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ORIGINAL PAPER

Psychiatric problems among returned migrants in Mexico: updated findings from the Mexican Migration Project

Kyle Waldman[1] · Julia Shu-Huah Wang[2] · Hans Oh[3]

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Abstract

Purpose Migration is often a stressful process that can have deleterious effects on health. We study the potential mental health consequences of migration by comparing Mexican migrants to the United States who have since returned to Mexico with Mexicans who have never migrated.

Methods Data from the Mexican Migration Project were used to compare returned migrants and non-migrants in Mexico for the years 2007–2016 ($N = 7716$). Random intercept logistic regression models were used to estimate the associations between characteristics of migration and psychiatric problems. Coarsened exact matching was implemented to account for the selection bias inherent to migration.

Results Relatively healthier Mexicans were more likely to migrate to the United States, regardless of their documentation status. Returned migrants in Mexico who traveled to the United States while undocumented were significantly more likely to report that they experienced psychiatric problems when compared with non-migrant Mexicans, even after adjusting for demographic, socioeconomic, pre-migration health, and community-level factors.

Conclusions Undocumented return migrants in Mexico are at-risk of developing psychiatric problems, despite evidence that suggests migrants tend to be healthier than non-migrants before they travel to the United States. Mental health services should encompass strategies for migrants on both sides of the border.

Keywords Migration · Mental health · Mexico · Selection bias

Introduction

The process of migration can be stressful, potentially giving rise to mental health problems. The literature on migration and mental health confirms that Mexican migrants to the United States (U.S.) are at-risk for psychiatric disorders [1-4]. Most studies on the consequences of migration on mental health have focused on the acculturation process and migrants in the host country (e.g., in the United States), and few have examined health impacts of migration from the perspective of return migrants who go back to their country of origin [4-6]. Studies have tended to compare Mexican migrants with Mexican-Americans born in the United States [7], which does not allow analysts to properly examine the health effects of migration. Ideally, we would be able to compare Mexicans who migrated to the United States with Mexicans from the same community with similar health and other profiles who did not migrate to the United States. Non-migrants from the same Mexican sending communities as Mexican migrants comprise an ideal comparison

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✉ Hans Oh
hansoh@usc.edu

Julia Shu-Huah Wang
jshwang@hku.h

[1] Sol Price School of Public Policy, University of Southern California, 650 Childs Way, Los Angeles, CA 90089-0411, USA

[2] Department of Social Work and Social Administration, The University of Hong Kong (HKU), Hong Kong, China

[3] Suzanne Dworak-Peck School of Social Work, University of Southern California, 669 W. 34th St., Los Angeles, CA 90089-0411, USA

group, as they may be less likely to differ from migrants with respect to characteristics that may bias analysis (e.g., early life health profiles or cultural conceptions of mental health). This study investigates the potential mental health consequences of migration on returned migrants, addressing limitations in prior studies and accounting for the positive health selection of migrants.

Prior studies identified several mechanisms to explain the negative association between migration experiences and adverse mental health outcomes. One possibility may be the effects of acculturative stress on migrants' mental health. Namely, adjusting to new cultural and social roles, and adopting new beliefs and routines can be stressful [8]. Acculturative stress is associated with anxiety [9], depression and suicidal ideation [10], and psychotic experiences [11] among Latinx migrants in the United States. Other mechanisms of psychological strain identified in the literature include separation from family and community [12] and discrimination [13]. Salas and Ayón [14] highlight other strains, such as isolation, fear of arrest and deportation, adversarial political environments, and trauma from crossing the border.

The examination of health consequences of migration is complicated by the inherent difference between migrants and non-migrants with respect to health. Despite exposure to stressors and barriers to resources, Mexican migrants appear to be healthier in many respects when compared with US-born Mexicans and non-Hispanic whites [15], including a lower prevalence of mental disorders [16]. This has been termed the "Hispanic paradox" [17, 18]. Some scholars have explained this health advantage by suggesting a selection effect, whereby healthy individuals are more capable and willing to migrate when compared to unhealthy individuals [4, 19]. Other scholars provide mixed evidence of a phenomenon known as 'salmon bias', which occurs when migrants return to Mexico after becoming sick or unhealthy [19-21].

