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Left Behind: The Effects of Offspring's Migration on Parental Mental Health in Mexico

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Abstract

In many developing countries, offspring are the primary caretakers of parents. Yet migration, also a common phenomenon in developing countries, may disrupt this process when offspring move away. This paper examines how adult children's migration status, both internally and internationally, affects the mental health of older parents who are left behind in Mexico, a developing country with a rapidly aging population and a long history of international migration to the United States. We use nationally-representative longitudinal data from the Mexican Family Life Survey and find that parents whose offspring immigrated to the United States experience increases in anxiety, sadness, loneliness and a wish to die compared to parents of offspring who did not migrate. Our results speak to a number of recent studies highlighting the ways in which immigration affects family processes in the sending context, the dynamics of which have traditionally been neglected in studies of international migration.

Key Words: Mexico, International Migration, Intergenerational Ties, Aging, Mental Health

INTRODUCTION

In most developed and developing countries, population aging challenges the public and social institutions responsible for elderly care. Developing countries face an additional burden of accelerated population aging due to a rapid demographic transition and a lack of institutional support for later-life persons (Palloni et al. 2000; Uthoff et al. 2005; Wong & Higgins 2007). In these contexts, offspring are the primary caretakers of parents and typically provide support through co-residence or geographic proximity. Yet migration, also a common phenomenon in developing countries, disrupts this process when offspring move away (Abas et al. 2009; Antman 2010; Kanaiaupuni 2000). The separation of families due to migration presents a stressful event for elderly parents who are left behind, with potential implications for older adults' mental health.

Previous research suggests that the main determinants of mental health in later life are related to the family's ability to provide instrumental care, the older adult's network of social support and her/his socio-economic conditions (Levkoff 1995). Migration may affect these determinants through two possible mechanisms. First, a child's absence caused by migration could lead to gaps in the proximate social or instrumental support received, thus negatively affecting parents' mental health. On the other hand, offspring's migration could signal the "launching" of offspring and further increase support to parents if remittances are sent.

The main goal of this paper is to examine how adult offspring's migration status, both internally and internationally, affects the mental health of elderly parents who are left behind in the country of origin. We use data from Mexico; a developing country with a rapidly growing elderly population. Individuals aged 65 and over currently represent the fastest growing share of the population, with a projected increase from 4.2% in 1995 to 12% by 2030 (Ordorica 1997). In addition, Mexico is the chief sending country of immigrants to the United States; approximately

9% of the population born in Mexico is now living north of the border (Passel 2006). Mexican immigrants account for 30% of all immigrants and more than half of the undocumented population residing in the United States. This is significant for later life well-being because undocumented status increases the barriers to offspring's return if and when parents are in need of support.

BACKGROUND

Theoretically, there are several reasons why the effect of migration on elderly well-being warrants our attention. First, developing countries experienced rapid population aging over the past half-century due to dramatic declines in total fertility rates and increased life expectancies among older individuals (Levkoff 1995). Second, social and economic transformations in developing countries have paralleled the demographic transition, leading to several uncertainties with respect to elderly well-being. An important consequence of rapid socioeconomic change is an increase in internal and international migration. In Mexico, circular migration to and from the United States has become a rite of passage for many young men in rural areas. A handful of migrants are seeking adventure; but most migrate to support their families through remittances or to accumulate savings for future investments (Kanaiaupuni 2000). Although most of the literature on international migration to and from Mexico has focused on men, women's internal migration has garnered attention as the demand for labor in the manufacturing and textile sectors has also increased (Kanaiaupuni 1999).

For elderly parents who have traditionally relied on offspring's assistance, migration presents a potential disruption to established patterns of instrumental and social support (Abas et al., 2009; Das et al. 2007; Kanaiaupuni 2000; Levkoff 1995). This is commonly known as the "abandonment" hypothesis and has been posited in studies that examine the effect of men's

migration on wives who are left behind and parents' migration on the effect of offspring left in the country of origin (Nobles 2008; Wilkerson et al. 2009).Yet few studies have examined the link between offspring's migration and parents' mental health specifically. These few studies found mixed results with respect to the association between offspring's migration and parents' mental health outcomes (Abas et al. 2009; Antman 2010).

In Mexico, a cross-sectional study using data on older individuals found evidence for the "abandonment" hypothesis when offspring's migration negatively affected parents' mental health status. Specifically, Antman (2010) found that offspring's migration to the United States increased the likelihood that parents felt depressed, lonely or sad in the week preceding the survey, although the exact timing of offspring's migration was not specified. Similar studies in Mexico also found negative effects of husbands' migration on wives' anxiety, sadness and loneliness (Nobles 2008; Wilkerson et al. 2009).

However, findings from Thailand suggest that parents whose offspring migrate are less likely to be depressed than those parents whose offspring never migrated (Abas et al. 2009). These findings speak to an alternative hypothesis to the "abandonment" theory; namely, the theory of "support" asserts that parents' pride or relief that offspring have been properly launched could lead to better mental health outcomes. In addition, migrant family members are more likely to financially help those left in the community of origin, thus contributing to the idea of familial support, rather than abandonment.

The mixed results of previous studies likely stem from the use of cross-sectional data. For example, a child's decision to migrate may in fact depend on parents' physical or mental health. Such behavior has been confirmed using data from other social contexts, where offspring delay migration when parents are in poor physical health (Giles and Mu 2007; Kuhn et al. 2011).

Without measures of parental health before and after the migration, disentangling the effect of migration on mental health is nearly impossible. Second, without indicators for other intervening events, it is difficult to separate the effects of migration from the effects of other events that offspring's migration may have caused. A likely example is the way in which offspring's migration will affect parents' socioeconomic status, which may in turn affect parents' mental health. Hence, we would ideally like to control for both socio-economic status before and after migration. Finally, the use of cross-sectional data prevents researchers from investigating other intervening events unrelated to the migration process (e.g., the loss of a spouse), but equally influential on parents' mental health.

