Substance Use Across Different Phases Of The Migration Process: A Survey Of Mexican Migrants Flows

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Abstract

Background—This study examined the levels of substance use and changes across different migration stages, including pre-departure, travel, destination, and return, among Mexican migrants converging on the U.S.-Mexico border.

Method—A cross-sectional survey was conducted in Tijuana, Mexico, between 2009 and 2010 among Mexican migrants returning from the U.S. and those travelling from other Mexican regions.

Results—The overall prevalence of last 12-month at-risk drinking, illicit drug use, and current smoking, was 42.3%, 17.7% and 31.4%, respectively. Compared to pre-departure migrants, males were at increased risk for illicit drug use at the destination and return stages. In contrast, females' alcohol consumption at the destination stage was lower than at pre-departure ($p<0.05$). The level of smoking was stable across all stages for both genders. In the destination stage, undocumented migrants were more likely to use illicit drugs relative to their documented peers ($p<0.05$).

Conclusions—Binational interventions promoting substance use reduction are needed among this mobile population.

Keywords

substance use behaviors; Mexican migrants; U.S.-Mexico border; migration stages

INTRODUCTION

In the U.S., Mexican migrants have been identified as one of the most vulnerable populations. They tend to work in low skill level jobs with little income,(1) be exposed to unfavorable living conditions,(2) and have limited or no access to healthcare resources.(3) Mexican migrants also report emotional hardships like discrimination, marginalization, nostalgia, lack of social support, and fear of deportation.(4) The experiences associated with the migration process can influence migrants' health behaviors, including use of alcohol, tobacco, and other drugs (ATOD), and related health outcomes. Existing studies suggest that migrants may use ATOD as a coping mechanism in the face of the disadvantaged economic, social and legal conditions they often experience in the U.S.(5–7)

Migration is a complex process including pre-departure, travel, destination, interception and return stages, and health risks may change as migrants move along these stages and the contexts associated with each migration phase.(8) According to the Behavioral Ecological Model (BEM), health behaviors are determined by multilevel factors, including individual-, interpersonal-, community-, and society-level factors.(9) Building on principles of respondent and operant conditioning, the BEM is a hierarchical model that posits that behaviors are the result of variation and selection by consequences. Selection operates at three levels: natural selection (i.e. behaviors that result in greater likelihood of reproducing and passing along genes), operant selection (i.e. behaviors that have been reinforced more consistently in an individuals' learning history), and cultural selection (i.e. repetition of learned behavior across individuals, within and across generations).

Applied to ATOD, the BEM predicts that migrants' substance use may vary significantly across migration stages, as a result of their exposure to different contextual and cultural factors associated with these stages and the contingencies these environments generate (i.e. operant and cultural selection).(9) Previous studies have found that transnational Mexican migrants at the pre-departure and return phases (i.e. in Mexico) are *more* likely to report use of ATOD, compared to Mexican non-migrants.(5,6,10,11) Mexican migrants at the destination phase (in the U.S.) have been found to be *more* likely to use drugs, but *equally* likely to use alcohol, and *less* likely to use tobacco relative to their peers who do not migrate.(12) The differential effects of migration on these behaviors among Mexican migrants may be explained by self-selection into migration, but also by their experiences in the U.S. For example, they may be exposed to more liberal norms regarding drug use,(13) *no* more or even less permissive norms on alcohol use,(14) and much stronger anti-tobacco social norms in the U.S. than Mexico.(15)

About 90% of Mexican migrants enter or return from the U.S. through eight cities on the northern border of Mexico(16,17) The border region is an area with higher prevalence rates

of alcohol and substance use compared to other Mexican regions.(18,19) Many migrants spend significant periods of time in the Mexican side of the border making arrangements to cross to the U.S. on their way north or after deportation. Some research has suggested migrants may initiate or increase substance use following deportation and while stranded on the border region.(20) It is unclear how traveling through this region may affect substance use among other groups of migrants.

Previous studies on ATOD use among Mexican migrants have relied on comparison of data from national epidemiologic studies conducted in the U.S. and Mexico independently. (6,11,12) However, data from different surveys may not be fully comparable due to differences in sampling frames, inclusion criteria, survey methods, or measurements. Additionally, samples focusing on receiving communities in the U.S. and sending communities in Mexico are more likely to recruit migrants who settle in the U.S. or return to Mexico permanently. In reality, a sizable proportion of migrants engage in a circular migratory pattern, traveling back and forth between the two countries, usually for the purpose of employment.(21) It is estimated that in 2012, there were 12 million Mexican migrants residing in the U.S. (22) and circular migrants represent about one third (29%) of them.(23) Each year, over 400,000 Mexicans return home, nearly all from the U.S., and 600,000 leave Mexico.(21) In addition, almost 400,000 deportation events among Mexican migrants take place.(24)

Temporary and circular migrants are likely to be underrepresented in existing epidemiological studies due to methodological difficulties to reach them and are therefore understudied. This is particularly true of *undocumented* migrants, who make up half of Mexico-U.S. migration flows.(25) Yet these migrants may behave differently from other migrant subgroups in terms of substance use because they are more marginalized and subject to greater stress. The health and health behaviors of these migrants are of importance to both Mexico and the U.S. because they spend time in both countries throughout the year.

