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Migration from Mexico to the US and Subsequent Risk for Depressive and Anxiety Disorders: A Cross-National Study

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Abstract

Objective—To test the hypothesized increase in risk for depressive and anxiety disorders following arrival in the US among Mexican-origin migrants.

Method—Data from surveys conducted in Mexico and the US were combined. The surveys were conducted separately, but used the same structured diagnostic interview. Discrete time survival models were specified to estimate the relative odds of first onset of depressive (major depressive episode, dysthymia) and anxiety (generalized anxiety disorder, social phobia, panic disorder, posttraumatic stress disorder) disorders among migrants after their arrival in the US compared with non-migrant Mexicans who have a migrant in their immediate family.

Results—After arrival in the US, migrants had signficantly higher risk for first onset of any depressive or anxiety disorder than non-migrant family members of migrants in Mexico (OR=1.4, 95% CI =1.04–1.94). Associations between migration and disorder varied across birth cohorts. Elevated risk among migrants relative to non-migrants was restricted to the two younger cohorts, those 18–25 or 26–35 years old at interview. In the most recent cohort, the association between migration and first onset of any depressive or anxiety disorder was particularly strong (OR=3.89, 95% CI=2.74–5.53).

Conclusions—This is the first study to compare risk for first onset of psychaitric disorder between representative samples of migrants in the US and non-migrants in Mexico. The findings are consistent with the hypothesized adverse effect of migration from Mexico to the US on the mental health of migrants, but only among migrants in recent birth cohorts.

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Conflict of Interest

Funding agencies had no role in the design and conduct of the study, collection, management, analysis, or interpretation of the data, or in the preparation, review, or approval of the manuscript. The authors have no conflicts of interest to disclose. The corresponding author (Breslau) takes responsibility for the integrity of the data and the accuracy of the data analysis, and that all authors had full access to all the data in the study.

About 12 million people living in the US in 2007 were born in Mexico[1], comprising about 30% of the US foreign-born population, 25% of the US Hispanic population, and about 10% of the Mexican-born population on both sides of the Mexico-US border. Mental health researchers have hypothesized that adverse social experiences inherent in the migration process have a negative effect on mental health in this population [2, 3]. Two findings from studies conducted in the US are consistent with this hypothesis. First, among Mexican-Americans (i.e. people of Mexican descent born in Mexico or the US), as among US Hispanics more broadly, greater acculturation, i.e. adoption of American patterns of behavior, is associated with worse mental health status, including higher rates of both psychiatric and substance use disorders [4–7]. Second, among Mexican-born immigrants in the US, those who have been in the US for longer periods of time have worse mental health than more recent arrivals[8]. However, because these studies are limited to comparisons within the US population, neither of these findings isolates the potential effect of migration on the migrants themselves [9, 10].

Only one pilot study has directly estimated the effect of migration by comparing the mental health of Mexican-born immigrants in the US with that of non-migrants in the Mexican general population. That study found that immigrants were at higher risk for mood and anxiety disorders *after migrating to the US*, compared with persons who remained in Mexico, but its generalizability is limited by a very small sample of immigrants (n=75), all of whom were interviewed in English[11]. These pilot findings indicated the need for a larger study and a stronger methodological approach.

In this study, we compare a sample of Mexican-born migrants (n=554; 259 males and 295 females) after their arrival in the US with a sample of non-migrants in Mexico (n=2519; 904 males and 1615 females) on their risk for first onset of a depressive or anxiety disorder. The samples come from epidemiological surveys in which respondents were interviewed with the same fully structured diagnostic interview. Respondents in the US had the choice of conducting the interview in English or Spanish. In addition, in this study we use an alternative analysis strategy to better control for potential confounding of the effect of migration on depressive and anxiety disorders that can arise from family-level influences (e.g. family socioeconomic status). In the pilot study, we adjusted statistically for family socioeconomic status by including a covariate for parental education in the statistical model predicting onset of disorder. In this study, we control for a broader range of these family-level pre-migration factors by restricting the comparison sample to people in Mexico who have family members in the US but have not themselves migrated. In contrast to statistically adjusting for confounding by including measured covariates in a multivariable model, restriction can reduce confounding from all family-level confounders, whether measured or not, making it perhaps the most effective method to use when a large number of observations are available in the restricted sample[12].

