenous health is limited. This research sheds light on the migration-indigenous health relationship by comparing pre- and post-migration self-rated health and its impact on health disparities between the indigenous and non-indigenous populations. Findings provide support for the argument that migration is a social determinant of indigenous health (King et al. 2009; Nettleton et al. 2007). Specifically, migrating internally is a risk factor that has an independent effect on indigenous health even after adjusting for personal, family, socioeconomic, and health care factors. Future research should explore what specific mechanisms of the migration experience are detrimental for the health of indigenous migrants, and whether it matters if they relocate to urban versus rural communities.

An unexpected finding was that the self-rated health of indigenous non-migrants improved more than that of their non-indigenous counterparts during the study period. Prior research that found improvements in indigenous health studied almost the same period (Leyva-Flores et al. 2013; Servan-Mori et al. 2014), so findings presented here provide support and additional evidence that indigenous health disparities in Mexico have narrowed in recent years. This improvement could be related to greater access to health care due to improved health care

coverage through the *Seguro Popular* (Leyva-Flores et al. 2013, 2014). By 2012, the gap in health insurance coverage between the Mexican indigenous and non-indigenous populations was virtually eliminated (The World Bank 2015). More research is needed to assess the effect of the *Seguro Popular* on indigenous health status and whether the narrowing of the health insurance gap has fostered a reduction of health disparities.

Countries all over the world recognize that overcoming the health inequities experienced by indigenous peoples must be a high priority, and many have included this in their national agendas (de la Peña 2005; Valeggia and Snodgrass 2015). In Mexico, the *National Population Program 2014-2016* addresses the need to foster the well-being of indigenous communities and focuses on improving their social and economic development and access to health care (CONAPO 2014b). Findings about the role of migration on indigenous health disparities will help inform public health policies such that they also take into account the high mobility of indigenous populations and the consequences on their health.

CHAPTER 5

CONCLUSION

There are two themes that tend to dominate migrant health research: health selection effects and migration effects (Jasso 2013). The question about selection is primarily concerned with positive or negative selection on health across different migration streams (Jasso et al. 2004; Lu and Zhang 2015; Palloni and Morenoff 2001). The health change question is concerned with migrants' health trajectories (Jasso 2013)—namely, whether their health improves or deteriorates (or stays the same) over time following the migratory move (Anglewicz et al. 2017; Goldman et al. 2014; Nauman et al. 2015; Spallek et al. 2011). The answers to these questions depend largely on the study population, where individuals moved from, and their destination.

In this dissertation, I focused on the case of Mexico to study the pre- and post-migration health of return US migrants and internal migrants, and explore if their health trajectories changed as a result of migration. Prospective data from the Mexican Family Life Survey (MxFLS) allowed me to examine these issues in a methodologically appropriate way (Anglewicz et al. 2017; Goldman et al. 2014). The MxFLS is a nationally representative longitudinal survey of the well-being of individuals and families in Mexico (Rubalcava and Teruel 2006a, 2006b, 2013). Panel respondents were interviewed at three time points between 2002 and 2012. In the follow-up interviews, respondents were asked about any internal and international migration trips that occurred between interviews. In addition to detailed migration histories, the MxFLS includes repeated measures on a variety of social, economic, and household indicators.

I had four primary research goals: (1) identify health selection effects among both

Mexican internal and international migrants; (2) examine the effect of internal and international migration on health trajectories by using data from before and after migration; (3) compare the health trajectories of migrants and non-migrants from the same country of origin; and (4) investigate the role of migration on the health of indigenous Mexicans. These goals were addressed in three empirical chapters which investigated: health selection and changes in the health of return US migrants (chapter 2), health selection and changes in the health of internal migrants (chapter 3), and health selection and changes in the health of indigenous peoples who migrated internally (chapter 4).

I focused on overall health, measured by self-rated health, as the outcome of interest. Self-rated health is especially useful when studying populations that do not have widespread access to health care services (Wong, Peláez, and Palloni 2005), as is the case of most rural areas and indigenous populations in Mexico. Another advantage is that self-rated health measured over time is able to capture continuous and underlying changes in health that may occur before the emergence of a disease or a functional loss (Shaw and Krause 2002). In all analyses I estimated linear growth curves and compared migrants' trajectories to those of non-migrants. Below, I summarize the results from each empirical chapter, provide an overall assessment of the findings, and conclude with policy implications.