Since the 1990s, the Mexican government-funded Migration Survey on the North Border of Mexico (EMIF, its Spanish acronym) has adopted an innovative sampling strategy to monitor migrants to and from the U.S., with a focus on sampling from migrant flows traveling through the North border of Mexico. Instead of collecting traditional stationary samples, the EMIF recruits migrants in transit as they converge on the U.S.-Mexico border. The survey is conducted at key sites associated with the transportation infrastructure linking the border region to the rest of Mexico as well as the U.S. (e.g. bus stations, train stations, airports, deportation facilities). Migrants from several flows are identified, including migrants traveling along the Mexican border region, from other Mexican regions, and returning from the U.S.(16) This sampling strategy provides a unique chance to recruit the highly mobile and undocumented migrant population. It also captures migrants at different migration stages, including pre-departure, travel, destination, and return, and thus allows the comparison of individuals' health behaviors across the stages using a uniform methodology.

Using a similar methodology, we examined the levels of ATOD use among Mexican migrants, changes of these behaviors along the migration process, and differences between flows representing contextual exposures within the same migration stage. This study adds to

literature on ATOD use among circular and undocumented Mexican migrants, a large and previously understudied group of migrants. Our ability to directly compare substance use behaviors among migrants at different migration stages also may help to guide international collaboration to address the health of a trans-national population with strong ties to the U.S. and Mexico.

METHODS

Study Population

From June 2009 to August 2010, a cross-sectional, population-based survey of Mexican migrants was conducted in the Mexican border city of Tijuana, which alone concentrates about 40% of the migrants travelling between these two countries.(26) The survey was conducted using the same sampling strategy as the EMIF to collect information among Mexican migrants converging in the Mexican border region on their migration history, HIV status and related risk behaviors. The survey included a limited set of questions focused on ATOD use.(27) The survey employed a multistage sampling design, with a combination of geographic and temporal units. Sampling venues included the Tijuana International Airport, the largest bus station in Tijuana (i.e. Central Camionera de Autobuses), and the main deportation station in Tijuana (i.e. Delegacion Federal de Migracion, San Ysidro). Time units included the day of the week and the survey shift. Every quarter a random sample of “venue–time” pairs was selected to determine where and when the survey was to be conducted over the following 3 months. The selection of sites and time units was done proportionally to the volume of the migrant flow traveling through each venue and time period. The sampling framework was generated quarterly by EMIF demographers through continuous enumeration of the “traffic” (i.e. number of persons) circulating through each of the sample sites during a 7-day period.

Individuals crossing through the sampling points were consecutively approached and screened for eligibility. Migrants were sampled from four migrant flows, including migrants 1) traveling from other Mexican regions (Northbound); 2) traveling from other Mexican border regions (Border); 3) returning from the U.S. to Mexico voluntarily (Southbound); and 4) returning from the U.S. to Mexico *via deportation* (Deported). Eligible individuals were defined as those who were at least 18 years old, born in Mexico or other Latin American countries, fluent in Spanish, not Tijuana residents (except for deported migrants), travelling for labor reasons or change of residence, and not having participated in the survey before. We approached 6,594 eligible respondents and 3,397 agreed to participate in the survey. The final sample included 3,207 participants who provided valid responses to the survey questions on ATOD use, resulting in an overall response rate of 48.6%. This study was approved by the authors’ institutional review boards in the U.S. and Mexico.

Migration Groups

Based on flow, previous migration history to the U.S., and state of residence, the respondents were categorized into seven migration groups representing migrants at different migration stages and exposure to different migration-related contexts: 1) Northbound migrants *without* a migration history to the U.S.; 2) Border migrants *without* a migration