METHODS

In 2001–2003 epidemiological surveys of psychiatric disorders were conducted in nationally representative samples of the adult populations of Mexico[13] and the US[14] using the same fully structured diagnostic instrument, the World Mental Health Survey version of the Composite International Diagnostic Interview (WMH-CIDI)[15]. Data from these surveys were combined to create a transnational sample of Mexican-born individuals residing either in Mexico or the US. Questions regarding migration experience of respondents and their family members included in the Mexico survey were used to identify a representative sample of individuals with a member of their immediate family living in the US (family members of migrants). Questions regarding country of birth and age at migration included in the US survey were used to identify a representative sample of Mexican-born immigrants

and specify the time periods prior and subsequent to their arrival in the US. Data from both surveys regarding age of onset of psychiatric disorders was used to compare risk for first onset among immigrants after their arrival in the US with that of family members of migrants residing in Mexico. Comparisons were conducted for first onset of depressive (major depressive episode and dysthymia) and anxiety (social phobia, panic disorder or agoraphobia, generalized anxiety disorder (GAD), Posttraumatic Stress Disorder (PTSD)) disorders.

Data on the Mexican population come from the Mexico National Comorbidity Survey (MNCS), a survey based on a stratified, multistage area probability sample of household residents in Mexico aged 18 to 65 years who lived in communities of at least 2500 people. Interviews were conducted with one randomly chosen member of each selected household from September 2001 through May 2002. The response rate was 76.6%, with 5,782 respondents interviewed. Data on the 2,519 non-migrants who had a migrant in their immediate family were used in this study. Note that the non-migrant family members of migrants were sampled independently from the US migrant sample, i.e. they are not relatives of the US-migrants. The sample is representative of individuals in families of current Mexican-born immigrants in the US.

Data on the Mexican-American population in the US come from two component surveys of the Collaborative Psychiatric Epidemiology Surveys (CPES)[16], the National Comorbidity Survey Replication (NCSR)[17] and the National Latino and Asian-American Survey (NLAAS)[18]. The NCSR was based on a stratified multistage area probability sample of the English-speaking household population of the continental United States [19]. Interviews were conducted in 2001–03 with a 70.9% response rate. The NLAAS was based on the same sampling frame as the NCSR, with special supplements to increase representation of the survey's target ethnic groups [16]. NLAAS interviews were conducted in 2002–03 with a 75.5% response rate for the Latino sample. Integrated survey sampling weights were developed based on the common CPES sampling frame to properly adjust the combined sample to represent the ethnic composition of the US population[20]. Data on the 554 Mexican-born respondents to either the NCSR or the NLAAS were used in this study.

Study procedures were approved by the Institutional Review Boards of Harvard Medical School, the University of Michigan, and the National Institute of Psychiatry Ramon de la Fuente.

Assessments

DSM-IV criteria for major depressive episode, dysthymia, generalized anxiety disorder (GAD), panic disorder, agoraphobia, social phobia and posttraumatic stress disorder (PTSD) were assessed with the WHO-CIDI, a fully structured face-to-face diagnostic interview administered in respondents' homes by a trained non-clinician interviewer, using a laptop computer. Clinical reappraisal studies in the NCSR [21] and the World Mental Health Surveys [22], in which the WHO-CIDI diagnoses were compared with structured clinical interviews administered by mental health professionals, showed good concordance for mood and anxiety disorders. The Spanish language version of the WMH-CIDI, used in both the MNCS and the NLAAS, was developed following WHO instrument translation guidelines with field testing prior to the start of data collection[23].