There are two papers, to our knowledge, that assess the association between migration and the mental health of returned Mexican migrants. Ullmann et al. [4] found moderate evidence of positive pre-migration health selection among male Mexican migrants. The authors demonstrated that male returned migrants were significantly more at-risk for developing psychiatric disorders when compared with male non-migrants. Using the same data, Wilson et al. [6] estimated the relationship between legal statuses of Mexican returned migrants and the onset of health conditions, finding that a lack of documentation was associated with a significantly increased risk of psychiatric disorders. The authors claim that their results lend moderate support for salmon bias. These studies vary in their sample and analytic models. Ullmann et al. [4] did not include women in their sample and did not account for documentation status, but were able to examine community characteristics in Mexico. Wilson et al. [6] did not examine community characteristics in Mexico, but included women in their sample and accounted for documentation status. Neither study explicitly accounted for selection bias in its estimation strategies.

The selection bias inherent to Mexican migration likely confounds analysis of migration's effect on health outcomes. No study that measures the effects of migration to the United States on the mental health of returned Mexican migrants has explicitly accounted for selection bias in its estimation strategy. If the healthy migrant hypothesis is at play, examining health consequences of migration by comparing those who have ever migrated to non-migrants may underestimate the adverse health effects of migration given the initial health advantages among migrants. If salmon bias is at work, comparing return migrants, potentially a group of migrants who fared worse at the destination country [22], to non-migrants may overestimate the total health effect of migration as more adverse than it actually is. Closely matching pre-migration characteristics between migrants and non-migrants may allow us to account for the positive health selection bias and the initial observable differences between migrants and non-migrants. However, we cannot explicitly address the salmon bias due to the small number of migrants surveyed in the United States. This limits our examination on impacts of migration strictly among returned migrants. Nevertheless, this is one step toward enhancing our understanding of the health consequences of migration.

This paper joins two studies in evaluating the mental health of returned migrants [4, 6]. We build on the work of Ullmann et al. [4] by examining a larger pooled sample across a longer stretch of time. We first examine the association between health status pre-migration and likelihood of migrating to assess the degree to which positive health selection may bias our results. Given potential health differences between migrants and non-migrants, we use coarsened exact matching (CEM) to match respondents [23]. Then, we test whether returned Mexican migrants are significantly more likely to report psychiatric problems than their non-migrant counterparts, after using CEM and adjusting for demographic, socioeconomic, health, and community-level characteristics. Further, we conduct additional analyzes to examine the role of documentation status in the onset of psychiatric problems.

Methods

Sample

The Mexican Migration Project (MMP) is a joint research project housed within Princeton University and the University of Guadalajara. The survey strategy combines ethnographic fieldwork practices and representative survey

sampling by collecting cross-sectional data from randomly selected households in Mexican migrant-sending communities and U.S. migrant-receiving communities. Massey and Zenteno [24] established that MMP data provide a representative lens through which one can view the experiences of Mexican migrants to the United States. MMP datasets match households and communities to community-level characteristics provided by the Mexican National Statistics and Geography Institute [25].

MMP began data collection on health variables in 2007. The data include information on individuals surveyed between 2007 and 2016. Our analytic sample included Mexican-born heads of household between the ages of 18 and 102. Although they were only included if they were at least 18 at the time of the survey, migrants in the sample were included on the condition that they migrated to the United States at a minimum age of 14 years old. Since we are interested in the health outcomes of returned migrants, we excluded the 134 respondents residing in the United States at the time of the survey. We also excluded nine respondents who reported migration to both the United States and Canada. The twenty respondents who did not report mental health information were dropped from the sample. The final analytic sample consisted of 7,716 individuals from 47 communities in Mexico.

