



# HHS Public Access

Author manuscript

*J Racial Ethn Health Disparities*. Author manuscript; available in PMC 2019 August 01.

Published in final edited form as:

*J Racial Ethn Health Disparities*. 2018 August ; 5(4): 798–807. doi:10.1007/s40615-017-0425-2.

## Does Acculturative Stress Influence Immigrant Sexual HIV Risk and HIV Testing Behavior? Evidence from a Survey of Male Mexican Migrants

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### Abstract

**Objective**—Migration is a structural factor that increases HIV vulnerability. Acculturative stress represents a possible mechanism through which migration may negatively impact HIV risk. This study investigated socio-ecological factors associated with acculturative stress levels and examined the association between acculturative stress and HIV-related behavior among Mexican im/migrants.

**Methodology**—We used data from a probability survey of Mexican im/migrants (N= 1,383) conducted in Tijuana, Mexico, in 2009-2010. The sample included migrants returning to Mexico via deportation or voluntarily after a recent stay in the U.S. Linear regression models were estimated to identify individual, migration, and contextual factors independently associated with overall acculturative stress levels. Logistic regression models were used to test for associations between acculturative stress, sexual HIV risk and HIV testing history behavior.

**Results**—We found that levels of acculturative stress were significantly and independently related to socio-economic markers, acculturation level, legal residence status, and sexual minority status. The analyses also showed that acculturative stress was positively related to sexual HIV risk behavior and negatively related to recent HIV testing.

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**Conflict of Interest:** The authors declare no conflict of interest.

**Compliance with Ethical Standards: Human and Animal Rights and Informed Consent:** *Ethical approval:* All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors.

**Informed consent:** Informed consent was obtained from all individual participants included in the study.

**Conclusions**—The results underscore that both individual and environmental factors contribute to levels of acculturative stress among Mexican im/migrants. In turn, acculturative stress may exacerbate sexual HIV risk and impede testing among this im/migrant population. Targeted interventions to prevent and decrease acculturative stress represent a potential strategy to reduce sexual HIV risk behavior and promote HIV testing among this vulnerable population of im/migrants in the U.S.

### Keywords

Acculturative stress; HIV/AIDS; sexual risk behavior; HIV testing; Mexican migrants

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### Introduction

Latinos represent 17% of the U.S. population [1] but they make 21% of the new HIV infections [2]. Approximately 16% of HIV cases in the U.S. are among foreign-born individuals, of whom 63% are from Central American or the Caribbean. Latino immigrants account for 43% of new HIV diagnoses among Latinos [3]. The Minority Stress Model explains health disparities experienced by minority groups in the U.S. as the result of prejudice, discrimination, and other social processes that result in reduced access to care and high levels of chronic stress [4]. The model posits that high levels of chronic stress and low health service utilization may promote the adoption of risk-taking behaviors and result in poorer mental and physical health outcomes among stigmatized minority populations [5].

Based on this model, HIV disparities affecting Latino immigrants could be explained, in part, by the unique experiences and stressors they face as they enter and adapt to their new lives in the U.S. Immigrating to a new country poses numerous challenges, such as separation from family and friends, learning a new language, navigating a new culture, and adapting to a different bureaucratic system. For Latino immigrants who are undocumented or live in mixed legal status families, these challenges are compounded by the constant fear of deportation, reduced access to health and social resources, and intensified sense of alienation related to the lack of legal residence status [6–8]. In addition to these immigration-specific stressors, many Latino immigrants in the U.S. face other sources of stress such as poverty, poor living and working conditions, racial/ethnic discrimination, low levels of access to health services, and limited education opportunities [8,9].

Stress is the result of an imbalance between the external or internal demands perceived as threatening by an individual and their assessment of the resources available to cope with them [10]. Acculturative stress refers to the psychological strain experienced by immigrants as they confront and assess the multiple demands imposed by the immigration experience and evaluate the resources they have to cope with them [11]. Among other factors, immigration-related stressors may include those resulting from undocumented status (e.g. fear of deportation, limited access to goods and services due to legal status), language challenges (e.g. difficulties communicating with others, pressure to learn a new language, linguistic barriers to access services), and perceived discrimination (e.g. perceptions of unfair treatment on the account of being from a different country) [8,11].