Statistical Analysis

Mexican-born migrants in the US were compared with non-migrant family members of migrants in Mexico. The Mexico comparison group was selected to control for family level differences between migrants and non-migrants that might affect risk for mood and anxiety

disorders following migration to the US, such as differences in childhood socioeconomic status. When a sufficiently large sample is available, restriction of the comparison group is preferable to statistical adjustment in a multivariable model because it adjusts for measured *and unmeasured* family level confounders while requiring fewer modeling assumptions. Discrete time survival models with time-varying covariates [24, 25] were used to estimate risk for onset of disorders associated with being in the US and, adjusting for age at interview and sex. Time was defined by chronological age. Being a migrant in the US was treated as a time-varying covariate. An advantage of survival analysis with time-varying covariates is that it allows consideration of independent variables whose value for any given person may change over time. A person's migration status (the independent variable) can change from not being a migrant (i.e. living in Mexico) to being a migrant in the US at any time until the onset of the psychiatric disorder of interest or age at interview (whichever comes first). To construct a conservative test of the effect of migration, disorders with onset in the same year that a person migrated were coded as having onset prior to migration.

Additional specifications were used to examine potential variations in the risk associated with being in the US by sex, birth cohort and chronological age. Sociological research has demonstrated that migration is associated with dramatic shifts in gender roles[1] that might influence risk for disorder. In addition, there is evidence that differences in mental health associated with migration are larger for women than for men[26] and tend to decrease at older ages[27]. Multiple imputation was used to include the small number of immigrants with missing data on age at migration. All analyses were conducted using SUDAAN software[28] to adjust standard errors for the complex sample designs of the surveys. Coefficients from multivariable logistic regression equations are presented in exponentiated form as covariate adjusted odds ratios (OR).

RESULTS

The sample includes 2,519 non-migrant family members of migrants in Mexico and 554 Mexican migrants in the US. Migrants are more likely to be male and in the middle age groups (ages 26–35 and 36–45) than family members of migrants (Table 1).

Before presenting results of the discrete- time survival analysis, we compare *lifetime prevalence* of disorders between the Mexican migrants in the US and the reference group of non- migrant family members of migrants in Mexico (Table 2). Compared with non-migrant family members of migrants in Mexico, Mexican migrants in the US had significantly higher lifetime prevalence of any depressive or anxiety disorder (17.4% vs. 11.7%), for depressive disorders as a group (11.0% vs. 8.2%) and for anxiety disorders as a group (10.1% vs. 6.2%). Among the 4 specific anxiety disorders assessed, migrants have higher prevalence for every type of disorder and this difference reaches statistical significance for 2 disorders, GAD (2.9% vs. 1.4%) and social phobia (5.2% vs. 3.2%).

Results of the discrete-time survival analysis show that, during the years following arrival in the US, migrants were at significantly higher risk for first onset of any depressive or anxiety disorder than non-migrant family members of migrants (OR=1.4, 95% CI (1.04, 1.94)) after adjustment for age, and sex(Table 3). After adjustment for prior onset mood and anxiety disorders, ORs associated with all disorder categories were greater than 1, indicating higher risk after immigration, and reached statistical significance for any anxiety disorder (OR=1.8, 95% CI (1.10, 2.80)), GAD (OR=2.4, 95% CI (1.36, 4.21)) and social phobia (OR=2.2, 95% CI(1.27, 3.68)).

Variation in the association between migration and risk for any depressive or anxiety disorder across subgroups was examined by testing statistical interactions in the discrete

time survival models, adjusting for covariates. Statistical interactions between migration and sex, birth cohort (age at interview = 18–25, 26–35, 36–45, 46 or over) and age at migration (prior to age 13 vs. age 13 or over) were tested. Of these, only the interaction between birth cohort and migration reached statistical significance.