Measures

Migration (main independent variable)

The primary variable of interest is whether or not respondents have ever migrated to the United States. Dummy variables were created to identify individuals who were non-migrants, documented migrants, and undocumented migrants. Respondents were also asked to provide the cumulative number of months spent in the United States across all trips made. We calculated the time since migrants returned to Mexico from their last U.S. trip in two steps. First, we added the duration of the last trip (years) to the year the last migration was initiated to obtain the year of return. Second, we subtracted the year of return from the year of the survey. Finally, we constructed a dichotomous variable equal to 1 if a respondent reported domestic migration experience within Mexico.

Mental health (dependent variable)

Mental health was measured using a single dichotomous (yes/no) variable that asked respondents: "Have you ever had or currently have emotional, nerves, or psychiatric problems?" This question is specific to the MMP study and was standard across respondents and survey years. Several other studies have used this question when analyzing the MMP dataset to examine mental health among Mexican migrants [4, 6].

Health covariates

Early life health was measured in two ways. First, we examined adult height, which is partially determined by early life factors, such as nutrition and parental income [26, 27]. Silventoinen [28] demonstrates that adult height is a strong indicator for childhood living conditions across regional and development contexts. Second, we examined self-rated health status at age 14, using an ordinal variable that captured responses "poor," "fair," "good," and "excellent." This variable was scaled from 1–4, with 4 indicating excellent health. MMP does not include data for pre-migration mental health specifically. Instead, the self-rated health question asked respondents to rate their overall "quality of health." Studies demonstrate that self-rated health is at least partially determined by mental health [29, 30]. Further, Latinx populations' (including Mexicans) ratings of their overall health status are influenced by their affective states [31]. Adult physical health was captured using a dichotomous variable that equals one if a respondent has ever or currently suffers from at least one of six physical health conditions: hypertension or high blood pressure, diabetes or high sugar levels, heart attack or heart problems, brain damage, a chronic lung condition, and cancer. These conditions were the only physical health conditions the MMP allowed migrants to name specifically.

Demographic and socioeconomic characteristics

Age, sex (ref: female), and marital status (ref: single) are included in the analysis as standard demographic controls. Sex and marital status are coded as dichotomous variables that represent the status of respondents at the time of the survey. Age is included in its linear and quadratic forms to adjust for the possible nonlinear association between age and the mental health outcome. MMP does not contain rich information on socioeconomic (SES) status early in life. Thus, we use the approach adopted by Crimmins et al. [32], using respondents' years of education as a proxy for early life SES.

To capture a respondent's present wealth, we created an asset index counting their ownership of key assets. Ten items comprise the index, each one asking whether or not the respondent owned the following assets: a stove, a refrigerator, a washing machine, a sewing machine, a radio, a television set, a landline phone, internet access, a personal computer, and a cellular phone. The variable was measured on a scale of 1–10, with 10 indicating ownership of all items (Cronbach's $\alpha = 0.71$). A superior measure for current

wealth would have been based on income, but household income was not collected for the years in the analysis. Filmer and Pritchett [33] demonstrate that asset ownership is an effective measure of wealth in the absence of income and expenditure data. Asset indicators have been used to reliably measure wealth inequality in a number of Latin American countries [34], including Mexico [35]. The 10-item scale is consistent with the household asset indices used in previous studies that measure the association between migration and health in Mexico [4, 6].

Community covariates

Four community-level variables were included in the models. The first three were variables that provide information on the percentage of households in each community that had access to running water, lacked plumbing, and had dirt floors. Housing indicators captured the socioeconomic status of communities in Latin America [36]. The fourth was the urbanicity (ref: rural) of the sending communities, which was captured using a dichotomous variable that labeled towns and villages as rural, while small urban and metropolitan areas were considered urban.