Studies have shown that acculturative stress is associated with negative physical [12,13] and mental health outcomes among Latino immigrants [14–16]. Perceived discrimination is a pervasive and distinct source of acculturative stress among Latino immigrants [11,16] that has been proposed as a possible pathway through which migration may contribute to a deterioration in health [17,18]. Racial/ethnic discrimination involves ‘practices and actions of dominant race-ethnic groups that have a differential and negative impact on subordinate race-ethnic groups’ [19]. Substantial research has shown an independent link between perceived discrimination and increased risk for depression and poorer general health outcomes among Latino immigrant samples [14,20]. In contrast with other sources of acculturative stress, studies suggest that perceived discrimination and its impact on mental health may increase with acculturation, perhaps due to an increased ability to recognize discriminatory actions or an increased desire to be part of the mainstream U.S. culture [21,22]. Some evidence supports that retention of Latino culture may be protective against perceived discrimination [23,24].

Theoretical and empirical evidence suggests that exposure to discrimination and other acculturation-related stressors could heighten the likelihood of sexual risk behavior and reduce the use of HIV prevention services. For example, discrimination and other types of acculturative stress may lead to fatalistic thinking [25], restrict the perception of behavioral choices available [26], and promote maladaptive coping strategies, such as sexual compulsivity and substance use, to regulate negative thoughts and emotional states [27–29]. Supporting this notion, some studies have demonstrated that racial discrimination contributes to HIV risk behavior among African Americans, including risky sex and substance use [30,31]. Similarly, stress from racism, social oppression, and perceived discrimination due to ethnicity and sexual orientation have been associated with heightened sexual activity and sexual risk among Latino gay men [32,33]. Jardin et al. (2016) found a positive association between acculturative stress and sexual HIV-risk behavior among a sample of ethnic and racial minority college students. A study with a sample of Latina women found that acculturative stress significantly contributed to a syndemic factor that increased the risk for substance abuse, violence, HIV, and depression [34]. Kinsler et al. (2009) found that among Latinos recruited at an STD clinic, lower levels of acculturation, a predictor of acculturative stress, were associated with fewer HIV tests [35].

Despite a growing body of evidence regarding the deleterious effects of perceived discrimination and other sources of acculturative stress on Latino immigrants' mental and physical health, very limited research has examined the impact of these factors on Latino immigrants' risk for HIV and utilization of HIV prevention services. Galvan et al. found that higher chronic stress levels were associated with having engaged in HIV-risk behaviors among a sample of 725 Latino day laborers, but their measure of stress did not focus specifically on immigration-related stressors [9]. A 2015 study provided evidence of a link between acculturative stress and alcohol use, which in turn could increase the likelihood of sexual risk [36]. The sample included both male and female im/migrants and was mostly Cuban and South American. Acculturative stress experiences and responses may differ by gender and among different Latino immigrant populations [26]. Thus, more research to identify predictors of acculturative stress and to understand the effects of acculturative stress

on HIV risk and protective behaviors among specific Latino immigrant populations is necessary [8].

Mexico is the most frequent country of origin for U.S. immigrants, with 28% of all immigrants and 54% of Latino immigrants originating from this country [37,38]. Mexican immigrants also account for over half of all undocumented immigrants [37]. Approximately 56% of Mexican immigrant adults are male [39]. Because of the proximity between Mexico and the U.S., changes in the labor markets, and massive numbers of deportations, many Mexican immigrants travel back and forth between the two countries, resulting in large migrant flows across the Mexico – U.S. border. Because the line between permanent and circular migration is often blurry, here to fore we use the term im/migrant to refer to both permanent and circular Mexican migrants. In 2013, more than 320,000 Mexican im/migrants traveled to the Mexican border to go to the U.S. and over to 700,000 Mexicans returned to Mexico from the U.S. voluntarily or via deportation. Regular travel between Mexico and the U.S. can influence retention of Latino behavioral orientation and may have implications for acculturative stress and HIV risk among circular Mexican im/migrants [40]. Likewise, high rates of undocumented status, widespread social stigma, and stereotyping of Mexican im/migrants could increase actual and perceived discrimination and negatively impact HIV-related behaviors among this im/migrant population [41].

Understanding the factors that influence sexual risk behaviors and put Mexican im/migrants at higher risk for HIV during migration is important for the design of future prevention efforts. To our knowledge, no study has examined the association between acculturative stress and HIV-related sexual risk and testing behavior among Mexican im/migrant males.