history to the U.S. and reporting a state bordering the U.S. as primary residence. 3) Border migrants reporting a state *not* bordering the U.S. as primary residence. 4) Southbound migrants; and 5) Deported migrants; 6) Northbound migrants *with* a migration history to the U.S.; and 7) Border migrants *with* a migration history to the U.S. and reporting a state bordering the U.S. as primary residence. Groups 1 and 2 represent those at the *pre-departure* phase. The former is travelling directly from their sending communities; the latter, is heading to their communities of residence in the border region after spending time as migrants in Tijuana or nearby border region. None of these migrants has a migration history to the U.S. Group 3 represents those at the *travel or transit* phase, using the border region as an *intermediate* point on their way to the U.S. or home in the interior of Mexico. Migrants on the pre-departure and transit phases may or may not intend to enter the U.S. but they represent potential international migrants, given their presence on the border region and the survey eligibility criteria. For example, Northbound migrants must state they are traveling to work or look for work. Otherwise, they must not have specific plans to return to their communities of origin or a job waiting for them in their communities of origin. Arguably, even among those not intending to migrate to the U.S. originally, if their efforts to find work fail or the right conditions materialize, they could initiate a border crossing attempt into the U.S. Groups 4 and 5 represent migrants at the *destination* stage, returning from the receiving communities in the U.S. either voluntarily or by force. The last two groups (6 and 7) represent migrants at the *return* stage. They both have a history of migration to the U.S., but are back in Mexico at the time of the survey. Group 6 is travelling from their sending communities in Mexico to the North border of Mexico as a destination or in their way back to the U.S. Group 7 is made of return migrants who have spent more time in the North border of Mexico than the U.S. during the last 12 months. Within the pre-departure and return phases, border migrants (Groups 2, 3, and 7) have recent exposure to the U.S.-Mexico border regions, a high-risk area in terms of substance use; within the destination phase, Southbound migrants are returning from the U.S. voluntarily, whereas the Deported are returning via deportation. The Deported migrants also capture part of the interception phase. Due to their recent deportation and the likely socioeconomic conditions prior to deportation (e.g., undocumented status, limited access to health care, fear of deportation, etc.), deportees may represent the most vulnerable migrant flow and particularly at risk for ATOD use.

Measures

Eligible, consenting participants completed an anonymous, interviewer-administered questionnaire using Questionnaire Development System computer-assisted personal interview (QDS™ CAPI). Questions covered sociodemographics, migration history, contextual factors related to the most recent migration stage, and last 12-month risk behaviors. Participants also received an FDA-approved rapid finger-stick blood HIV test. This study focuses on the ATOD data collected with this survey.

Last 12-month at-risk drinking—Respondents were asked how often they consumed alcohol during the last 12 months. Those reporting “sometimes” or “everyday” were further asked on the days they drank alcohol on average how many drinks they normally consumed. Based on these two questions, respondents were classified as engaging in at-risk drinking, which can lead to alcohol dependence and alcohol use disorder, if they were 1) males who

drank alcohol sometimes and consumed more than 4 drinks on drinking days on average, or drank every day and consumed an average of more than 2 drinks per day; or 2) females that drank sometimes and consumed more than 3 drinks on drinking days on average, or drank more than 1 drink per day on everyday basis during the last 12 months. The definition represents a modified version of that proposed by National Institute on Alcohol Abuse and Alcoholism – males consuming more than 4 drinks on any single day or more than 14 drinks per week, or females consuming more than 3 drinks on a single day or more than 7 drinks per week for women.(28).

Current smoking—Participants were asked whether they had smoked 100 or more cigarettes in their lifetime. Those who answered yes were further asked how often they smoked cigarettes at the time of the interview. A binary variable - current smoking, was generated using these questions: those who reported having smoked 100 or more cigarettes in their lifetime and who reported smoking sometime or every day at the time of the interview.(29)

Last 12-month any illicit drug use—Seven survey items asked respondents what substances they had used during the past 12 months, including cocaine, heroin/smack, marijuana, crystal meth, inhalants, ecstasy and other. These items were later recoded into a dichotomous variable: use of any illicit drug during the last 12 months if any of these items received a positive response.

Statistical Analysis

Data were weighted to account for the complex sampling design and response rates. The calculation of survey weights used standard procedures for multistage sampling methods and has been described in details elsewhere.(30) Prevalence rates of ATOD use, overall and stratified by migration group and gender, were calculated. Multivariable logistic regressions were then conducted to detect significant difference of ATOD use across migration stages (pre-departure, departure, destination, return), using the pre-departure phase as the reference. The regressions were stratified by gender to capture potential differences between males and females in ATOD use along the stages. Within each migration stage, we further explored differences in ATOD use among different flows; for example, at the “return” migration stage, we tested for differences between deported vs. voluntary southbound migrants. These analyses were not stratified by gender due to the small sample size of the female population, which limited statistical power. However, respective models for males and females showed similar patterns across stages. All logistic regressions were consistently adjusted for sociodemographic factors, including age, ethnicity, education level, marital status, and employment status, and intention to enter/return to the U.S. All analyses were performed with the software STATA/MP 13.1 (StataCorp LP, College Station, TX).

RESULTS

The study sample represented a weighted population of 864,390 male and 131,218 female Mexican migrants travelling through Tijuana during the study period.