Analysis

The MPP provides data through a complex survey design in which respondents are nested within Mexican sending communities [37]. To account for the hierarchical structure of the data, we employed random intercept logistic regression models, which is consistent with the approach used in Ullmann et al. [4]. All models include survey year dummies to account for possible time trends of outcomes. Likelihood ratio tests rejected the null hypothesis that observations were uncorrelated within communities ($p < 0.05$), indicating the need to address the multilevel nature of the sampling strategy in the non-CEM models.

First, we examined the associations between physical health status at age 14 (prior to migration) and likelihood of migration to investigate whether relatively healthier individuals selected to migrate to the United States. We additionally examined whether there were health differences between non-migrants and migrants when stratifying migrants by documentation status. Second, we examined the association between migration and likelihood of endorsing psychiatric problems by employing random intercept logistic regression models. We matched respondents in the non-migrant and migrant groups using CEM. Respondents were matched according to their sex, highest level of education, and self-rated health status at age 14. CEM is a monotonic imbalance bounding procedure that greatly reduces imbalance in covariates between the non-migrant and migrant groups while only pruning approximately three percent of the analytic sample [23]. Subsequent statistical analyses utilized CEM-generated weights to adjust for selection bias.

Two assumptions must be met to believe that the use of overall health status at age 14 can function as a proxy for pre-migration health in general and pre-migration mental health specifically. First, health status at age 14 must predict health status just before migration to the United States. If health status among respondents changed significantly between age 14 and the age at time of migration, the health rating used in this study would serve as an ineffective proxy. Second, self-rated health status must be predictive of mental health status. Even if health status at age 14 adjusted for non-random selection into migration on the basis of physical health, it must be predictive of mental health status to make inferences about the mental health effects of migration. We conducted falsification tests to examine each of these assumptions.

1. Health status at age 14 was used because matching on health must occur at a constant time period across migrants and non-migrants, and self-rated health status at age 14 is the only health rating that fills that requirement. Fortunately, the MMP questionnaire asked migrants to assess their overall health quality ("poor," "fair," "good," and "excellent") just before they migrated to the United States. To test the assumption that health status at age 14 predicts health status just before migration, we ran an ordered logistic regression model wherein the outcome was health status just before migration to the United States, the independent variable of interest was health status at age 14, and the covariates were other pre-migration characteristics. The model included community and survey year fixed effects.
2. To test the assumption that the overall health rating is meaningfully associated with mental health, we ran a random intercept logistic model wherein the outcome was endorsing psychiatric problems, the independent variable of interest was health at the time of the survey, and covariates included demographic, socioeconomic, migration, and community infrastructure characteristics. The model included survey year fixed effects. If respondents took their mental health histories into account when rating their overall health, their average health ratings should be negatively related to endorsing psychiatric problems even after controlling for the presence of physical health conditions.

Results

Descriptive statistics

Table 1 presents information regarding the survey-weighted migration, socioeconomic, and community characteristics

of the sample, separated by documentation status. Approximately 20% of the sample had ever migrated to the United States ($n=1693$), and 77% of migrants crossed the border while undocumented ($n=1265$). The average number of trips made to the United States among migrants was 2.03 trips. On average, documented migrants made more trips to the United States (3.13) than undocumented migrants (1.71, $p<0.001$). About 17% of the sample reported domestic migration experience within Mexico ($n=1157$), although documented migrants to the United States were no more likely to report domestic migration experience than undocumented migrants. The wealth of undocumented migrants was lower than that of documented migrants with respect to asset ownership ($p<0.001$) despite levels of education not being significantly different between the two groups.

Table 2 presents the demographic, health, and socioeconomic characteristics of the sample, stratified by migration status. Males headed a majority of households (86%, $n=6588$), and comprised an even larger proportion of migrants (96%, $n=1607$). Returned migrants were younger, on average, than non-migrants ($p<0.001$). Returned migrants were more likely to be residing in rural areas and to be married at the time of the survey ($p<0.001$). Consistent with Ullmann et al. [4], returned migrants tended to be taller and healthier pre-migration than non-migrant Mexicans ($p<0.001$). Approximately 7.5% of returned migrants endorsed psychiatric problems, a significantly higher rate than the 5.5% of non-migrants who answered similarly ($p<0.05$).