Previous researchers use instrumental variables as one way to correct for the potential bias associated with using cross-sectional data. For example, Antman (2010) uses the sex and married ratios of elderly respondent's offspring as an instrument for a child's migration that is unrelated to parental mental health. Although she found that the effect of offspring's migration on parents' physical and mental health was evident without the use of instruments, controlling for potential selection into migration greatly increased the magnitude of the migration effect (Antman 2010).

Our paper fills a gap in the literature by using longitudinal data from the Mexican Family Life Survey (MxFLS) to examine whether offspring's migration affects the mental health of older parents over time. We distinguish between domestic migrants and international migrants to the United States to assess whether offspring's migration affects parents' mental health differently depending on offspring's destination. This is an important distinction given the barriers and costs associated with international migration to the United States, a large share of

which is undocumented. To our knowledge, previous research on the effects of migration on parents' mental health has not distinguished between offspring's migration destinations.

Although the focus of this paper is on offspring's migration, we cannot ignore numerous other demographic traits, prior characteristics and intervening life events that may also affect parents' depression. First, several demographic characteristics are consistently associated with elderly mental health. These include individual's age, sex and educational attainment. Previous research shows that aging is correlated with increased levels of depression in developing countries (Das et al 2007; Antman 2010). In addition, similar to developed countries, women in developing countries are more likely to suffer from depression than their male counterparts. As a long term indicator of socioeconomic status and potential measure of access to public health resources, education is typically negatively associated with poor health outcomes (Das et al. 2007; Antman 2010).

Second, prior conditions before a child's migration are likely to be correlated with parents' depression and the decision of a child to migrate. These include parental physical health (Das et al. 2007) and previous mental health status which are strong predictors of future mental health outcomes and are known to affect offspring's' decision to migrate (Giles and Mu 2007; Kuhn et al. 2011). Household socioeconomic status and support within the household are also linked to elderly mental health and may also affect an offspring's decision to migrate (Levkoff 1995). Additionally, parents who are themselves former migrants may be less likely to suffer when offspring migrate because they themselves have either accumulated sufficient capital allowing them to rely less on offspring (Wong et al. 2007), or are more likely to be imbedded in a culture of migration and have normative expectations of offspring's migration (Kandel and Massey 2002).

Third, intervening life events that are also likely to affect mental health outcomes are the experience of an economic shock or the experience of losing a spouse. Das et al. (2007) found significant variation in the association between individual incomes and elderly depression across countries. However, the authors note that income may not capture more important household economic characteristics, such as the experience of a financial disruption (e.g., through a natural disaster or long-term sickness of a household member), which could have a greater influence on mental health outcomes than that predicted by income or expenditures alone (Das et al. 2007: 477). Finally, previous literature has shown how the probability of poor mental health is likely to increase during separation, divorce and widowhood (Levkoff 1995; Das et al. 2007).

METHODS

Data

We use data from the Mexican Family Life Survey (MxFLS), an ongoing nationally-representative longitudinal survey of individuals, households, and communities with over 35,000 individuals who were interviewed in 2002 and again in 2005. Re-contact rates in 2005 were over 90%. This survey is unique in that it follows and interviews Mexico-U.S. migrants across the border, facilitating an understanding of family reunification and disintegration in both countries.

The MxFLS is particularly well-suited to address our research questions for several reasons. First, it is a panel study that includes a mental health questionnaire which was conducted in 2002 and 2005 for all respondents age 15 or more, which allows us to examine change in some aspects of mental health that may be triggered by offspring's migration. Second, the data allow us to identify adults whose offspring migrated to the United States from adults whose offspring migrated within Mexico. This feature permits the comparison of mental health effects from two different types of migration (international versus domestic migration). Third,

the study includes a rich set of socio-economic and demographic characteristics as well as physical health measures of health. Fourth, the MxFLS measures several intervening events that may also affect mental health, which can be controlled for in our analysis.

Based on the full MxFLS sample in 2002, 2.4% of respondents moved to the United States and were living there in 2005 when the second wave was conducted (Rubalcava *et al*, 2009). With respect to domestic migration, 8% of baseline respondents moved within Mexico to a different locality for at least one year. In the MxFLS, geographic units distinguish between localities (towns), which are subsumed within municipalities (counties), which are subsumed within states. Although 8% of the respondents reported having moved for at least one year to a different locality, only 1.5% of the sample was living in another locality when the second wave was conducted, the rest of the individuals had returned to their original households in 2005. One important characteristic of this subgroup of domestic migrants is that about 50% moved to another locality within the same municipality, about 25% moved to another municipality within the same state, and about 25% moved to another state. In this paper, we focus on parents whose offspring migrated and were not living in the household during the second wave.

Measures

Dependent Variables

The MxFLS mental health module includes 21 questions assessing several aspects of individuals' emotional well-being. Our dependent variables capture a range of indicators for mental health status. The main indicator is the Calderón measure of depression which is based on the first 20 questions of the mental health module. Possible answers range from *No* to *All the time* using a 4-point scale. These questions were designed and tested by researchers at the Mexican Institute of Psychiatry to diagnose depressive symptoms and have proven reliable in the past (Calderón,

1997). In our study, the measure is also highly reliable (α=.91 in 2002 and α=.94 in 2005). Items include questions asking the respondent how often he/she experiences sadness, lack of energy, difficulty concentrating, less appetite, obsessive, nervous/anxious, tired, insecure, useless, lonely, and wishes to die, among others. The final scale is created by summing these values and potential values range from 20 to 80. A higher score indicates a greater number of depressive symptoms. Other variables that we examine include whether the respondent expresses anxiety, sadness, loneliness or wishes to die. To measure these concepts we use questions related to each of these emotions which are part of the Calderón scale and generate a simple dichotomous variable with a value of 1 if the respondent reports experiencing any of these feelings (see Appendix A for details of which items we use to construct each outcome).