Sociodemographics and migration profile of the study population

Overall, 99.2% of the migrants converging on the U.S.-Mexico border reported Mexico as their country of origin. Mexican migrants represented by our sample tended to be young (Mean = 34.1 years, SD = 11.2), predominantly male (86.9%), and less educated (only 36.0% had completed high school, Table 1). Among those on the pre-departure, travel and return stages, 54.1% planned to cross the border into the U.S., while among those on the destination stage, 73.7% planned to return to the U.S. in the future. Compared to other migration groups, the Southbound migrants spent the longest time in the U.S. during lifetime and the previous year ($p < 0.001$).

Last 12-month at-risk drinking

Overall, 44.5% of males and 27.9% of females had engaged in at-risk drinking during the previous year (Table 2). Among males, the prevalence ranged from 37.7% for Border migrants at the travel phase to 51.5% for Border migrants at the return phase. Among females, the prevalence was lowest for Southbound migrants representing the destination phase (8.0%) and highest for Border migrants at the travel stage (54.8%).

The adjusted likelihood of at-risk drinking did not vary across the four migration stages among males (Table 3). For females, migrants at the destination stage were less likely to report at-risk drinking relative to those at the pre-departure stage (AOR=0.21, 95% CI=0.08–0.55). In general, women who planned to enter /return to the U.S. were more likely to engage in at-risk drinking, after controlling for migration phase and other factors (AOR=3.22, 95% CI=1.29–8.03). Comparison of flows within migration stages did not reveal significant differences for any stage among either males or females (Table 4). However for the destination phase, plans to return to the U.S. was a significant predictor of at-risk drinking, after adjusting for other factors (AOR=1.95, 95% CI=1.17–3.23).

Current smoking

Approximately, 33.3% of males and 20.5% of females were current smokers at the time of the interview. The prevalence among males was highest for Border migrants at the return stage (45.7%) and lowest for Border migrants at the pre-departure stage (18.0%). Among females, the prevalence ranged from 0.9% for pre-departure Border migrants to 26.4% for those at the travel stage. After the adjustment of sociodemographic factors, we found no significant difference across the migration stages regarding smoking for either gender, nor between any spatial trajectories. Within each stage, no significant differences by flow were found either, but for the return phase, individuals with a plan to re-enter into the U.S. were more likely to smoke (AOR=2.23, 95% CI=1.18–4.19).

Last 12-month illicit drug use

During the preceding 12 months, 19.3% of males and 7.4% of females had used at least one type of illicit drug. The most frequently used drugs were marijuana, cocaine, and crystal meth, with estimated rates of 9.9%, 7.4% and 6.3% respectively. Among males, the prevalence was highest for Departed (28.0%) and lowest for pre-departure Northbound migrants (10.1%). Among females, the prevalence was highest for returned Northbound individuals (18.1%). No pre-departure Border female migrants reported using illicit drugs.

Male migrants at the destination and return stages were more likely to report drug use relative to those at the pre-departure phase (OR=2.23, 95% CI=1.32–3.75; OR=2.77, 95% CI=1.60–4.79; respectively). Deportees also had greater odds of using illicit drugs compared to their counterparts returning voluntarily (OR=1.52, 95% CI=1.01–2.29). No significant difference across migration stages or flows was detected among females.

DISCUSSION

This study examined ATOD use among Mexican migrants in transit across or along the Mexico-U.S. border region, complementing previous research on less mobile migrants conducted in sending and receiving communities. Our study focused more heavily on circular and undocumented migrants. Even though our sample is based in Tijuana, Mexico, the population it represents is highly relevant to both Mexico and the U.S., given the high volume of circular migration and migrants' repeated travel between the two countries.

Our results suggest high levels of substance use behaviors among both male and female migrants converging in the Mexican border city of Tijuana. Across migration flows and stages, one-third of migrant males in our sample were current smokers. This rate is substantially higher than the smoking prevalence for males in California (14.9%),⁽³¹⁾ a state with strong anti-tobacco programs and where the majority of our respondents spent most of their time (results not shown). This prevalence is also higher than the estimate for male adults in Mexico (24.0%).⁽³²⁾ We observed the same pattern for females. A quarter of female respondents were smokers, a considerably higher rate than that estimated for female Californians (9.5%) and adult women in Mexico (7.8%).^(31,32) Moreover, smoking prevalence among Mexican migrants represented by our sample is higher than returned migrants in Mexico (males: 28.5%)⁽¹⁰⁾ and Mexicans living in the U.S. (males: 20.6%; females: 5.6%).⁽¹²⁾

Approximately, one-fifth of Mexican migrants in transit used illicit drugs during the preceding year, doubling the prevalence estimated for returned migrants in Mexico (8.9%).⁽³³⁾ This behavior is slightly more prevalent compared to employed adults in the U.S. (14.1%).⁽³⁴⁾ Cocaine and crystal meth use are particularly concerning, given their known effects on physical and mental health.^(35,36) We did not find directly comparable estimates of past year at-risk drinking among general population or Mexican migrants in the U.S. or Mexico because definitions for excessive alcohol use varied across studies. However, the high prevalence of last 12-month at-risk drinking (42.3%) among adult migrants based on this study suggests this population is at high risk for alcohol dependence.