SUMMARY OF FINDINGS

Chapter 2 focused on the health of return US migrants. Return migrants were panel respondents who migrated to the US at any time between interviews, lived there for at least one year, and were back in Mexico at the time of the last interview. First, I examined if return migrants and non-migrants differed in early life health (measured by height) and baseline (pre-

migration) self-rated health. Results from logistic regression models provided evidence of positive health selection among Mexican return migrants—namely, being taller (which translates to good early life health) and reporting better initial self-rated health were significant predictors of having US migration experience. Next, I investigated whether the health of return migrants improved or deteriorated after migration, and if their health trajectories differed from those who stayed in Mexico at all times. Results from linear growth curves revealed that the self-rated health of return migrants worsened after migration, whereas the health of non-migrants improved during the same period. Moreover, while returnees reported substantially better pre-migration health than non-migrants, the return migrant /non-migrant disparity was substantially reduced after migrants' return.

Chapter 3 focused on the health of internal migrants. Internal migrants were panel respondents who migrated domestically to a different locality within Mexico at any time between interviews and lived there for at least one year. I stratified all analyses by gender given that Mexican internal migration is predominantly female and the motivations and patterns of migration vary substantially across men and women (Ariza and D'Aubeterre 2009; Curran and Rivero-Fuentes 2003; Sobrino 2010). First, I investigated health selection effects by comparing the initial (pre-migration) health of internal migrants and non-migrants, and examined whether their health trajectories differed over time. Results from linear growth curves showed no evidence of health selection or of migration effects on health: there were no significant differences between migrants and non-migrants in initial health and their health trajectories were similar over time (both groups experienced health improvements during the study period and a comparable degree of change). Results were similar for men and women.

Then, I examined if the characteristics of the migration trip were related to differences in

post-migration health among internal migrants. Results from lagged dependent variable ordinary least squares regressions revealed that the characteristics of the migration trip were indeed related to post-migration health, but the effects varied substantially by gender. Migrating at older ages and migrating to rural destinations were negatively related to men's post-migration health; age at migration and type of destination were not related to women's post-migration health. With regard to migration motivations, men who migrated for work/education or independence had worse health and those who migrated for safety reasons had better health than their counterparts who migrated for family reasons. Women who migrated due to health and safety reasons reported worse post-migration health than those who migrated for family reasons.

Chapter 4 focused on indigenous Mexicans and examined if internal migration was related to their health disparities. Indigeneity was defined as self-identifying as a member of an indigenous group. First, I explored health disparities between indigenous and non-indigenous respondents at the baseline and over time. Results from linear growth curves revealed expected and unexpected findings: indigenous respondents reported worse initial self-rated health than their non-indigenous counterparts, but they experienced a greater positive change in health over time. I then included an interaction term between indigenous status and internal migration to assess whether migration experience modified the association between indigeneity and health. I found that initial health and changes in health over time did vary across indigenous and migration status. Indigenous migrants reported better initial self-rated health than all other groups but their health deteriorated substantially after migration; on the other hand, the health of indigenous non-migrants and non-indigenous respondents improved during the study period.

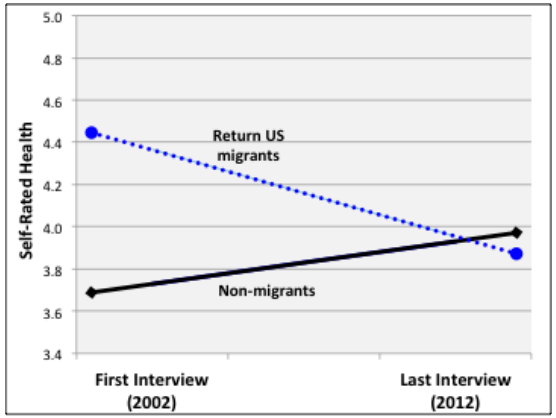
Taken together, the findings from this dissertation provide evidence of the reciprocal relationship between health and migration, but also reveal that this relationship operates

differently based on the destination and on the specific migrant population. To better summarize the findings, Figure 5.1 illustrates the main results from Chapters 2, 3 and 4 by depicting the health trajectories of return migrants vs. non-migrants (panel A), internal migrants vs. non-migrants[12] (panel B), and indigenous migrants vs. indigenous non-migrants (panel C). Overall, I found similar patterns among return US migrants and indigenous internal migrants: both groups exhibited evidence of positive health selection relative to their non-migrant counterparts, and both experienced a similar trend of health deterioration after migration. Internal migrants[13], on the other hand, were not significantly different from non-migrants in initial health or changes in health.