This study sought to identify factors associated with acculturative stress and to investigate whether, in turn, acculturation-related stressors are associated with HIV testing and sexual risk behavior among a probability sample of return Mexican im/migrant males.

Based on theories and empirical evidence presented above, we hypothesized that levels of perceived discrimination and other immigrant-related stressors among Mexican im/migrants would vary according to indicators of socio-economic resources, level of acculturation, and legal residence status. Multiple minority status, such as indigenous ethnicity and sexual orientation, and residence in a more versus less immigrant-friendly state were also considered potential determinants of acculturative stress. We further hypothesized that higher levels of acculturative stress would be positively associated with sexual HIV risk behavior and negatively associated with HIV testing.

## Materials & Methods

### Study Design and Procedures

We used data from the MIGRANTE Project, a binational research study that consists of several cross-sectional probability surveys of Mexican im/migrants traveling through Tijuana, Mexico, between 2007 and 2015 ([www.migrante.weebly.com](http://www.migrante.weebly.com)). Between 30% -40% of Mexican im/migrants circulating between the U.S. and Mexico traveled through Tijuana in the years preceding implementation of the surveys [42–44]. MIGRANTE survey

participants were recruited at the San Ysidro deportation facility, the Tijuana airport, and the central bus station. A multistage sampling frame was employed to sample adults from four migration flows: 1) *Northbound flow* – im/migrants arriving in Tijuana from sending communities in Mexico; 2) *Border flow*– im/migrants traveling to Tijuana from other Mexico-U.S. border region; 3) *Southbound flow*– im/migrants returning from the U.S. to sending communities in Mexico voluntarily; 4) *Deported flow*– im/migrants traveling from the U.S. to Mexico via deportation. For the current study, we used data from one of the MIGRANTE surveys focused on HIV risk and conducted from June 2009 through August 2010. We used data only from im/migrants in the Southbound and Deported flows, since the survey collected information about HIV-related sexual and testing behaviors and exposure to acculturative stressors during their recent experience in the U.S. Deported im/migrants were eligible if they were at least 18 years old, born in Mexico or other Latin American countries, and fluent in Spanish. For Southbound migrants, additional inclusion criteria included not being a Tijuana resident and having been in the U.S. for labor reasons, a change in residence, or for more than 30 days. MIGRANTE sampling methods have been described in more detail elsewhere.[45]

Individuals crossing through the sampling points at the deportation facility, bus station, or airport were consecutively approached and screened for eligibility. Southbound im/migrants in the airport were recruited immediately after they went through the passport/security control in the airport and on their way to the boarding gates. In the bus station, they were recruited in the waiting area. For deported im/migrants, recruitment took place at the deportation station, once they had been cleared for departure by Mexican immigration officers. A project staff member explained the study and obtained informed verbal consent.

Participants completed an anonymous, interviewer-administered questionnaire using Questionnaire Development System computer-assisted personal interview (QDS™ CAPI). Questions covered sociodemographics, migration history, last 12-month risk behaviors, and socio-ecological determinants of HIV risk. Participants also received an FDA-approved rapid finger-stick blood HIV test. Rates of HIV infection and behavioral risk factors have been published elsewhere [46]. Study participants received a \$10 phone card incentive. All study procedures were reviewed and approved by the authors' institutional review boards in both the U.S. and Mexico.

## Sample

The MIGRANTE 2009-10 HIV survey included 1,711 im/migrants: 1,020 im/migrants from the Southbound flow and 691 from the Deported flow (response rate: 45.8% and 98.4%, respectively). For this analysis, we excluded females (n=191) and restricted our study to male im/migrants, who made the vast majority of the sample. We also excluded im/migrants who had been in the U.S. for less than 30 days during the previous 12 months (n=224) because measures on acculturation-related stressors were not applied to this group. The final analytical sample included 1,383 male im/migrants: 855 from the Southbound flow and 528 from the Deported flow.