As predicted by the BEM, we found meaningful differences in ATOD use among migrants at different migration phases. Some differences across migration groups can be explained by differential distribution of sociodemographic characteristics, while others persist after the adjustment for sociodemographic factors. The pattern of differences across migration phases was unique for each substance examined. For alcohol use, males are equally likely to report at-risk drinking across the four migration phases. On the contrary, females are found to consume less alcohol in the U.S. relative to their peers at the pre-departure stage, only to rise to levels similar to those at the pre-departure stage among returned female migrants. The

differential effects of migration on men and women is suggestive that women may be more responsive to changed social norms with respect to alcohol use.

We found *no* evidence showing that Mexican migrants in U.S. were less likely to smoke than those in Mexico communities for either males or females. This contradicts the study by Tong et al. that indicated Mexican migrants in the U.S. were less likely to smoke compared to returned migrants or migrants' family members in Mexico.(12) It is also at odds with previous research showing lower rates of smoking among Mexicans in San Diego (a receiving community) compared to Tijuana (an intermediate, transit community) and Guadalajara, Mexico (a sending community).(15) The differences may result from differences in sampling strategies; the previous studies are likely representative of longer-term migrants, whereas our sampling strategy was designed to include a larger fraction of understudied circular and undocumented migrants. The smoking rates for the seven migration groups in this study are all higher relative to those for migrants based on these previous studies (20.6% for males and 5.6% for females). Future studies should explore factors contributing to the seemingly higher level of tobacco use by circular and undocumented Mexican migrants, even prior to their leaving their communities of origin.

Consistent with previous studies,(6,11) the findings indicate that male migrants in the U.S. have higher odds of using illicit drugs relative to their peers who have not migrated to the U.S. The impact of migrating to the U.S. on migrants' drug use behavior appears to be sustained even after migrants return to Mexico. The lack of such a pattern among females may be due to the generally low prevalence of illicit drug use among all migration groups and insufficient power to detect significant differences.

Comparisons of flows within the same migration stage did not find that migrants travelling along the border region were more likely to use ATOD than migrants travelling from other sending communities in Mexico, within either the pre-departure or return stage. This is contrary to previous studies indicating that the border region had higher rates of ATOD use relative to other Mexican regions.(18,19) It may be due to that migrants consume ATOD at a higher level compared to the general population in Mexico.(6) Within the destination stage, however, ATOD use was generally more prevalent among deportees compared to their counterparts who had spent a longer time or did not face deportation in the U.S., suggesting this population is more vulnerable and exposed to higher health risks. After the adjustment for sociodemographic factors, deportees remained more likely to report drug use than Southbound individuals. The increased risk for illicit drug use among deportees may be caused by factors related to their illegal entry to and undocumented status in the U.S., and/or the related conditions they experienced prior to their deportation from the U.S. such as psychosocial stress, limited access to legal and medical resources, and potentially exploitative working conditions.(37–39) Selection on some traits, such as risk-aversion, may also connect crossing the border illegally and using regulated substances. Alternatively, deportation may also be caused by illicit drug use, as suggested by Ojeda et al.(7) Due to the cross-sectional nature of the data, it is difficult to establish the causal ordering between deportation and drug use; it is most likely that effects operate in both directions.

Measurements of alcohol and drug use used in this study captured substance use the year prior to interview and was not confined to a single region. As a result, associations between migration stages/ flows and ATOD use may be subject to measurement error. However, survey data was also available on alcohol and drug use occurring in the region associated with the corresponding migration stage (e.g., the U.S. for “destination” migrants). We thus restricted the two behaviors to the region associated with each migration stage and adjusted for the duration individuals had spent in that region. The results did not change significantly from those presented here (Table S1 and S2, Supplements), suggesting that the past-year alcohol and drug use regardless of region is robust in measuring migrants’ substance use behaviors at each migration phase.