Hispanic paradox and migrant self-selection

The random intercept logistic regression models in Table 3 show that both proxies for early life health, height (OR: 1.54 95% CI: 1.21–1.95, $p<0.001$) and self-rated health at age 14 (OR: 1.53 95% CI: 1.36–1.72, $p<0.001$), were associated with significantly greater odds of having migrated. Models 2 and 3 in Table 3 present the association between early life health and migration for documented and undocumented migrants, respectively. Height and self-rated health were significant predictors of migration at the conventional levels ($p<0.05$, $p<0.01$, and $p<0.001$) for both documented and undocumented migrants. Across models, the associations between migration, age, and education generally showed as assumed [33, 34]. Increasing age decreased the likelihood of having migrated without documentation (OR: 0.97 95% CI: 0.97–0.98, $p<0.001$), and educational attainment decreased the likelihood of having migrated without documentation (OR: 0.94 95% CI: 0.92–0.96, $p<0.001$). Education was not significantly associated with documented migration (OR:

Table 1 Weighted descriptive statistics of migration, socioeconomic status, and community characteristics of migrants, stratified by documentation status

	Sample Weighted % (SE)	Documented Weighted % (SE)	Undocumented Weighted % (SE)	*p* Value
Migration characteristics				
Percent with U.S. migration experience	19.7% (0.47)	100% (0.00)	100% (0.00)	–
Percent with domestic migration experience	16.9% (0.44)	15.9% (1.86)	17.0% (1.11)	$p=0.61$
Among migrants to the U.S.				
Mean number of trips to the U.S.	2.03 (2.06)	3.13 (3.22)	1.71 (1.38)	$p<0.001$
Mean cumulative time spent in the U.S. (years)	6.40 (7.35)	9.12 (10.98)	5.57 (5.53)	$p<0.001$
Mean number of years since last migration (years)	13.45 (13.57)	15.18 (17.57)	12.93 (12.03)	$p<0.001$
Percent undocumented during last U.S. trip	76.50% (1.12)	0% (0.00)	100% (0.00)	–
Socioeconomic characteristics				
Mean years of education	7.21 (4.49)	6.62 (4.29)	6.73 (3.70)	$p=0.656$
Mean score asset ownership index (scale 1–10)	6.03 (2.12)	6.67 (2.01)	6.18 (1.86)	$p<0.001$
Community characteristics ($N=47$)				
Urban community	45.60% (0.62)	28.20% (2.57)	28.60% (1.56)	$p<0.01$
Rural community	54.40% (0.62)	71.80% (2.57)	71.40% (1.56)	–
Average percent of households with running water	76.2% (20.4)	73.6% (21.3)	74.8% (22.6)	$p=0.517$
Average percent of households with no plumbing/sewage	13.2% (13.9)	15.3% (16.8)	14.7% (14.2)	$p=0.529$
Average percent of households with dirt floors	6.9% (6.2)	6.5% (5.25)	7.1% (6.8)	$p=0.064$
N	7,716	428	1,265	–

Means are reported for continuous variables with standard deviations in parentheses

Percentages and standard errors are reported for categorical variables

P values are reported for equality of means *t* tests (means) and Chi-square tests (proportions)

Table 2 Weighted descriptive statistics: Demographic, health, and socioeconomic characteristics by migrant status