## Measures

**Sexual HIV Risk Behavior**—Survey questions inquired separately about last 12-month vaginal and anal sex and distinguished between sex with female and male partners. For each type of sex and partner's gender separate questions further differentiated between practices with steady partners, casual partners, and sex workers, including use of condoms for each sexual practice. Additional questions focused on sex in exchange for money or other goods, forced vaginal or anal sex, and sex with an injection drug user. Using the answers to these questions, indicators representing 20 different sexual risk behaviors were created. These indicators were summed up to create a composite scale to assess sexual risk (possible range 0-20, Kuder Richardson's coefficient [KR20]=0.72 with present sample). Higher scores on this scale indicated higher levels of sexual HIV risk behavior. Participants above the 75% percentile on this HIV risk score were classified as at high risk for HIV. All others were classified as low or moderate risk.

**HIV Testing**—Participants were asked whether they had ever been tested for HIV and, if so, whether they had been tested within the past 12 months. Respondents who answered positively to both questions were classified as having been tested in the last 12 months; all others were classified as not tested in the last 12 months.

**Acculturative Stress**—We adapted 12 items originally included in the Hispanic Stress Inventory [47] and subsequently used by Finch et al. with Latino migrant samples [14] and added 4 new items to create a composite scale of acculturative stress (KR20=.897 with present sample). The 16 items covered experiences related to stress due to immigration status, language conflict, and perceived discrimination. Individual items, coded as 1 or 0, were summed to create a score ranging from 0 to 16, where higher values represented higher levels of acculturative stress.

**Socio-ecological Determinants of Acculturative Stress**—Measures of theoretical ‘drivers’ of acculturative stress included a) demographic and socioeconomic indicators, such as age (in years), educational level (less than high school vs. high school or higher), marital status (single, married and living with spouse, or married but not living with spouse), health insurance status (insured vs. uninsured), and history of imprisonment (yes/no); b) acculturation level, based on length of stay in the U.S. (less than 5 years, between 5 and 9 years, or 10 or more years); c) migration history, including migration flow (Southbound or Deported) and previous history of deportation (yes/no), as indicators of legal residence status; d) multiple minority status, based on indigenous ethnicity and sexual orientation; and e) residence in a more immigrant-friendly state, such as California, compared to less immigrant-friendly U.S. states [48,49] A copy of the questionnaires is available at <http://migrante.weebly.com/waves-and-questionnaires.html>

## Statistical Analyses

Means and standard deviations were computed for continuous variables. Percentages were computed for categorical variables. We conducted a principal component analysis with the 16 acculturative stress items to identify orthogonal factors under the overall acculturative stress construct. Based on previous literature, we hypothesized that we would identify a legal

component, a discrimination component, and a language component. The independent factors emerging from this analysis were saved and used to explore the unique role of each acculturative stress dimension in relation to HIV-related behaviors.

We used multiple linear regression models to identify individual, migration, and contextual factors independently associated with overall acculturative stress levels and the acculturative stress components resulting from the factor analysis. Adjusted logistic regression models were used to test for associations between acculturative stress (overall levels and independent factors) and level of sexual HIV risk (i.e. high versus moderate/low level) and between acculturation-related stress and last 12-month HIV testing history (i.e. tested versus not tested). All models included age, marital status, education, health insurance, history of detention/imprisonment, length of residence in the U.S., migration flow, previous history of deportation, indigenous ethnicity, gay/bisexual orientation, and state of residence in the U.S. as control variables. Models on recent HIV testing also included level of HIV risk (high vs. moderate/low) as a control variable. All analyses were conducted using IBM SPSS Statistics 22.0 (IBM Corp., Armonk, NY).

## Results

### Descriptive Analyses

Table 1 shows the characteristics of the study sample, including markers of socio-economic status, acculturation, migration history, minority status, and surrounding broader environment. Scores in the HIV risk scale ranged from 0 to 10, with an average score of 1.11 (SD=1.64). About 19.1% of participants were classified as high sexual risk and only 23.9% reported having been tested in the previous 12 months. The average score in the acculturative stress scale was 4.45 (SD=4.43). Only 27.5% of respondents reported not having experienced any of the 16 acculturative stressors covered by our scale, while half of the sample experienced 3 or more stressors and 1 in 4 respondents experienced 7 or more of them.