Implications for practice and policy

Our findings have important implications for public health efforts targeting Mexican migrants to prevent ATOD use. First, they underscore the need to increase our understanding of the factors that contribute to ATOD use among migrants in transit; this population uses substance at a higher level relative to other Mexican migrants and Mexican non-migrant adults. Our data suggest the role of circular migration patterns as significant predictors of ATOD among Mexican migrants, as indicated by increased risk for ATOD use among individuals with a plan to return to the U.S. These results are particularly concerning in light of documented low levels of access to health care among circular Mexican migrants (Martinez-Donate et al. in press), which may limit access to treatment of ATOD-related health problems and result in more severe consequences of these risk behaviors for this medically underserved population. Second, the results call for binational public health programs promoting alcohol reduction, smoking cessation, and drug quitting among mobile migrants, targeting certain subgroups. Joint efforts should target male migrants with a migration history to the U.S. for drug use and female migrants back in Mexico for alcohol use. Interventions for tobacco use need to be implemented for migrants at all migration stages. Undocumented migrants are also in need of programs to prevent increased use of illicit drugs. Multilevel interventions guided by the BEM, i.e. interventions implemented at more than one of the individual, interpersonal, community, and society levels, would be more effective in changing behaviors than single-level ones.(9) For surveillance and intervention purposes, the U.S.-Mexico border region may serve as an exceptional point. Following similar sampling method of the EMIF and our study, research and prevention projects can reach out to Mexican migrants as they enter or return from the U.S. Besides the border region, intervention programs for ATOD use are also needed in sending and receiving communities. In particular, circular and undocumented Mexican migrants were found to experience low levels of access to healthcare in the U.S. (40), and thus it is important for the interventions to be designed to effectively reach this special population. For example, Ventanilla de Salud, a program implemented in Mexican consulates in the U.S. to provide health information, counseling and referrals to migrants(41), may prioritize the topic of ATOD use among their services. A free, binational quit line culturally tailored to meet the needs of circular, low-acculturated, underinsured, and mostly undocumented Mexican migrants should also be explored as a strategy to provide counseling and referral to treatment services for this population in both countries.

Limitations

This study is subject to limitations. First, the response rate of the survey was moderate, but within the target range (40–60%) recommended for surveys of high importance in terms of key policy decisions or resource allocation decisions.(42) Given limited research focused on mobile populations, it is difficult to assess the comparative recruitment success of this survey. However according to the short survey used for screening eligibility, non-respondents tended to be older, better educated, and had a higher proportion of individuals being female and married ($p<0.05$), representing a less risky profile for ATOD use. The differences suggest that the reported ATOD use in our study might overestimate actual rates in the Mexican migrant population. Second, the data are based on self-report and may be subject to information bias. Nevertheless, most studies and national estimates of ATOD use rely on self-report data,(5,10,12,43,44) and there is no reason to believe that errors in our study are systematically different from others. Third, the available information on alcohol consumption does not allow us to define more severe drinking problems like binge drinking, alcohol dependence or alcohol abuse. Future research should further examine these drinking problems among Mexican migrants on different migration phases. Fourth, we used the “plans to enter to the U.S.” as proxy to measure participants’ intention to migrate to the U.S. However, this measure does not exclude the possibility that individuals were planning to cross the border for reasons other than migration or seeking employment, like tourism or visiting family.

In conclusion, our study found high rates of ATOD use among Mexican migrants in transit, underscoring the need for binational interventions that promote substance use reduction among this population. Joint public health efforts should target Mexican migrants at certain migration stages and from specific flows to address these problems. The U.S.-Mexico border region may serve as an excellent location for prevention programs to reach out to mobile migrants.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1
Sociodemographic and migration characteristics of Mexican migrants converging on the U.S.-Mexico border, by migration group

	Overall	Pre-departure (In Mexico and without a migration history to the U.S.)		Travel (Along the U.S.-Mexico border)		Destination (In the U.S.)		Return (In Mexico and with a migration history to the U.S.)		P-value
		North-bound (N=554)	Border (N=43)	Border (N=367)	South-bound (N=983)	Deported (N=674)	North-bound (N=446)	Border (N=118)		
Sociodemographics										
Age, Mean (SD)	34.1 (11.2)	33.2 (11.1)	31.8 (8.6)	33.4 (10.4)	35.2 (12.1)	31.6 (9.2)	35.6 (10.8)	31.3 (10.8)	<0.001	
Gender (male), %	86.9	79.6	85.4	85.3	89.5	91.2	92.6	74.4	<0.001	
Completed high school, %	36.0	60.5	61.3	42.6	21.5	14.2	25.5	75.8	<0.001	
Married/cohabiting, %	51.8	48.9	57.3	53.1	50.1	49.3	60.0	32.6	0.025	
Indigenous Ethnicity, %	4.1	2.3	1.7	1.9	4.8	4.8	7.4	0.0	0.005	
Employment status, %									0.005	
Full time	63.1	67.0	72.1	48.8	63.2	67.9	62.3	55.3		
Part time	11.1	6.2	17.7	20.0	12.4	13.7	10.1	10.4		
Other	25.8	26.8	10.2	31.2	24.4	18.4	27.6	34.2		
Migration										
Lifetime in the U.S. (yrs.), Mean (SD)	5.9 (8.6)	0	0	1.7 (4.1)	12.1 (9.7)	9.0 (8.9)	6.2 (7.3)	1.9 (2.9)	<0.001	
Time in the U.S. during last year (days), Mean (SD)	143.1 (158.6)	0	0	24.2 (71.5)	277.0 (122.7)	237.0 (154.6)	163.9 (147.9)	32.3 (75.3)	<0.001	
Plan to enter the U.S., %	54.1	40.1	24.1	54.3	NA	NA	69.9	88.0	<0.001	
Plans to return to the U.S., %	73.7	NA	NA	NA	75.0	70.3	NA	NA	0.225	