	Weighted % (SE) Sample	Migrants Weighted % (SE)	Non-migrants Weighted % (SE)	*p* Value
Demographics				
Sex				
Male	85.9% (0.42)	95.6% (0.55)	83.5% (0.50)	$p<0.001$
Female	14.1% (0.42)	4.4% (0.55)	16.5% (0.50)	–
Age	49.8 (15.5)	47.9 (14.6)	50.2 (15.7)	$p<0.001$
Urban	45.50% (0.62)	34.70% (1.34)	48.10% (0.69)	$p<0.001$
Married	71.90% (0.54)	80.90% (1.03)	69.60% (0.62)	$p<0.001$
Health				
Height (ft)	5.41 (0.31)	5.49 (0.28)	5.40 (0.31)	$p<0.001$
Self-rated health at age 14 scale (1–4)	3.30 (0.53)	3.40 (0.56)	3.28 (0.52)	$p<0.001$
Emotional/psychiatric problems	5.9% (0.30)	7.5% (0.77)	5.5% (0.32)	$p<0.019$
Physical health condition	26.4% (0.53)	24.7% (1.16)	26.8% (0.60)	$p=0.125$
Socioeconomic characteristics				
Mean years of education	7.19 (4.49)	6.70 (3.85)	7.31 (4.63)	$p<0.001$
Mean score asset ownership index (1–10)	6.02 (2.12)	6.30 (1.91)	5.96 (2.16)	$p<0.001$
N	7716	1693	6023	–

Means are reported for continuous variables with standard deviations in parentheses

Percentages and standard errors are reported for categorical variables

P values are reported for equality of means *t* tests (means) and Chi-square tests (proportions)

Table 3 Odds ratios for random intercept logistic regression models predicting migration experience

	Model 1	Model 2 (Documented)	Model 3 (Undocumented)
Height (ft)	1.54 (1.21–1.95)***	1.74* (1.14–2.68)*	1.50 (1.15–1.95)**
Health (age 14)[a]	1.53 (1.36–1.72)***	1.56 (1.26–1.93)***	1.52 (1.34–1.73)***
Age	0.98 (0.98–0.99)***	1.02 (1.01–1.03)***	0.97 (0.97–0.98)***
Male (ref: female)	4.59 (3.50–6.02)***	2.99 (1.95–4.59)***	5.71 (4.07–8.00)***
Education (years)	0.96 (0.94–0.98)***	1.02 (0.99–1.05)	0.94 (0.92–0.96)***
Urban (ref: rural)	0.72 (0.45–1.14)	0.45 (0.20–1.05)	0.82 (0.54–1.24)
N	7716	6451	7228

Odds ratios and confidence intervals (95% level) presented

Models include survey year fixed effects

Sample excludes household heads who migrated to the U.S. before the age of 14

[a]Self-rated health at age 14 ranges from 1 (poor) to 4 (excellent)

*$p<0.05$

**$p<0.01$

***$p<0.001$

1.02 95% CI: 0.99–1.05). Men were more likely to report having migrated to the United States, regardless of documentation status ($p<0.001$).

Although the traditional comparison in the Hispanic paradox framework is Latinx migrants and US-born Latin Americans or non-Hispanic whites, the evidence presented above suggests positive self-selection among Mexican migrants with respect to their health. Although not causal, the results offer strong evidence that Mexican return migrants are, on average, healthier pre-migration than their non-migrant peers.

Migration and mental health

Table 4 presents the results of the fully adjusted unmatched and CEM multilevel models predicting the impact of migration on mental health outcomes. Table 4 includes the estimated associations between migration and psychiatric

problems, whereas the results for the covariates can be found in Table S1 of the supplemental materials. Models 4 and 5 comprise the results for the unmatched random intercept logistic regression model and CEM model, respectively, wherein the independent variable of interest was migration status. Model 4 demonstrates that having migrated to the United States was positively associated with the endorsement of psychiatric problems (OR: 1.46 95% CI: 1.13–1.89, $p < 0.01$). Similarly, the CEM results in Model 5 demonstrate that having migrated to the United States was associated with 1.46 times the odds of reporting psychiatric problems (95% CI: 1.13–1.88, $p < 0.01$).