Independent Variables

Our main independent variable of interest is whether the respondent has an adult child who migrated between 2002 and 2005. International migration is a dichotomous variable for whether the respondent had at least one child who migrated to the United States and no child migrated domestically. Offspring's migration to the United States is measured when the child is still living in the United States in 2005. In our analysis we do not consider cases in which offspring migrated to the United States between 2002 and 2005, but had returned home by 2005.

Internal migration is a dichotomous variable indicating whether at least one child migrated internally and no child migrated to the United States. As in the previous case, we do not consider those who move and returned home between 2002 and 2005 as domestic migrants. Domestic migrants are defined as those living in a different locality in 2005 from where they were living in 2002. We do not distinguish between offspring who move to different localities, municipalities or states; all are considered domestic migrants in our analysis. However, we know

that in our analytical sample 15% of offspring moved to a different locality within the same municipality, 25% moved to another municipality within the same state, and 55% moved to another state. The few cases where parents had offspring who migrated internally *and* internationally were excluded from our sample (n=6).

Demographic characteristics include age in 2002, which we measure using a categorical variable for respondents aged 50 and younger and 51 and over. We also include male as a dichotomous variable and rural residency status in 2002 as a dichotomous variable. Educational attainment is measured using a continuous variable for total years of schooling in 2002.

Prior characteristics include respondent's mental health status, physical health status, household level characteristics and the respondent's own migration history in 2002. Mental health measures are described in the previous section. Physical health measures include respondent's self-rated poor general health status, which is a dummy variable indicating whether respondents rated their health as regular, bad or very bad; poor relative health status, which is a dummy variable indicating whether respondents rated their health as the same as, worse than or much worse than others of a similar age and sex. We also include an indicator variable for whether a respondent reported having at least one chronic condition in 2002. Household size is measured as a continuous variable and potentially captures the availability of social and instrumental support in the household in 2002. We also include household expenditure as a continuous variable, which we transform using the natural logarithm. The respondent's migration history, which indicates his/her own familiarity with a "culture" of migration as well as potential wealth accumulated from previous migration(s), is also included as a dummy variable indicating whether the respondent ever lived for at least one year in a different locality from the one he/she was living in at the age of 12. This includes both internal and international migration histories.

Finally, we include two important intervening events unrelated to a child's migration that could also affect parents' mental health. We include a dummy variable indicating whether the respondent experienced the loss or separation from a spouse between 2002 and 2005. We also include an indicator for whether the respondent experienced an economic shock unrelated to a child's migration that occurred in the past five years. This could include the death of a household member, accident or sickness experienced by a household member, unemployment of a household member or failure of a family business, or the effects of a natural disaster. See Appendix A for a more detailed explanation of how we measured explanatory variables.

SAMPLE

In 2002, MxFLS interviewed 23,815 individuals aged 15 or older. Among those respondents, about 60% lived with at least one biological child. Although we originally planned to limit our analysis to only those over age 50, the small number of older adults who actually experience a child's migration between 2002 and 2005 forced us to expand our sample to gain more statistical power. Considering our interest in adults who are *left behind* when their offspring migrate, we exclude from the sample any adults who were themselves international or domestic migrants. These conditions leave us with a sample of 13,517 age-eligible respondents. Of these 13,517 adults, 643 were lost due to attrition in 2005. 3,560 respondents had missing values on the mental health outcomes and 1,492 had missing values on the independent variables used in the analysis. Thus from 13,517 age-eligible respondents our analytical sample comprises 7,825 parents with at least one co-resident child living in Mexico in 2002 and 2005.

Attrition Analysis

Non-randomness of those included in the analytical sample was a concern, in particular if selection into the sample was correlated with mental health status at baseline and if offspring's

migration type was correlated with the likelihood of being in the sample. To deal with this problem, we explore potential biases associated with missing data in the following way. First, we ran logistic regressions predicting the odds of being in the analytical sample as a function of each one of the mental health outcomes in 2002 (e.g. expressing anxiety, sadness, loneliness or wishes to die) and found that in the presence of controls for age, sex, education, and rural origin in 2002, respondents included in the analytical sample are more likely to experience anxiety ($p<.01$) or sadness ($p<.01$). However, we find no significant differences between respondents in the analytical sample and respondents not included in the sample in the cases of depressive syndrome ($p=.125$), expressing loneliness ($p=.838$) and expressing a wish to die ($p=.472$). Second, to explore whether having a migrant offspring was associated with being in the analytical sample, we estimated a logistic regression predicting the odds of being in the analytical sample as a function of having a migrant child; we found that, net of age, sex, education, and rural origin, parents with migrant offspring (living in the United States and in Mexico) were more likely to be in the analytical sample than parents of non-migrants ($p<.01$ and $p=.01$). Finally, we ran an ordinary least squares regression model using education in 2002 as the outcome variable and an indicator variable for whether individuals were in the analytical sample and found that, net of age, sex, and rural origins, the educational attainment of those in the analytical sample do not differ from those not included in the sample ($p=.125$).

With respect to anxiety and sadness, the attrition analysis indicates that any effects we may find from our analysis may be biased. Specifically, the effects of offspring's migration on parents' negative mental health may be overestimated given that parents who remain in the sample in 2005 are more likely to be anxious and sad at baseline compared to those not included.

Descriptive Statistics

Table 1 shows the characteristics of the sample. The first panel shows that 4.8% of adults experienced the migration of at least one of their offspring due to migration to the United States between 2002 and 2005. Similarly, 2% of adults experienced separation due to a child's domestic migration within Mexico.

The second panel of Table 1 shows that approximately 24% of the sample is older than 50[1], 38% is male, the majority of respondents have a little more than 6 years of education and 30% is of rural origin. The second to fourth column of the second panel of Table 1 shows sample characteristics by offspring's type of migration. We find that compared to adults whose offspring have not migrated, adults who experience the loss of a child due to migration tend to be older, which may reflect the fact that younger adults are more likely to have younger offspring who are not old enough to migrate. Parents of U.S. migrants tend to be more educated compared to domestic migrants' parents, yet parents of non-migrants have the highest level of average education. Non-migrant offspring's parents are the least likely to live in rural areas (27%), followed by U.S. migrants' parents of whom approximately 47% are of rural origin and domestic migrants' parents of whom 63% live in rural areas.