Table 2
Prevalence of ATOD use, by migration group and gender: Mexican migrants converging on the U.S.-Mexico border

ATOD use	Overall	Pre-departure (In Mexico and without a migration history to the U.S.)		Travel (Along the U.S.-Mexico border)		Destination (In the U.S.)		Return (In Mexico and with a migration history to the U.S.)		P-value
		North-bound	Border	Border	South-bound	Deported	North-bound	Border		
Overall										
Last 12-month at-risk drinking, %	42.3	42.0	41.2	40.3	40.8	45.7	43.3	50.1	0.868	
Current smoking, %	31.4	29.8	15.4	32.4	29.4	33.4	34.1	40.2	0.483	
Last 12-month illicit Drug Use, %	17.5	9.6	9.7	12.6	19.1	25.8	23.2	25.9	<0.001	
Male										
Last 12-month at-risk drinking, %	44.5	45.1	45.0	37.7	44.7	48.2	44.1	51.5	0.747	
Current smoking, %	33.3	31.7	18.0	33.4	31.0	34.8	35.2	45.6	0.564	
Last 12-month illicit Drug Use, %	19.3	10.1	11.3	14.4	20.9	28.0	23.6	29.6	<0.001	
Female										
Last 12-month at-risk drinking, %	27.9	30.0	19.1	54.8	8.0	20.5	32.7	45.9	0.004	
Current smoking, %	20.5	22.2	0.9	26.4	16.2	18.5	20.3	24.5	0.832	
Last 12-month illicit Drug Use, %	7.3	7.6	0.0	2.2	3.2	3.2	18.1	15.3	0.219	

Table 3

Multivariable logistic regressions comparing ATOD use at different migration stages: Mexican migrants converging on the U.S.-Mexico border

	<u>Last 12-month at-risk drinking</u>	<u>Current Smoking</u>	<u>Last 12-month illicit Drug Use</u>
	<u>AOR (95% CI)</u>	<u>AOR (95% CI)</u>	<u>AOR (95% CI)</u>
Overall			
Migration stage			
Pre-departure	Ref	Ref	Ref
Travel	0.94 (0.54–1.65)	1.17 (0.69–1.97)	1.22 (0.51–2.93)
Destination	0.84 (0.59–1.19)	0.86 (0.58–1.28)	1.91 (1.13–3.22)
Return	1.01 (0.70–1.45)	1.14 (0.78–1.68)	2.54 (1.47–4.37)
Age (years)	0.97 (0.95–0.98)	0.99 (0.98–1.01)	0.96 (0.94–0.97)
Female (Ref: male)	0.50 (0.33–0.74)	0.59 (0.39–0.88)	0.38 (0.20–0.74)
Indigenous ethnic	0.82 (0.49–1.39)	0.80 (0.43–1.48)	0.84 (0.43–1.62)
Married (Ref: non-married)	0.88 (0.67–1.14)	0.81 (0.61–1.07)	0.54 (0.38–0.77)
Completed high school education	0.96 (0.73–1.28)	0.86 (0.63–1.16)	0.55 (0.38–0.80)
Employment status			
Full time employed	Ref	Ref	Ref
Part time employed	1.44 (0.93–2.24)	1.40 (0.87–2.24)	1.47 (0.86–2.49)
Other employment status	1.03 (0.77–1.37)	0.72 (0.52–0.99)	1.25 (0.84–1.86)
Plan to enter/ return to the U.S.	1.33 (0.98–1.77)	1.35 (0.98–1.85)	1.23 (0.85–1.79)
Male			
Migration stage			
Pre-departure	Ref	Ref	Ref
Travel	0.75 (0.42–1.31)	1.12 (0.63–1.98)	1.38 (0.55–3.45)
Destination	0.88 (0.60–1.30)	0.85 (0.55–1.31)	2.12 (1.22–3.67)
Return	0.97 (0.66–1.45)	1.13 (0.74–1.71)	2.60 (1.47–4.61)
Age (years)	0.97 (0.96–0.98)	0.99 (0.98–1.01)	0.96 (0.95–0.98)
Indigenous ethnic	0.84 (0.49–1.43)	0.82 (0.44–1.54)	0.86 (0.44–1.67)
Married (Ref: non-married)	0.94 (0.71–1.25)	0.79 (0.58–1.07)	0.55 (0.38–0.80)
Completed high school education	0.89 (0.65–1.20)	0.79 (0.57–1.11)	0.52 (0.35–0.79)
Employment status			
Full time employed	Ref	Ref	Ref
Part time employed	1.48 (0.93–2.35)	1.44 (0.89–2.35)	1.36 (0.81–2.29)
Other employment status	0.97 (0.71–1.33)	0.73 (0.51–1.04)	1.36 (0.91–2.05)
Plan to enter/ return to the U.S.	1.29 (0.71–1.33)	1.38 (0.98–1.94)	1.18 (0.80–1.72)
Female			
Migration stage			
Pre-departure	Ref	Ref	Ref
Travel	4.67 (0.94–23.2)	1.78 (0.59–5.42)	0.44 (0.07–2.89)
Destination	0.21 (0.08–0.55)	0.82 (0.32–2.11)	0.38 (0.08–1.85)
Return	0.64 (0.24–1.71)	0.75 (0.23–2.40)	1.54 (0.30–8.01)