### Acculturative Stress Principal Component Analysis

The principal component analysis identified three independent factors underlying the overall acculturative stress construct. The first component, labeled *perceived discrimination*, explained 19.34% of the variance. Items loading most heavily in this factor included being treated unfairly, observing friends being treated unfairly, feeling mistreated for speaking poor English, and social rejection on the account of being Mexican. The second factor, labeled *legal status* explained 19.32% of the variance. Items loading most heavily in this factor were being questioned about legal status, fear of deportation, fear of consequences of visiting a social or government agency, avoidance of immigration officials, difficulty finding legal services, limited contact with family and friends due to immigration status, and difficulty obtaining health services due to undocumented status. The third factor, labeled *language conflict*, explained an additional 16.50% of the total variance. Difficulty learning English, difficulties interacting with others in English, difficulty coping with daily situations due to low English fluency, and difficulties finding a job were the items loading most heavily in this factor.

## Factors Associated with Acculturative Stress and its Principal Components

Adjusted linear regression models showed that having health insurance ( $B=-.90$ ,  $p<.001$ ) and having lived in the U.S. for 10 or more years ( $B=-1.26$ ,  $p<.001$ ) were negatively related to acculturative stress scores. In contrast, having a previous history of deportation ( $B=2.17$ ,  $p<.001$ ) and a gay/bisexual orientation ( $B=1.50$ ,  $p=.001$ ) were positively related to acculturative stress. Only marginally significant associations were found between acculturative stress and age ( $B=-.02$ ,  $p=.071$ ; Table 2) and a high school degree or higher degree ( $B=-.54$ ,  $p=.073$ ), while no significant associations were found between acculturative stress and marital status, history of incarceration, indigenous ethnicity, or residence in California. Table 2 shows the independent associations between socioeconomic factors, cultural indicators, migration history, minority status, and political environment and each of the three orthogonal acculturative stress components: perceived discrimination, legal stress, and language conflict.

## Association Between Acculturation-related Stress and Sexual HIV Risk Behavior

In adjusted models, levels of acculturative stress were significantly and positively related to the likelihood of being at higher level of risk for HIV ( $AOR=1.05$ ,  $p=.008$ ; Table 3). Adjusted models of sexual HIV risk on each acculturative stress component showed that only the perceived discrimination factor was significantly related to the odds of being in the high HIV risk level ( $AOR=1.18$ ,  $p=.022$ ) (Table 3).

## Association Between Sources of Acculturative Stress and HIV Testing Behavior

Scores in the acculturative stress scale were negatively and significantly related to the likelihood of reporting an HIV test in the last 12 months ( $AOR=.97$ ,  $p=.038$ ) in adjusted logistic regression models. Independent models estimated for each of the acculturative stress components indicated that only language conflict was significantly related to the odds of having received an HIV test in the previous 12 months. For every unit increase in the language conflict component, the odds of a recent HIV testing decreased by 19% ( $AOR=.81$ ,  $p=.007$ ). No significant association was observed between the perceived discrimination and legal status components and the odds of having had an HIV test in the last 12-months (Table 3).

## Discussion

This paper examined levels, and factors associated with, acculturative stress and its underlying dimensions among Mexican im/migrants returning from the U.S. This study also investigated the association between acculturation-related stress and HIV-related behaviors. In trying to establish this association, this study represents a first step to respond to previous calls to expand the research on acculturation-related challenges and their potential impact on the health of specific Latino immigrant populations [8,26]. In this probability sample of male Mexican im/migrants returning from the U.S., we found that exposure to acculturative stressors related to legal status, language barriers, and perceived discrimination was widespread. Although it is not possible to establish direct comparisons with other immigrant populations, the vast majority of returning Mexican im/migrant men in our sample experienced at least one of these challenges and half experienced 3 or more acculturative



stressors in their recent stay in the U.S. These results are consistent with previous research documenting high prevalence of perceived discrimination among Latinos [16,50] and substantial social stigma towards Mexican immigrants in the U.S. [41]. Considering the growing body of evidence linking acculturative stress to poor mental and physical health, our findings call for interventions to reduce the prevalence, and impact, of exposure to these stressors among Mexican immigrant men in the U.S.