The third panel of Table 1 shows the characteristics of the sample in 2002, before offspring's potential migration. It includes physical health status, socio-economic conditions and previous migration history of the adults included in the sample. In terms of physical health for the entire sample, we observe that approximately 57% of the adults reported having poor general health status in 2002, 65% reported having poor general health status compared to others of the same age and sex, and 49% reported having at least one chronic condition. When we examined

[1] A finer breakdown of the age distribution would look like this: 23% are between ages 14 to 30; 53% between 31 and 50; and 24% are older than 50. However, because we were interested in the interactions between age and migration and there were very few cases within each migration-age group, we decided to simplify our age categories to distinguish between two groups only: parents older than 50 and parents 50 or younger.

the physical health characteristics by type of offspring's migration, we observe that U.S. migrants' parents are more likely to report poor general health status (69%) compared to domestic migrants' parents (63%); while non-migrant offspring's parents reported having the least general health problems (56%). No important differences are observed in the measures of relative poor health status and chronic conditions among the groups.

Socio-economic characteristics of the full sample indicate that the average household size in 2002 included 5 members and the log of household expenditure was 8.3. The average household size among parents with migrant offspring is 6 members in 2002. The table shows that for the entire sample, approximately 32% reported having lived for at least one year in another locality from the location where they lived when they were 12 years old.

The fourth panel of Table 1 presents statistics of intervening events that may have an effect on mental health which are not related to migration. For the entire sample, approximately 2.3% of adults become widowed, divorced or separated between 2002 and 2005. The statistics by type of offspring's migration show that about 1% of the parents whose offspring move to the U.S. become widowed, divorced, or separated, while 1.3% of parents of domestic migrants experience the loss of a spouse through separation, divorce or death. Finally, the table shows that approximately 13% of the sample reported experiencing an economic shock, with parents of international migrants (13%) less likely to report an economic shock than parents of a domestic migrant (19%).

Table 2 shows descriptive statistics for mental health outcomes. The first column describes statistics for the entire sample, and the second to the fourth columns present the information by type of offspring's migration. The first panel shows the average individual values of parent's mental health outcomes for 2002 and 2005 and the difference in values between the

two waves. For the entire sample, we observe a decrease in depressive syndrome of approximately 1.19 points; we also observe a decline of approximately 11% in the number of individuals reporting anxiety, 6.7% in the numbers of individuals reporting sadness, and 4.6% of individuals reporting loneliness. Regarding expressing wishes to die, we do not see any substantial change. The analysis by type of offspring's migration shows similar trends for all groups, with the exception of expressing loneliness and wishes to die for parents with offspring who migrated to the United States, where the trend is upward, meaning that on average the percentage of parents reporting feeling loneliness increased by 2.2% and the parents reporting wishes to die increased by 7.7%.

The second panel of Table 2 shows difference-in-difference estimators that were estimated by running weighted OLS regression models for the difference in each mental health outcome on dummies for offspring's migration status without using control variables. The coefficients are presented in the second panel of Table 2. We find that there is a significant difference (p=.05) in the percentage of parents expressing loneliness when their offspring migrate to the United States (2.2%) compared to parents with no migrant offspring (-4.8%). Similar results are obtained for expressing wishes to die (p=.012). When we compare parents of domestic migrants with parents of no migrant offspring we observe no significant differences in changes in mental health. Finally, if we compare U.S. migrants' parents versus domestic migrants' parents, we again find a significant difference in parents expressing loneliness (p=.086) and a wish to die (p=.005).

ANALYTIC STRATEGY

To assess the impact of offspring's migration on parents mental health outcomes we use ordinary least squares regression models where the outcome variable is the change in the mental health

outcome between 2002 and 2005 (i.e. depressive syndrome, expressing anxiety, expressing sadness, expressing loneliness, expresses wish to die).[2] The main goal of the analysis is to examine how adult offspring's migration, considered as an event, affects the change in mental health of elderly parents who are left behind over time. We explore this by: (1) including as explanatory variables two dummies for offspring's migration – internal and international migration; (2) categorizing adults into two age groups; and (3) including an interaction term between age group and type of offspring's migration to see whether the elderly experience offspring's migration differently from their younger counterparts. We adjust standard errors to account for clustering at the household level given that both mothers and fathers of the same migrant child may be included in the analytical sample.

We examine the joint significance of the interaction terms' coefficients. For those outcomes with significant interactions, we estimate the effect of offspring's migration to the United States on the change in mental health for those aged 51 or more by adding the coefficients of offspring's migration to the United States and the interaction between U.S. migration and age. We control for other characteristics that individuals reported at baseline that may affect the change in mental health, such as prior conditions, previous migration history, and other intervening events not related to migration. To examine whether physical health has a significant effect on the change on mental health, we conduct tests of joint significance of all physical health coefficients.

Finally, in order to investigate if there are significant differences between the effect of offspring's international migration versus internal migration on parents' mental health, we re-

[2] Precedence for using similar models is found in the effects of divorce on mental health literature (Menaghan and Liebermann 1986; Williams and Umberson 2004).

estimate the same models described before and change the reference category for the migration variable from parents of non-migrants to parents' with migrants to the United States. We do not present the tables from these models in the paper, but we do mention in the analysis whenever we find significant differences between this two groups.

RESULTS

Table 3 shows the results from the OLS regressions for each one of the mental health outcomes of interest: depressive syndrome, anxiety, sadness, loneliness, and wish to die. We will focus the discussion of our results on the coefficients obtained for U.S. migration, domestic migration, age, and the interaction between these two.