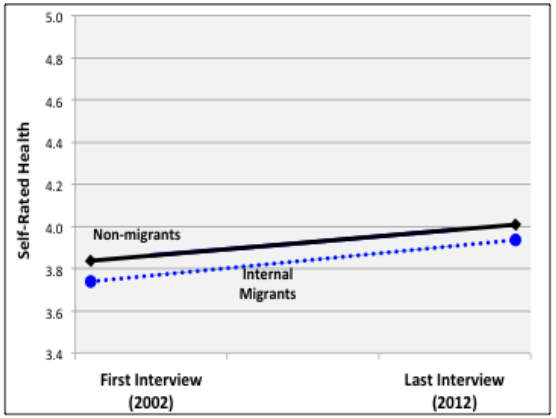
[12] The analyses of internal migrants were stratified by gender, but for ease of comparison I plotted the trajectories for the complete sample.
[13] Recall, internal migrants in Chapter 3 include all individuals who migrated internally between interviews, including indigenous peoples. However, the models adjust for the effects of indigenous status.

Figure 5.1 Self-rated Health Trajectories for Mexican Return Migrants, Internal Migrants, and Indigenous Migrants Compared to Non-Migrants

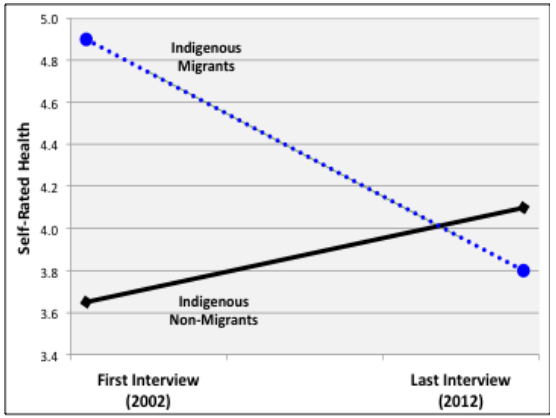
A. Return Migrants



B. Internal Migrants



C. Indigenous Migrants



RESEARCH AND POLICY IMPLICATIONS

There is a vast literature indicating that living in the US is detrimental for immigrants' health. However, findings from my dissertation suggest that it may not be US experience per se that is harmful for health; rather, migrating (either domestically or internationally) to more developed destinations may be detrimental for low-skilled individuals.

One possible explanation for different patterns uncovered in this dissertation could be the skill levels and types of occupations across these migrant groups. The majority of Mexican migrants in the US and indigenous internal migrants work in agriculture and other unskilled occupations (Anguiano 1993; Massey, Durand, and Pren 2016; Velasco-Ortiz 2014), which are physically taxing and require good physical health. This could potentially explain their positive health selection. Additionally, in the specific case of return migrants, given the high rates of undocumented migration, good health is potentially needed to endure the migrant trip (Montes de Oca et al. 2011). The deteriorating health of return migrants and indigenous migrants could also be related to the physical demands of their occupations, as well as to the fact that both groups may have to overcome cultural and linguistic barriers (Viruell-Fuentes 2007; Zabin and Hughes 1995). The extent to which this conjecture is true warrants further investigation. Future studies should also examine whether the internal migration-health relationship operates differently for low-skilled vs. high-skilled migrants. Low-skilled internal migrants may face more health risks such as carrying heavy loads, exposure to toxic substances, and working long hours (Benach et al. 2011), and thus may exhibit similar patterns as those found among return migrants and indigenous migrants.

The overall findings of this dissertation also underscore the reality that migrants are not a homogenous group. The results in Chapter 3 indicated that, as an aggregate group, Mexican

internal migrants were not positively selected on health and migration did not have an independent effect on their health trajectories. However, this finding obscures the experiences of ethnic minorities. By disaggregating internal migrants and investigating the particular experiences of indigenous Mexicans in Chapter 4, I uncovered significant health selection and evidence of health deterioration among a subset of internal migrants.