We found support for our study hypotheses predicting that among Mexican im/migrants acculturative stress levels would be associated with socioeconomic markers, as well as with acculturation indicators, legal immigration status, and multiple minority status. Our results are consistent with existing literature on acculturative stress, which has suggested that acculturation-related challenges vary according to individual and societal factors [11]. For example, we found that overall acculturative stress and two of its underlying components, perceived discrimination and legal status stress, are more elevated among im/migrants without health insurance. Given that recent and undocumented im/migrants do not qualify for public insurance programs in the U.S., health insurance status among our sample is a likely a marker of socioeconomic resources. In that sense, our findings agree with previous studies showing that acculturative stress, including perceived discrimination, is more intense among im/migrants with less socioeconomic resources [51]. Likewise, our results regarding a negative association between having a history of deportation and overall acculturative stress, and in particular with the legal status stress and language conflict dimensions of this construct, also concur with empirical evidence demonstrating that the lack of legal residence status contributes significantly to, and may intensify the effects of, other challenges faced by im/migrants as they adapt to their new lives in the U.S. [6,8]. The cumulative evidence underscores the need for policies and programs aimed at reducing acculturative stress levels among unauthorized Mexican im/migrants, as a particularly vulnerable group.

Studies have been inconclusive regarding the role of level of acculturation as a driver of acculturative stress. Some research has suggested that acculturative stress is more intense during the beginning of the acculturation process and among less acculturated im/migrants [51–53]. Yet, other research has found that more acculturated Mexican im/migrants report higher levels of discrimination [22] and suggested a protective role of Latino culture retention [14]. With our sample of Spanish-speaking, returning Mexican im/migrants, we found that length of stay in the U.S. was associated with decreasing levels of acculturative stress. Our analysis of the relation between level of acculturation and the underlying dimensions of acculturative stress indicated that the association was significant in particular for language-related stressors but not found for perceived discrimination and legal status stress. The findings suggest that as im/migrants live in the U.S. for longer periods of time they may find it easier to navigate challenges related to the new language, however they could continue to perceive unfair treatment from the dominant society and, given limited avenues to pursue regularization of their immigration status, continue to experience high levels of legal status stress. Further research must continue to elucidate the association between acculturation and acculturative stress among Mexican im/migrants and contribute to reconcile the disparate findings across studies.

Limited research has explored the role of ethnic or sexual minority status as risk factors for elevated acculturative stress among Mexican im/migrants. Our analyses indicate that gay/bisexual Mexican im/migrants experience greater exposure to immigration-related challenges, in general, and greater levels of legal status stress, in particular, compared to heterosexual im/migrants. These findings are likely to stem from prevailing homophobic sentiments among some segments of both the U.S. and Mexican societies [54,55] and are consistent with the Minority Stress Model [4], which predicts higher levels of stress among groups subject to multiple layers of prejudice and social stigma. Consequently, support services for sexual and indigenous minority im/migrants as they navigate the challenges of adapting to their new communities are especially important.

Despite a growing body of evidence regarding the negative impact of perceived discrimination on the health of sexual minorities and the damaging effects of acculturative stress on mental and physical health of Latino im/migrants, little research has investigated the association between acculturative stress and the risk for HIV infection among Latino im/migrants. We hypothesized that acculturative stress would be positively associated with sexual risk for HIV. Our analyses offer support for this hypothesis. We found that im/migrants with higher levels of acculturative stress, presented an elevated behavioral risk profile for the acquisition of HIV. A detailed analysis of the components of acculturative stress further indicated that the association was found in particular for the perceived discrimination component. These findings expand on a growing body of literature linking perceived discrimination and other sources of acculturative stress to behavioral risk factors [24,29,56] and mental and physical health outcomes among Latinos [13,16,17,52,57,58].

Minority stress [4] and acculturation theories [27,59] and empirical evidence [60] also suggest that stress resulting from perceived discrimination and other immigration challenges could affect health care utilization. Our study offers additional support for that idea, with findings indicating that acculturative stress is negatively associated with HIV testing, particularly language challenges. Increasing HIV testing among Latino im/migrants is imperative in order to reduce disproportionate rates of late HIV testing and limited linkage to treatment services among this population [61]. Thus, future research must further investigate whether this association is causal in nature. In such case, studies must then identify the mechanisms through which acculturative stress deters im/migrants from seeking preventive services that are critically important for reducing disparities in access to HIV treatment. Furthermore, more research is necessary to design HIV testing services tailored to the needs of Mexican im/migrants who tend to experience higher levels of acculturative stress, including those without health insurance, low acculturated, with a history of or at risk for deportation, and/or members of sexual minorities.