Depressive Syndrome

The first column of Table 3 shows no significant differences in the change in depressive syndrome between parents whose offspring migrated, either internally or to the United States, compared to parents whose offspring did not migrate, net of demographic characteristics, prior conditions in 2002 and intervening events. Moreover, the interactions of age and migration are not jointly significant ($p=.540$) which indicates that the effect of migration on parental mental health does not vary by the parent's age.

The results for the demographic variables show that, net of the other explanatory variables in the model, parents older than 50 show a greater increase in depressive syndrome compared to younger parents. Furthermore, males experience a lower change in depression syndrome than females, and one additional year of education decreases depressive syndrome levels by 0.12 points. The results for time 1 characteristics show that an increase in one point in depressive syndrome at baseline significantly decreases ($p<.005$) the change in depressive syndrome (potentially due to a ceiling effect), physical health at baseline has a significant effect

on the change in depressive syndrome as shown by the test of joint significance for all physical measures together (p<.005), but socioeconomic characteristics in 2002 (i.e. household size and log of household expenditure) do not have a significant effects in the change in depressive syndrome. Previous history of parents' migration does not seem to affect the change in depressive syndrome.

Finally, intervening life events significantly affect the change in depressive syndrome. As expected, changes in depressive syndrome are greater for individuals who become widowed, divorced or separated compared to individuals who remained single, married or in a union. Moreover, changes in depressive syndrome are greater for parents who experience an economic shock within the last five years compared to those who do not experience any economic shock.

Expressing Anxiety

The second column of Table 3 shows that, net of demographic traits, prior characteristics and intervening events, 6% more parents reported anxiety when their offspring migrated to the United States compared to parents whose offspring did not migrate. According to the analysis of missing values, these results may overestimate the effect of migration. The effect of offspring's migration within Mexico on the change in parents' anxiety is not significant in our analysis (p=.507). The interactions between age and migration are not jointly significant (p=0.345) which indicates that the effect of migration does not vary by age.

The results obtained for the demographic characteristics and conditions at baseline are similar in direction and significance to those described for the depressive syndrome analysis. The only difference appears in the impact of intervening life events on changes on mental health, where we do not find significant differences when parents became widowed, divorced or separated compared to those who remain single, married or in a union. However, parents who

experience an economic shock show a significant increase in anxiety compared to those who do not experience shocks ($p<.005$).

Expressing sadness

The third column of Table 3 shows a significant effect of offspring's migration to the United States on parents' sadness and the effect varies by age group (the test of joint significance for the interaction of migration and age is $p=0.04$). To estimate the effect of offspring's migration to the United States on the population aged 51 or more, we add the coefficients of offspring's migration to the U.S. and the interaction between U.S. migration and age. The sum of the coefficients indicates that net of other characteristics in the model, 4% more parents reported sadness when they were older than 50 years old and their offspring move to the United States, compared to the change in the percentage of parents reporting sadness who are 50 or younger with non-migrant offspring. According to the attrition analysis, these results may be overestimated. The effect of offspring's migration within Mexico for parents age 50 or younger on the change in the percentage of parents expressing sadness is not significant in our analysis ($p=.373$). However, 18% more parents reported sadness when they were older than 50 and their offspring migrated within Mexico compared to the change in the percentage reporting sadness of parents age 50 or younger with no migrant offspring.

From the ancillary OLS regressions (not presented here) where we change the reference category of the migration variable, we find a significant difference between parents whose offspring migrated to the United States and parents whose offspring migrated internally. In particular, 15% more parents reported an increase in sadness when they were older than 50 and their offspring migrated internally compared to younger parents whose offspring migrated to the

United States (p=.01). Results for the control variables in the model are similar to those examined in the case of expressing anxiety.

Expressing loneliness

The fourth column of Table 3 shows that net of demographic and prior characteristics as well as intervening events, 5% more parents reported loneliness when their offspring move to the United States compared to those parents reporting loneliness with non-migrant offspring. The effect of offspring's migration within Mexico on feeling lonely is not significant in our analysis (p=.791). The effect of offspring's migration on parents' mental health does not vary by parents' age (p=.565).

Results for the control variables in the model are similar in direction and significance to those examined in the case of expressing anxiety, with the exception of rural origin which in this case is not significant, and becoming widowed, divorced or separated which becomes significant, meaning that 7% more parents reported feeling lonely when they became widowed, divorced or separated compared to those who remained single, married or in a union (p=.002), net of other variables in the model.

Expressing wishes to die

The last column of Table 3 presents results for expressing wishes to die. We find that 5% more parents reported wishes to die when their offspring migrate to the United States compared to those whose offspring did not migrate. The effect of offspring's migration within Mexico on parents' wishes to die is not significant in our analysis (p=.838). Furthermore, the effect of migration on parents' wishes to die does not vary by age of the parents (p=0.827). Results for the control variables in the model are similar to those examined in the case of expressing anxiety, with the exception of parents' rural origin, which in this case it is not significant.

DISCUSSION

Results from our study find general support for the "abandonment" of parents who are left behind when offspring migrate to the United States. Specifically, parents whose offspring migrate to the United States between 2002 and 2005 have a higher predicted increase in levels of anxiety, sadness, loneliness and a wish to die compared to parents of offspring who did not migrate. However, we found no significant effects of migration on parents' mental health for offspring who migrate domestically compared to parents whose offspring never left. Results from ancillary regressions (not shown here) suggest that the effect of offspring's migration to the United States differs significantly from the effects of having a child who migrates within Mexico for outcomes related to a change in sadness only. Finally, we found few interaction effects to suggest that the association between a change in parent's mental health status and offspring's migration status varied across parental age.

Through the use of longitudinal data, a major contribution of this paper was the mitigation of several endogeneity problems plaguing previous research. First, we address the problem of reverse causation by measuring our outcome variable as the difference between parents' mental health in 2002 and 2005. In our panel data, we know that the event of migration must have happened before the second measure of parents' mental health was taken in 2005. Second, we include intervening events such as experiencing economic shocks or spousal separation that could also affect changes in mental health, but are not consequences of offspring's migration itself. Finally, we control for prior characteristics in 2002 that potentially affect both offspring's decision to migrate and parents' mental health status. These include parental socioeconomic status and perhaps more importantly, parental mental and physical health status in 2002.