As shown in Table 4, the elevated risk among migrants occurs almost entirely in the two most recent birth cohorts, those 18 to 25 and 26 to 35 years of age at the time of interview. Risk for both depressive and anxiety disorders subsequent to migration was highest (relative to non-migrant family members of migrants) among members of the most recent cohort, those who were 18–25 at the time of interview. In this group, the OR for any depressive disorder was 4.4 (compared with 1.2 overall) and the OR for anxiety disorder was 3.4 (compared with 1.8 overall). Of the six ORs in the older cohorts, those age 36–45 and age 46 and older, none reached statistical significance and four were less than 1.

DISCUSSION

This study is unique among studies of migration and risk for psychiatric disorders in the use of cross-national data to compare morbidity in a representative sample of migrants with that in their source population. Respondents on both sides of the border were interviewed within the same time frame using the same diagnostic interview. While our early pilot study included only a small sample of English-speaking migrants, this study includes a larger sample of migrants interviewed in their choice of English or Spanish. In addition, the comparison group in this study, members of families in Mexico with a migrant in the US, provides a robust adjustment for migrant selection. The finding that migrants are at higher risk for onset of depressive and anxiety disorders during the years following migration, compared with family members of migrants who remained in Mexico, provides the first direct evidence that experiences as a migrant might lead to the onset of clinically significant mental health problems in this population. In particular, migrants were at higher risk of depressive disorders, inclusive of major depression and dysthymia, as well as GAD and social phobia. In addition, when the relatively small increase in risk across the entire immigrant population (OR=1.4) is broken down by birth cohorts, a much larger effect is revealed among a restricted segment of the population, those in the most recent birth cohorts, with the strongest association found in the youngest cohort, those age 18 to 25(OR=3.9).

This evidence is particularly important because the two findings from previous studies that have been cited as evidence of an adverse effect of migration on mental health are open to alternative explanations. First, previous studies reported associations between poor mental health and acculturation, i.e. the extent to which immigrants or members of ethnic minority populations have adopted behaviors typical of mainstream Americans or gained proficiency in English, when both are assessed contemporaneously [6, 29]. This association is purported to reflect, in part, the impact of negative experiences faced by immigrants in the process of assimilation, i.e. acculturative stressors. However, these findings can be explained by high levels of risk for psychiatric disorder among the US-born members of ethnic minority populations, who have both high risk for psychiatric disorders and high levels of acculturation relative to immigrants [9, 30].

Second, previous studies have found that immigrants who have lived in the US for longer periods of time have higher risk for psychiatric disorder than immigrants who have recently arrived[8]. That finding seems to indicate that a longer period of exposure to the US leads to a decline in mental health. However, the association between duration of residence and onset of disorder is confounded by age at migration: holding age constant, immigrants who have lived in the US longer migrated at younger ages. Recent studies have found that immigrants

who arrive in the US before age 13, have a much higher risk for mood and anxiety disorders than immigrants who arrive in the US as adolescents or adults[31]. The apparent effect of longer duration of residence in the US may reflect the high levels of risk among immigrants who arrived as children, who, compared with other immigrants of the same age, are likely to have lived in the US for longer periods of time. The difference might be in age at migration rather than duration of residence in the US.

This study provides evidence of an adverse effect of migration on mental health among Mexican migrants to the US that overcomes important limitations of previous studies of this population. First, the sample is limited to first generation immigrants, to distinguish mental health problems among immigrants from mental health problems of US-born offspring of immigrants. This sample offers more direct evidence on the mental health effects of experiences in the years following migration to the US. Second, the use of survival models ensures that disorders which occurred prior to migration were not counted as potential effects of migration. Third, we improve the adjustment for migrant selection by comparing migrants in the US with a sample of family members of migrants in Mexico. The use of family members of migrants as a comparison group adjusts for *between-family migrant selection*, i.e. differences between Mexican families with and without migrants that might influence the risk for depressive and anxiety disorders. Sociological research suggests that family characteristics, such as economic security, which enables the initial investment required for migration, are important determinants of migration [32–34].