Overall, the findings suggest targeting acculturative stress may represent a potential strategy to reduce HIV risk behaviors to Mexican im/migrants, particularly among the groups that may be more vulnerable to experience high levels of this type of stress and those that may suffer more negative consequences when exposed to it. These include im/migrants who are younger, less acculturated, sexual minorities, undocumented and uninsured. Interventions aimed at helping these im/migrants to cope more effectively with the challenges of adapting to a new culture and navigating the different, and sometimes hostile, social and legal

environments they face in the U.S. are necessary and may result in decreased risk for HIV and improved access to HIV prevention resources, as well as better general mental and physical health outcomes.

This study is subject to several limitations. The response rate (~51%) was moderate, leaving room for the possibility of self-selection bias. The survey was conducted only in Tijuana and our analyses were restricted to male Mexican im/migrants. Consequently, the findings may not apply to Mexican males who return from the U.S. through other Mexican border towns. As is common in other HIV prevention studies, all the information was self-reported and may be subject to information bias. Our measurement scales for HIV risk and acculturative stress showed acceptable levels of internal consistency, but have not been subject to a formal psychometric validation process and their use may have resulted in measurement error. The cross-sectional methodology limits our ability to establish causal associations among the factors studied, but the findings lay the foundation for future studies with a longitudinal design to further investigate a potential causal link between them. Finally, the amount of variance explained by the predictors examined in our study was generally low, signifying the need to identify additional factors not included in our study and potentially driving HIV risk and testing behaviors.

Despite these limitations, our paper adds nuance to the relatively limited literature on the relation between acculturative stress and HIV risk and preventive behaviors among Mexican im/migrants. The results have implications for the development of programs to reduce concerns about lack of legal status, language challenges, and feelings of discrimination among Mexican im/migrants as part of larger binational efforts to reduce HIV transmission among this population. It is likely that levels of perceived discrimination and overall levels of acculturative stress among im/migrants in the U.S. have increased since the time data for this study were collected. Recent political debates and increased media attention to Mexican immigration during the campaign preceding the 2016 elections have resulted in rising anti-immigration narratives and expressions of discrimination against im/migrant populations in the U.S. [41,62,63] The results of the 2016 presidential election and the already implemented and announced changes in immigration policies these results have brought make the relevance of programs and efforts to support im/migrants even more important.

Policies, programs, and campaigns to facilitate a pathway to acquire legal immigration status, obtain health insurance, and to promote settlement and social integration of im/migrants, including sexual minority im/migrants, could result in a reduction of acculturative stress and, indirectly, help to reduce sexual risk and promote HIV testing among socially vulnerable Mexican im/migrants.

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**Table 1**  
**Sample characteristics (N=1,383)**

	%	Mean (SD)
<i>Socio-economic markers</i>		
Age (years)		34.0 (11.2)
Completed high school	22.3	
Marital status		
• Unmarried	48.4	
• Married, living with spouse in the U.S.	26.5	
• Married, not living with spouse in the U.S.	25.1	
Health insurance (insured)	36.0	
History of incarceration	34.6	
<i>Acculturation markers</i>		
Length of residence in the U.S.		
• Less than 5 years	28.4	
• 6-9 years	23.8	
• 10 or more years	47.8	
<i>Migration history indicators</i>		
Migration flow		
• Voluntary return	61.8	
• Deported	38.2	
Previous history of deportation	48.7	
<i>Multiple minority status markers</i>		
Indigenous ethnicity	5.4	
Gay/bisexual sexual orientation	7.2	
<i>Broader social climate indicator</i>		
California was state of residence	79.8	
<i>Sexual HIV-related risk behavior</i>		
HIV risk score (possible range 0-20)		1.11 (1.64)
• High risk level (score $\geq 3$ )	19.1	
• Low/moderate risk level (score $< 3$ )	80.9	
Tested for HIV in last 12 months	23.9	
<i>Acculturative stress</i>		
Overall acculturative stress score (possible range 0-16)		4.45 (4.43)

**Table 2**  
**Factors associated with acculturative stress among Mexican im/migrants, Tijuana, 2009-2010 (N=1,383)<sup>1, 2</sup>**