Findings also point to potential differences among migrants by gender. In this dissertation, I was able to estimate separate gender models in the internal migration analyses (Chapter 3) given that the sample size was sufficiently large. In these analyses I did not find gender differences in the effects of internal migration, but did find significant gender differences in the effects of the characteristics of the trip on post-migration health. There were few differences in the characteristics of female and male internal migrants, which could potentially explain why the migration effects on health are similar for men and women. In the case of US migration, prior research indicates that male and female migrants are different at the time of migration and also at the time of return (Abraído-Lanza et al. 2005; Lopez-Gonzalez et al 2005; Read and Reynolds 2012; Wong and Gonzalez-Gonzalez 2010). In the case of indigenous migrants, men and women tend to migrate at similar rates but their experiences in the destination are different in terms of, for example, occupation and contact with the health care system (Cárdenas Gómez 2014; Klein and Vazquez Flores 2013). Therefore, future research might potentially uncover gender differences in health upon return to Mexico between male and female return migrants, as well as between male and female indigenous migrants.

The distinct social, economic, and political climates in the origin and destination countries during different time periods may produce migrant cohorts that have different socioeconomic profiles and health stocks (Hamilton et al. 2015). Therefore, studies that include

various migrant cohorts could potentially under- or overestimate health selection and the effects of migration on health. An advantage of using a panel data such as the MxFLS is that it permits assessing the migration-health association among a cohort of individuals who migrated during the same period, thus adjusting for unmeasured contextual factors that could impact the health of migrants. The MxFLS interviews were conducted between 2002 and 2012, a period marked with changes in the Mexican and US contexts. In Mexico, there were substantial increases in the educational profile of the population (Villarreal 2006), as well as a continued downward trend in fertility rates (CONAPO 2014). In the US, this period saw more restrictive immigration policies, a rise in deportations, and an economic crisis resulting from the Great Recession (Masferrer and Roberts 2012; Parrado and Gutierrez 2016). These contextual conditions likely shaped who migrated during the MxFLS study period, as well as the consequences of migration.

On the other hand, a disadvantage of longitudinal data is attrition. To reduce attrition, most longitudinal studies use short windows between interviews to facilitate follow-up. In the MxFLS, there was an average of 3-4 years between interviews. While the short duration between follow-up interviews helps reduce attrition, it also prevents the examination of health effects that may take longer to manifest (Lu and Zhang 2015). Future studies should consider following migrants for longer periods of time in order to be able to uncover potential longer-term effects of migration.

The dissertation began by discussing Mexico's population policy and its concerns regarding the rise of return migration and changing patterns of internal migration. What are the policy implications of the results presented here? Findings about the deterioration of health following US migration have important implications for the Mexican health care system. As results show, migrants to the US tend to be selected from the healthier population; however, by

the time they return to Mexico, their health may reflect the cumulative toll of migration (Fernández-Niño et al. 2014; Montes de Oca et al. 2011). While their health upon return is similar to that of the non-migrant population, there is evidence that returnees tend to live in precarious conditions in Mexico, have high rates of underemployment and unemployment, and low rates of health insurance (Mestries 2015; Parrado and Gutierrez 2016; Wassink 2016). All of this could further deteriorate their health and increase their risk of long-term morbidity or mortality (Zimmerman et al. 2011). Therefore, future policy actions must focus on facilitating access to health, education, housing, and labor market for return migrants, as well as provide assistance in legal aspects related to return.

While the Mexican government recognizes the urgent need to address the wide health disparities experienced by indigenous groups (Comisión Nacional para el Desarrollo de los Pueblos Indígenas 2016; CONAPO 2014b), none of the 110 federal social programs related to health target the indigenous population (Leyva-Flores et al. 2014). Health disparities between the indigenous and non-indigenous populations remain, and policies need to address this issue. Prevention programs could focus on reducing health risks at the origin community, with a special focus on residents who have intentions to migrate in order to mitigate the potential negative health risks of migration (Ginsburg et al. 2016). Investments in indigenous communities would improve overall health, reduce indigenous health disparities, and potentially diminish the need to migrate. In addition, gathering information about the health of indigenous migrants at their destination may help inform public health policies to address health risks upon arrival and prevent their rapid health deterioration.

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