A remaining limitation of this study is the possibility of residual confounding (of the effect of migration on mental health) by pre-migration differences between migrants and non-migrants. Our pilot study suggested that there is negative health selection in this population, i.e. that indicators of risk for psychiatric disorder are associated with higher likelihood of migration[11]. Confounding might occur at the family level, i.e. by differences between families with and without migrants, or at the individual level, i.e. by differences between migrants and non-migrants within families. Restriction of the control group to non-migrant members of families of migrants in Mexico is intended to account for confounding at the family level. Differences between migrants and non-migrants within families were accounted for in this study by treating the exposure, migration, as a time-varying covariate; disorders that preceded migration, including those occurring in the year of migration, were counted towards the baseline risk among non-migrants. In addition, estimates were adjusted for prior onsets of comorbid psychiatric disorders, which might have occurred before or after migration. Nonetheless, the possibility of residual confounding cannot be entirely ruled out. In supplementary analyses of this sub-sample, conducted to address the question of migrant selection, migration remained associated with higher risk for onset of depressive and anxiety disorders after adjustment for childhood adversity profiles.

Reliance on recall of the lifetime occurrence of psychiatric disorders is also a potential limitation of this study[35]. Inaccuracy in recall would bias the results if migrants were more likely to recall past symptoms than family members who remained in Mexico. The potential influence of recall bias should be considered in light of the observed inter-cohort variation in the association between migration and risk for disorder. We would expect recall bias to be more severe in older cohorts, because they have a longer period of time over which they are asked to recall their experience of psychiatric symptoms. However, in this study the association between migration and disorder was strongest in the youngest respondents, among whom the influence of recall bias is likely to be minimized.

Finally, the differences observed here may also reflect differences in idiom of distress between migrants and their families of origin. These differences are minimized in this study by the use of the same fully structured diagnostic interview, which assesses specific

symptoms rather than general complaints, and by the shared Mexican cultural background of the entire sample. Future studies of shifts in idiom of distress among migrants might further test whether the apparent impact of migration on mental health can be accounted for by methodological difficulties in assessing psychiatric disorders cross-culturally.

This study advances our knowledge of the transition in population levels of risk for depressive and anxiety disorders from the relatively low prevalence found in Mexico[13] to the relatively high prevalence found in the Mexican origin population of the US[36]. Evidence now suggests three distinct components of this transition. First, there is evidence of negative mental health selection, i.e. that individuals who migrate have less favorable childhood mental health profiles than individuals who do not migrate [37]. Second, evidence from this study suggests that after arrival in the US migrants are at still higher risk than Mexicans who did not migrate, even after accounting for selection factors. Third, Mexican-origin individuals, whether born in Mexico or the US, who spend their childhood in the US are at roughly equally high levels of lifetime risk as the general US-born population[31].

Identifying these components of the transition in risk for psychiatric disorder associated with migration may help identify and test suspected etiological factors. Studies of migration and mental health have focused attention on discrimination as one likely cause of increased risk for psychiatric disorder. Studies of Caribbean-origin migrants in Europe suggest associations between discrimination and psychotic disorders [38,39]. In the US there is evidence of an association between experiences of discrimination and depression among Hispanics [40, 41]. While suggestive, current evidence is limited to studies that compare migrants with descendants of immigrants born in the host country. In addition, associations between migration and mental health may not be generalizable across migrant groups, which differ dramatically in the factors influencing migration and the conditions in the receiving host country.

Potential explanations for the inter-cohort variation in the effect of migration might lay either in change in the composition of migrants across birth cohorts or in changes in the social context of immigrant absorption in the US. Historical studies of migration from Mexico to the US have found that the demographic composition of the migrant population has been relatively stable over the periods covered in this study[42]. Therefore it is unlikely that secular changes in the types of migrants account for the observed variation in the effect of migration. Changes in the context of immigrant absorption in the US have also occurred in this period that would likely affect the experience of recent birth cohorts, most notably the immigration reforms of 1965 and 1986. The finding that elevation in risk for depressive and anxiety disorders occurs among recent birth cohorts of Mexican migrants may help guide future research by locating the effect of migration within the particular experiences of this sub-population.