	Acculturative Stress Principal Components		
	Overall Acculturative Stress Score B (p)	Perceived Discrimination Factor B (p)	Legal Status Factor B (p) Language Conflict Factor B (p)
<i>Socio-economic markers</i>			
Age (years)	-.023 (.071)	-.003 (.359)	-.005 (.056) .000 (.897)
Completed high school	-.538 (.073)	.005 (.941)	-.045 (.511) <b>-.185 (.007)</b>
Marital status			
• Unmarried	Ref.	Ref.	Ref.
• Married, living with spouse in the U.S.	.285 (.358)	-.075 (.317)	.094 (.181) .098 (.167)
• Married, not living with spouse in the U.S.	.138 (.664)	-.142 (.065)	.100 (.166) .105 (.150)
Health insurance (insured)	<b>-.896 (.001)</b>	<b>-.152 (.017)</b>	<b>-.223 (&lt;.001)</b> .038 (.536)
History of incarceration	-.117 (.692)	-.071 (.318)	.058 (.386) <b>-.038 (.571)</b>
<i>Acculturation</i>			
Length of residence in the U.S.			
• Less than 5 years	Ref.	Ref.	Ref.
• 6-9 years	-.166 (.632)	-.010 (.903)	.036 (.642) <b>-.105 (.187)</b>
• 10 or more years	<b>-1.26 (&lt;.001)</b>	.091 (.252)	-.128 (.088) <b>-.490 (&lt;.001)</b>
<i>Migration history</i>			
Migration flow			
• Voluntary return	Ref.	Ref.	Ref.
• Deported	.337 (.278)	-.023 (.757)	.136 (.053) .016 (.824)
Previous history of deportation	2.169 (<.001)	.162 (.055)	<b>.496 (&lt;.001)</b> <b>.166 (.040)</b>
<i>Multiple minority status</i>			
Indigenous ethnicity	.792 (.146)	.117 (.369)	.040 (.744) .156 (.211)
Sexual orientation			
• Heterosexual	Ref.	Ref.	Ref.
• Gay/bisexual	<b>1.501 (.001)</b>	.131 (.248)	<b>.283 (.008)</b> .162 (.134)
<i>Broader social climate</i>			
State of residence			



	Acculturative Stress Principal Components			
	Overall Acculturative Stress Score B (p)	Perceived Discrimination Factor B (p)	Legal Status Factor B (p)	Language Conflict Factor B (p)
• Other	Ref.	Ref.	Ref.	Ref.
• California	-.476 (.116)	-.126 (.083)	-.064 (.350)	.007 (.915)
R square	.143	.023	.138	.068

<sup>1</sup> Table shows adjusted regression coefficients (B), associated p values, and R squared value, resulting from regression models of acculturative stress scores and independent underlying factors emerging from principal component analysis (i.e. perceived discrimination, legal status, and language conflict) on markers of socioeconomic status, acculturation, migration history, multiple minority status, and social climate.

<sup>2</sup> Bold values indicate significance at p<0.05

**Table 3**  
**Association between acculturative stress and HIV-related risk and testing behavior among Mexican im/migrants (N=1,383)<sup>1,2</sup>**

	Overall Acculturative Score Stress		Acculturative Stress Principal Components					
	AOR (p)	R <sup>2</sup>	Perceived Discrimination Factor		Legal Status Factor		Language Conflict Factor	
			AOR (p)	R <sup>2</sup>	AOR (p)	R <sup>2</sup>	AOR (p)	R <sup>2</sup>
<i>Sexual HIV Risk Behavior Level (High)</i>	<b>1.05 (.008)</b>	.089	<b>1.18 (.022)</b>	.087	1.06 (.487)	.081	1.11 (.165)	.083
<i>Last 12-month HIV Testing (Tested)</i>	<b>.97 (.038)</b>	.049	1.03 (.647)	.043	.89 (.132)	.046	<b>.81 (.007)</b>	.052

<sup>1</sup>Table shows adjusted odds ratios (AOR), associated p values, and Nagelkerke R square values resulting from regression models of sexual HIV risk (high vs. moderate/low) and HIV testing (tested vs. not tested) on overall acculturative stress scores and on orthogonal factors emerging from principal component analyses; perceived discrimination, legal status, and language conflict. Models were adjusted for all variables listed on Table 1. Models for HIV testing were further adjusted for level of sexual HIV risk.

<sup>2</sup>Bold values indicate significance at p<0.05