CONCLUSION

Although our findings use panel data to correct for many of the problems found using cross-sectional research, we are also aware of limitations to the analysis. First, the attrition analysis suggests that older individuals who remain in the sample were originally more anxious and sad compared to those not in the sample. This suggests that for these outcome measures, our results may be biased. Second, our non-significant results comparing parents of domestic migrant offspring to parents whose offspring did not migrate should be interpreted with caution given the small number of parents whose offspring were internal migrants (n=147). Third, our research findings are limited to a specific subgroup of parents with co-residing offspring in 2002. We can only examine how offspring living at home affect their parent's mental health upon migration and cannot make broader claims about the effect of offspring's migration on parents' mental health for those offspring who already left home. There are several reasons to believe that offspring living at home may differ from those who already left. For example, offspring living at home are likely to be younger than those who have already established their own homes and parent-child relationships may be closer than those offspring who do not reside with parents. In addition, the migration of younger offspring may also signal the emptying of the parental nest, which may trigger any number of depressive symptoms for parents. For these reasons, parents' reaction to the migration of those who live at home may be particularly acute.

We plan several next steps to our analysis. First, we will include offspring's remittances sent to parents to examine whether the negative effects of offspring's migration on the change in parents' mental health is mitigated by offspring's financial help. Such findings would provide evidence for a support hypothesis; a test of which was not completed here. Second, we will include the number of offspring who migrate as opposed to a simple dummy indicator of any

child's migration with the idea that the change in mental health may be related to the intensity and not just the occurrence of offspring's migration. Third, we plan to conduct additional sensitivity analyses to examine how our results might change if those who are lost to attrition have disproportionally better or worse mental health than those who remain in the sample.

In developing countries such as Mexico, internal and international migration plays an important role in family life. For many families, a spouse's, parent's or offspring's migration enhances potential family resources by increasing the pool of financial capital and social capital through migration. Yet the positive effects of migration should not obscure the potential negative consequences of migration as well, particular among family members who may be reliant on the proximate support of kin who emigrate. In our study, we find that adult offspring's migration to the United States negatively affects the mental health of parents who are left behind. Our results speak to many recent demographic studies highlighting the ways in which migration affects family processes in the sending context. In this way, we argue that any positive or negative evaluation of the effects of migration cannot be tallied on only one side of the border. Because migration involves the sending and receiving of individuals across space, more research must be conducted on the ways in which migration affects family processes in both locations.

BIBLIOGRAPHY

Abas, M., S. Punpuing, t. Jirapramulpitak, P. Guest, K. Tangchonlatip, M. Leese, M. Prince. 2009. "Rural-Urban migration and depression in ageing family members left behind." British Journal of Psychiarty. 195: 54-60.

Antman, Francisa. 2010. "How Does Adult Child Migration Affect the Health of Elderly Parents Left Behind? Evidence from Mexico." (Under Review)

Calderón G.N (1997) "Un Cuestionario para Simplicar el Diagnóstico del Síndrome Depresivo" Revista de Neuro-Psiquiatría, 60:127-135.

Das, J., Q. Do, J. Friedman, D. MacKenzie, K. Scott. 2007. "Mental health and poverty in developing countries: revisiting the relationship." *Social Science and Medicine.* 65(3): 467-480.

Giles, J, R. Mu. 2007. "Elderly Parent Health and the Migration Decisions of Adult Offspring: Evidence from Rural China." *Demography* 44 (2): 265-288.

Kanaiaupuni, Shawn Malia. 2000. "Reframing the Migration Question: Men, Women, and Gender in Mexico." Social Forces 78(4): 1311-1348.

Kanaiaupuni, Shawn Malia. 2000. Leaving Parents Behind: Migration and Elderly Living Arrangements in Mexico (Working Series Paper, No. 99-16). Madison: University of Wisconsin, Center for Demography and Ecology.

Kandel, W., D. Massey. 2002. "The Culture of Mexican Migration: A Theoretical and Empirical Analysis." *Social Forces.* 80(3): 981-1004.

Kuhn, Randall, Bethany Everett, and Rachel Silvey. 2011. "The Effects of Offspring's Migration on Elderly Kin's Health: A Counterfactual Approach." *Demography.* 48(1):183-209.

Levkoff Sue E., Ian w. Macarthur, and Julia Bucknall.1995. "Elderly Mental Health in the Developing World", , Soc. Sci. Med. Vol. 41, No. 7, pp. 983-1003, 1995

Menaghan, E. and M. Lieberman. 1986. “Changes in Depression following Divorce: A Panel Study.” *Journal of Marriage and Family*. 48(2): 319-328.

Nobles, Jenna. 2008. “The Sending Experience of Mexican Migration: Decision making, time-se, and psychological distress among women in Mexico.” *Paper presented at the American Sociological Association meeting.*

Ordorica, Manuel. 1997. “Cambios en la Estructura Por Edad de la Poblacion [Changes in the Population Age Structure by Age]” DEMOS 12:8-10.

Palloni, A., Pelaez, M., & De Vos, S. (2000). Aging in Latin America (Working Series Paper, No. 99-2). Madison: University of Wisconsin, Center for Demography and Ecology.

Passel, Jeffrey S. 2006. The Size and Characteristics of the Unauthorized Migrant Population in the U.S. ,38783 Pew Hispanic Center Research Report

Rubalcava, Luis, Graciela Teruel, Erika Arenas, and Christian Herrera. 2009. “Tracking beyond borders: Mexican Family Life Survey experience”, Working Paper

Uthoff Andras, Jorge Bravo, Cecilia Vera y Nora Ruedi. 2005. “Cambios en la estructura por edades de la población, transferencias, intergeneracionales y protección social en América Latina”, CEPAL

Williams, K., D. Umberson. 2004. “Marital Status, Marital Transition and Health." *Journal of Health and Social Behavior*. 45 (1): 81-98.