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Table 1

Age and sex distribution of family members of migrant interviewed in Mexico and Mexican-born immigrants interviewed in the US*

	Family Members of Migrants		Migrants	
	n	%	n	%
Age				
18–25	620	28.08	105	19.99
26–35	759	30.22	231	38.70
36–45	572	20.61	117	23.10
46 and older	568	21.09	101	18.21
Sex				
Male	904	44.52	259	54.24
Female	1615	55.48	295	45.76
Total Sample Size	2519		554	

*Sample sizes are unweighted and percentages are weighted. The sample of family members of migrants comes from the Mexico National Comorbidity Survey and the sample of migrants comes from the National Latino and Asian American Survey and the National Comorbidity Survey.

Table 2

Lifetime prevalence of depressive and anxiety disorders in family members of migrants interviewed in Mexico and Mexican-born migrants interviewed in the US*

Disorder Category	Family Members of Migrants		Migrants		$X^2(1)$	p-value
	n	%	n	%		
Any depressive or anxiety disorder	315	11.7	114	17.4	10.51	0.001
Any depressive disorder	227	8.2	74	11.0	5.64	0.018
Any anxiety disorder	159	6.2	65	10.1	5.48	0.020
Generalized Anxiety Disorder	37	1.4	22	2.9	5.83	0.017
Panic Disorder	27	1.2	11	1.9	0.93	0.340
Social Phobia	90	3.2	34	5.2	4.56	0.034
PTSD	35	1.9	15	2.6	0.48	0.488

*Counts of cases are unweighted while percentages are weighted. Significance tests are design-adjusted.

Table 3

Risk for onset of depressive and anxiety disorders among migrants following arrival in the US relative to family members of migrants in Mexico

Disorder Category	AOR*	95% CI
Any depressive or anxiety disorder	**1.42**	**(1.04, 1.94)**
Any depressive disorder	1.16	(0.75, 1.77)
Any anxiety disorder	**1.78**	**(1.12, 2.83)**
generalized anxiety disorder	**2.39**	**(1.36, 4.21)**
panic disorder	1.19	(0.34, 4.18)
social phobia	**2.16**	**(1.27, 3.68)**
PTSD	1.37	(0.49, 3.79)

*Adjusted odds ratios (AOR) estimated in discrete time survival models with adjustment for age and sex. Each disorder category was examined in a separate model. Models for categories other than 'Any depressive or anxiety disorder' included a time-varying indicator for prior onset of disorders not included in the category being examined. Figures in bold are statistically significant at the p=0.05 level.

Table 4

Birth cohort variation in risk for onset of depressive or anxiety disorder among migrants following arrival in the US relative to family members of migrants in Mexico*

Type of Disorder	Birth Cohort							
	18–25		26–35		36–45		46+	
	AOR	95% CI	AOR	95% CI	AOR	95% CI	AOR	95% CI
Any depressive or anxiety disorder	**3.89**	**(2.74–5.53)**	**1.83**	**(1.15–2.91)**	0.57	(0.25–1.33)	1.1	(0.62–1.95)
Any depressive disorder	**4.37**	**(2.37–8.04)**	1.50	(0.85–2.66)	0.61	(0.25–1.50)	0.87	(0.49–1.54)
Any anxiety disorder	**3.40**	**(1.73–6.70)**	1.86	(0.86–4.01)	0.77	(0.30–2.00)	1.77	(0.85–3.70)

*Adjusted odds ratios (AOR) estimated in discrete time survival models with adjustment for age and sex. Each disorder category was examined in a separate model. Models for categories other than 'Any depressive or anxiety disorder' included a time-varying indicator for prior onset of disorders not included in the category being examined. Birth cohorts are defined by age at interview. Figures in bold are statistically significant at the p=0.05 level.