The results in Table 4 establish an elevated risk of psychiatric problems among the pooled sample of migrants, but does not account for the possibility of heterogeneous effects across different types of migrants. Table 5 extends the analysis by stratifying the migrant sample by documentation status. Models 6 and 7 display the results for the unmatched random intercept logistic regression models estimating the associations between psychiatric problems and documented and undocumented migration to the United States, respectively. Models 8 and 9 estimate the same associations, but utilize the CEM procedure to correct for potential selection bias on the basis of health. Models 6 and 8 demonstrate that the association between documented migration and psychiatric problems was statistically indistinguishable from zero. In contrast, Models 7 and 9 provide similar estimates that show evidence of an elevated risk of psychiatric problems among Mexican returned migrants who were undocumented in the United States (OR: 1.59 95% CI: 1.20–2.12, $p < 0.01$ in Model 9). The results for the full set of covariates are provided in Table S2 in the supplemental materials. The CEM procedure successfully achieved balance in the covariates used for matching, as seen in Table S3 in the supplemental materials. Additionally, a sensitivity analysis estimated the associations between total years of experience in the United States, years since last migration, and the endorsement of psychiatric problems. Neither of those variables or their interactions with documentation status yielded significant results, and the estimates are provided in Table S4 in the supplemental materials.

Table 4 Odds ratios for random intercept logistic regression models predicting adult psychiatric problems

	Unmatched model	Coarsened exact matching model
	Model 4	Model 5
Migration status		
Migrant	1.46 (1.13–1.89)**	1.46 (1.13–1.88)**
Non-migrant	1.00	1.00
N	7716	7643

Odds ratios and confidence intervals (95% level) presented

Models include survey year fixed effects

Models control for demographic, socioeconomic, health, community infrastructure, and domestic migration characteristics

Samples sizes differ after trimming in CEM models

*$p < 0.05$

**$p < 0.01$

***$p < 0.001$

Falsification tests

The first falsification test examined the assumption that health at age 14 was predictive of health just before migration by estimating an ordered logistic regression model that demonstrated the association between health at age 14 and health among returned migrants just before they migrated to the United States. Table S5 in the supplemental materials

Table 5 Odds ratios for random intercept logistic regression models predicting adult psychiatric problems

	Unmatched Models		Coarsened exact matching models	
	Model 6	Model 7	Model 8	Model 9
Documentation status				
Documented	1.16 (0.72–1.85)	–	1.18 (0.74–1.88)	–
Undocumented	–	1.56 (1.17–2.08)**	–	1.59 (1.20–2.12)**
Non-migrant (Ref)	1.00	1.00	1.00	1.00
N	N = 6,451	*N* = 7288	*N* = 6199	*N* = 7090

Odds ratios and confidence intervals (95% level) presented

Models include survey year fixed effects

Models control for demographic, socioeconomic, health, community infrastructure, and domestic migration characteristics

Samples sizes differ after trimming in CEM models

*$p < 0.05$

**$p < 0.01$

***$p < 0.001$

displays the results of the model. Self-rated health at age 14 was a highly significant and meaningful predictor of self-rated health just before migration to the United States (OR: 9.61 95% CI: 7.22–12.78, $p < 0.001$). Conditional on the covariates, a one-unit increase in the health scale at age 14 was associated with approximately nine times the odds of reporting a higher health status just before migration, indicating that health at age 14 served as an effective proxy for pre-migration health. The second falsification test examined the assumption that self-rated health status was predictive of mental health. Indeed, Table S6 in the supplemental materials demonstrates that a higher health status rating at the time of the survey was negatively associated with the odds of endorsing psychiatric problems (OR: 0.48 95% CI: 0.41–0.57, $p < 0.001$).