Wilkerson, J., Niwako Yamawaki, S. Downs. 2009. “Effects of Husbands' Migration on Mental Health and Gender Role Ideology of Rural Mexican Women.” *Health Care for Women International*. 30(7): 612 – 626.

Wong, Rebeca and Monica Higgins. 2007. Dynamics of Intergenerational Assistance in Middle- and Old-Age in Mexico in Health of Aging Hispanics, edited by Jacqueline L. Angel and Keith E. Whitfield. New York: Springer Publishing.

Wong, R., A. Palloni, B. Soldo. 2007. "Wealth in Middle and Old Age in Mexico: The Role of International Migration." International Migration Review. 41(1): 127-151.

Zuñiga, Elena, Daniel Vega.2004. Envejecimiento de la Población de México Reto del siglo XXI. Consejo Nacional de Población.

Table 1. Descriptive Statistics of the sample by type of children's migration*

	All the sample (N=7827)	No Migrant Children (N=7268)	With U.S. Migrant Children (N=412)	With Domestic Migrant Children (N=147)
	Mean	Mean	Mean	Mean
Migration of at least one children				
To the United States	0.048	0.000	1.000	0.000
	(0.21)	(0.00)	(0.00)	(0.00)
Domestically within Mexico	0.020	0.000	0.000	1.000
	(0.14)	(0.00)	(0.00)	(0.00)
Demographics				
Age in 2002				
50 or younger	0.758	0.762	0.702	0.668
	(0.43)	(0.43)	(0.46)	(0.47)
51+	0.242	0.238	0.298	0.332
	(0.43)	(0.43)	(0.46)	(0.47)
Male	0.376	0.374	0.404	0.415
	(0.48)	(0.48)	(0.49)	(0.49)
Education in 2002	6.400	6.565	4.202	3.987
	(4.52)	(4.51)	(4.03)	(4.22)
Rural in 2002	0.287	0.271	0.466	0.625
	(0.45)	(0.44)	(0.50)	(0.49)
Time 1 Characteristics				
Physical Health				
Poor General Health Status	0.569	0.562	0.693	0.633
	(0.50)	(0.50)	(0.46)	(0.48)
Relative Poor Health Status	0.653	0.652	0.683	0.623
	(0.48)	(0.48)	(0.47)	(0.49)
Chronic Conditions	0.336	0.337	0.340	0.299
	(0.82)	(0.82)	(0.84)	(0.79)
Household Size	5.152	5.075	6.280	6.018
	(2.05)	(2.01)	(2.36)	(2.43)
Log of Household Expenditure	8.321	8.328	8.226	8.186
	(0.98)	(0.98)	(0.98)	(0.90)
Previous migration history	0.319	0.320	0.287	0.313
	(0.47)	(0.47)	(0.45)	(0.47)
Intervening Life Events				
Becoming widowed/divorced/separated	0.023	0.024	0.009	0.013
	(0.25)	(0.25)	(0.22)	(0.21)
Economic Shocks	0.134	0.133	0.127	0.188
	(0.34)	(0.34)	(0.33)	(0.39)

Source: Mexican Family Life Survey 2002 and 2005

* Calculations are weighted and standard deviations in parenthesis.

Table 2. Mental Health outcomes by type of children's migration[(1)] *

	All adults (N=7827)			No Migrant Children (N=7268)			With U.S. Migrant Children (N=412)			With Domestic Migrant Children (N=147)		
	2002	2005	Δ	2002	2005	Δ1	2002	2005	Δ2	2002	2005	Δ3
Depressive Syndrome	27.326	26.137	-1.189	27.234	26.045	-1.189	28.673	27.782	-0.891	28.387	26.436	-1.951
	(7.41)	(7.83)	(0.39)	(7.33)	(7.74)	(0.38)	(8.59)	(8.48)	(10.16)	(8.05)	(10.06)	(10.53)
Expresses anxiety	0.613	0.499	-0.114	0.611	0.496	-0.115	0.635	0.564	-0.071	0.635	0.484	-0.151
	(0.49)	(0.50)	(0.00)	(0.49)	(0.50)	(8.59)	(0.48)	(0.50)	(0.64)	(0.48)	(0.50)	(0.62)
Expresses sadness	0.650	0.583	-0.067	0.648	0.579	-0.069	0.687	0.671	-0.016	0.633	0.550	-0.083
	(0.48)	(0.49)	(0.00)	(0.48)	(0.49)	(8.48)	(0.46)	(0.47)	(0.55)	(0.48)	(0.50)	(0.60)
Expresses loneliness	0.276	0.230	-0.046	0.273	0.225	-0.048	0.299	0.321	0.022	0.329	0.238	-0.091
	(0.45)	(0.42)	(0.00)	(0.45)	(0.42)	(0.48)	(0.46)	(0.47)	(0.59)	(0.47)	(0.43)	(0.53)
Expresses a wish to die	0.104	0.105	0.002	0.101	0.100	-0.001	0.139	0.216	0.077	0.161	0.092	-0.070
	(0.31)	(0.31)	(0.00)	(0.30)	(0.30)	(0.50)	(0.35)	(0.41)	(0.48)	(0.37)	(0.29)	(0.43)

	Difference		Difference		Difference	
	Δ2-Δ1	p-value	Δ3-Δ1	p-value	Δ3-Δ2	p-value
Depressive Syndrome	0.298		-0.762		-1.060	
	(0.67)	*0.655*	(1.02)	*0.454*	(1.20)	*0.377*
Expresses anxiety	0.044		-0.036		-0.080	
	(0.04)	*0.264*	(0.06)	*0.559*	(0.07)	*0.263*
Expresses sadness	0.053		-0.013		-0.067	
	(0.04)	*0.137*	(0.06)	*0.817*	(0.07)	*0.317*
Expresses loneliness	0.070		-0.042		-0.112	
	(0.04)	*0.054*	(0.06)	*0.450*	(0.07)	*0.086*
Expresses a wish to die	0.078		-0.069		-0.147	
	(0.03)	*0.012*	(0.04)	*0.106*	(0.05)	*0.005*

Source: Mexican Family Life Survey 2002 and 2005

* Calculations are weighted and standard deviations in parenthesis.

Table 3. OLS regressions of changes in mental health outcomes (N=7973)

	Depressive Syndrome	Expresses anxiety	Expresses sadness	Expresses loneliness	Expresses wish to die
	Coef.	Coef.	Coef.	Coef.	Coef.
Migration of at least one child					
Non-migrants			(ref. category)		
To the United States	0.77	0.06*	0.11***	0.05*	0.05**
	(0.50)	(0.03)	(0.03)	(0.03)	(0.02)
Domestically within Mexico	0.39	-0.04	-0.05	0.01	0.01
	(1.41)	(0.05)	(0.05)	(0.05)	(0.04)
Migration X Age					
To the U.S. x 51 +	0.99	0.01	-0.06	0.05	0.02
	(0.90)	(0.05)	(0.05)	(0.05)	(0.04)
Domestically x 51 +	0.28	0.13	0.18**	0.00	-0.02
	(1.76)	(0.09)	(0.08)	(0.08)	(0.06)
Demographics					
Age in 2002					
15-50			(ref. category)		
51 +	0.60**	0.04**	0.05***	0.02*	0.02*
	(0.24)	(0.02)	(0.02)	(0.01)	(0.01)
Male	-1.47***	-0.11***	-0.12***	-0.10***	-0.04***
	(0.16)	(0.01)	(0.01)	(0.01)	(0.01)
Education in 2002	-0.12***	-0.01***	-0.01***	-0.01***	0.00***
	(0.02)	(0.00)	(0.00)	(0.00)	(0.00)
Rural in 2002	-0.52**	-0.03**	-0.05***	-0.01	0.00
	(0.20)	(0.01)	(0.01)	(0.01)	(0.01)
Time 1 Characteristics					
Mental Health outcome in 2002	-0.74***	-0.85***	-0.84***	-0.83***	-0.83***
	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)
Physical Health					
Poor General Health Status	0.63***	0.06***	0.05***	0.04***	0.02**
	(0.19)	(0.01)	(0.01)	(0.01)	(0.01)
Relative Poor Health Status	0.20	0.02	0.02*	0.00	0.00
	(0.18)	(0.01)	(0.01)	(0.01)	(0.01)
Chronic Conditions	0.57***	0.03**	0.03**	0.02*	0.02**
	(0.20)	(0.01)	(0.01)	(0.01)	(0.01)
Household Size	0.017	-0.004	-0.002	-0.003	0.001
	(0.04)	(0.00)	(0.00)	(0.00)	(0.00)
Log of Household Expenditure	-0.083	-0.007	0.003	0.000	0.004
	(0.10)	(0.01)	(0.01)	(0.01)	(0.00)
Previous migration history	-0.227	-0.010	-0.001	-0.011	-0.006
	(0.18)	(0.01)	(0.01)	(0.01)	(0.01)
Intervening Life Events					
Becoming	0.72*	-0.02	0.03	0.07***	0.00
widowed/divorced/separated	(0.38)	(0.02)	(0.02)	(0.02)	(0.02)
Economic Shocks	2.29***	0.15***	0.13***	0.05***	0.03**
	(0.30)	(0.02)	(0.02)	(0.02)	(0.01)
Constant	20.04***	0.49***	0.49***	0.25***	0.07***
	(0.93)	(0.06)	(0.06)	(0.05)	(0.04)
R2	0.338	0.413	0.402	0.437	0.407

Source: Mexican Family Life Survey 2002 and 2005

*p<.100, **p<.05, ***p<.005

APPENDIX A

Table A1: Outcome variables

Variables	2002/2005
Depressive Syndrome	This scale is based on the first 20 questions only. Negative answers (No) are valued 1 and positive answers (Sometimes, A lot of time, All the time) are valued 2 to 4 in a progressive way. A scale that goes from 20 to 80 is created by summing these values.
Expresses anxiety	=1 if the respondent reports positively to questions related with anxiety (7, 10, 11, 13 and 18)
Expresses sadness	=1 if the respondent reports positively to questions related with sadness (1, 2, and 12)
Expresses loneliness	=1 if the respondent reports positively to question 21
Expresses a wish to die	=1 if the respondent reports positively to question 19

Table A2: Independent Variables

Migration of at least one children	
To the United States	=1 if at least one child migrated to the United States and no child migrated internally
Domestically within Mexico	=1 if at least one child migrated within Mexico and no child migrated to the U.S.
Demographics	
Age in 2002	
15-50	=1 if age of the respondent between 26 and 50 years old
51 +	=1 if age greater than or equal to 51 years old
Sex	=1 if Male
Education in 2002	Years of Schooling reported in 2002
Rural in 2002	=1 if respondent was living in a rural area in 2002
Time 1 Characteristics	
Mental Health outcome in 2002	Depending on the outcome variable we use each of the level of depression, anxiety,
Physical Health	sadness, loneliness, difficulty sleeping, wish to die, or feeling useful reported in 2002
Poor General Health Status	=1 if the respondent reports having Regular, Bad or Very Bad health reported in 2002
Relative Poor Health Status	=1 if the respondent reports having Same, Worst or Very Worst health compared to others of the same sex and age reported in 2002
Chronic Conditions	# of Chronic conditions reported in 2002
Household Size	# of household members excluding employees
Log of Household Expenditure	Natural log of HH expenditure
Previous migration history	=1 if the respondent reported in 2002 having migrated for at least one year to another locality from the one he/she was living at the age of 12
Intervening Life Events	
Becoming widowed/divorced/separated	=1 if respondent became Widowed, Separated or Divorced between waves
Economic Shocks	=1 if the Household experience an economic shock no related to migration within the last five years