Discussion

Return migrants in Mexico who traveled to the United States without documentation are at a significantly increased risk for developing psychiatric problems. The current literature is sparse, and fails to explicitly adjust for the possibility that positive health selection may bias analysis of the association between migration to the United States and poor mental health outcomes. Our results provide evidence of positive pre-migration health selection to the United States among returned Mexican migrants relative to non-migrant peers. Migrants appeared to be significantly healthier pre-migration, supporting the notion that positive health selection contributes to the Hispanic paradox. Based on this evidence, we are the first to use CEM to formally address migrants' positive health selection when examining the impacts of migration on mental health among return migrants. We argue that despite the better average pre-migration health profile of migrants, the mental health of undocumented return migrants was significantly worse than non-migrants, providing some evidence of the negative health impact of migration. This underlies the need for more research to focus specifically on the mental health of undocumented Latinx migrants in the United States as well as those who return to Mexico.

The number of years spent in the United States as a migrant and the number of years since returning to Mexico were not significantly associated with psychiatric problems. Interestingly, these results suggest that the dosage of potential migration-related stress as well as re-acculturation in Mexico may not play as important of a role in shaping mental health outcomes as one might expect. At the very least, our results suggest that mental health outcomes are not monotonically related to the number of years spent in the United States. Instead, we interpret these results as the need to move beyond measures of time toward assessing the lived experiences of Mexican migrants in the United States. Hatzenbuehler et al. [38] examined state-level immigration policies and their association with mental health morbidity among Latinx populations. More laborious examinations of immigration and health policy environments may be fruitful for identifying the most important stressors on the mental health of migrants.

The findings largely comport with existing literature [4, 6, 39], but should be interpreted bearing in mind limitations. First, the MPP data used were cross-sectional and did not contain data on the mental health of migrants before migrating to the United States. We used overall health as a proxy for mental health. A falsification test established that self-rated health was a significant and meaningful predictor of mental health outcomes in the expected direction. However, future studies with different datasets may look specifically at pre-migration mental health status.

Second, it is also possible that healthy individuals may have stayed in the United States, while people with mental health problems were systematically more likely to return to Mexico, resulting in salmon bias [21, 22]. Our study was unable to account for this possibility, and so future studies can explore the mental health of migrants who have chosen to stay to see if they differ from migrants who decide to return and non-migrants in the sending communities. Third, while we were able to include women in our sample, the number of women who migrated was relatively small, limiting generalizability. Finally, the mental health measure was a self-reported item (not a diagnosis given by a trained psychiatric professional or trained interviewer), and so responses were subject to recall and social desirability biases. Future studies can use validated diagnostic measures that assess specific psychiatric disorders. Individuals with the most severe psychiatric conditions (such as schizophrenia) may have been systematically excluded from the surveys.

The use of the CEM estimation strategy to correct for non-random selection into migration produced results that were indistinguishable from the unmatched random intercept logistic regression models. The similarity of results across empirical strategies offers a few implications. A falsification test demonstrated that health at age 14 was a strong predictor of health around the time of migration. It may be that controlling for health at age 14 alongside a rich set of covariates adequately adjusted for selection bias with respect to health. Moving forward, scholars should make an effort to account for either early life or pre-migration health status when estimating the effects of migration on health. The similarly of the results also suggests a greater degree of confidence in the Ullman et al. [4] finding that migration was associated with a higher risk of psychiatric problems in the MMP dataset because they specified a similar model even without the use of matching.

Returned Mexican migrants who were undocumented appear to be at-risk for developing mental health problems, and should be targeted with culturally tailored outreach and community-based screenings. These interventions should be administered bearing in mind the possibility that Mexican migrants may underutilize services while they are undocumented. Furthermore, the results displayed in Tables S1 and S2 of the supplemental materials demonstrate that across most models, unmatched and matched, key demographic and socioeconomic characteristics were predictive of psychiatric problems. The significantly greater likelihood of reporting mental health issues among women, the relatively less educated, single respondents, and those on the lower end of the assets index indicate the need to recognize heterogeneity within migrant populations when planning preventive and/or therapeutic interventions. Interventions should be implemented on both sides of the United States-Mexico border.

Compliance with ethical standards

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

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