	<u>Last 12-month at-risk drinking</u>	<u>Current Smoking</u>	<u>Last 12-month illicit Drug Use</u>
	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)
Age (years)	0.95 (0.92–0.98)	0.96 (0.93–0.99)	0.85 (0.74–0.97)
Indigenous ethnic	NA	NA	NA
Married (Ref: non-married)	0.38 (0.17–0.82)	1.01 (0.45–2.23)	0.50 (0.11–2.20)
Completed high school education	1.92 (0.81–4.56)	1.48 (0.66–3.35)	0.58 (0.15–2.16)
Employment status			
Full time employed	Ref	Ref	Ref
Part time employed	1.10 (0.23–5.30)	0.74 (0.14–4.00)	2.58 (0.29–22.7)
Other employment status	1.77 (0.79–3.96)	0.63 (0.27–1.47)	0.44 (0.10–1.95)
Plan to enter/ return to the U.S.	3.22 (1.29–8.03)	1.43 (0.57–3.58)	2.86 (0.74–11.0)

* **ATOD**: alcohol, tobacco, and other drug; **AOR**: adjusted odds ratio; **CI**: confidence interval

Table 4

Multivariable logistic regressions comparing ATOD use among individuals from different contextual exposure within the same migration stage: Mexican migrants converging on the U.S.-Mexico border

	<u>Last 12-month at-risk drinking</u>	<u>Current Smoking</u>	<u>Last 12-month illicit Drug Use</u>
	<u>AOR (95% CI)</u>	<u>AOR (95% CI)</u>	<u>AOR (95% CI)</u>
Pre-departure			
Contextual exposure			
Northbound	Ref	Ref	Ref
Border	0.67 (0.20–2.28)	0.30 (0.10–1.25)	1.11 (0.14–8.91)
Age (years)	0.97 (0.95–0.99)	0.98 (0.96–1.00)	0.95 (0.92–0.99)
Female (Ref: male)	0.52 (0.29–0.93)	0.64 (0.33–1.26)	0.64 (0.19–2.19)
Indigenous ethnic	0.55 (0.13–2.34)	0.89 (0.18–4.28)	NA
Married (Ref: non-married)	0.91 (0.57–1.47)	0.80 (0.48–1.36)	0.85 (0.41–1.77)
Completed high school education	0.80 (0.50–1.29)	0.76 (0.46–1.26)	0.42 (0.20–0.89)
Employment status			
Full time employed	Ref	Ref	Ref
Part time employed	2.92 (1.04–8.23)	1.88 (0.68–5.17)	4.25 (1.09–16.6)
Other employment status	1.18 (0.67–2.07)	0.87 (0.46–1.60)	2.00 (0.74–5.43)
Plan to enter the U.S.	0.98 (0.60–1.60)	1.37 (0.43–1.57)	1.98 (0.89–4.37)
Destination			
Contextual exposure			
Southbound	Ref	Ref	Ref
Deported	1.09 (0.76–1.57)	1.16 (0.80–1.68)	1.52 (1.01–2.29)
Age (years)	0.96 (0.94–0.97)	0.99 (0.97–1.01)	0.96 (0.94–0.98)
Female (Ref: male)	0.14 (0.08–0.27)	0.44 (0.22–0.90)	0.13 (0.04–0.39)
Indigenous ethnic	1.10 (0.51–2.40)	0.80 (0.36–1.77)	1.69 (0.73–3.89)
Married (Ref: non-married)	0.77 (0.50–1.17)	0.77 (0.50–1.21)	0.53 (0.33–0.86)
Completed high school education	1.58 (0.98–2.54)	1.32 (0.79–2.19)	0.90 (0.51–1.58)
Employment status			
Full time employed	Ref	Ref	Ref
Part time employed	0.77 (0.44–1.36)	1.27 (0.62–2.61)	1.34 (0.73–2.44)
Other employment status	0.67 (0.42–1.07)	0.87 (0.52–1.47)	1.00 (0.54–1.84)
Plan to return to the U.S.	1.95 (1.17–3.23)	0.99 (0.51–1.47)	1.55 (0.89–2.69)
Return			
Contextual exposure			
Northbound	Ref	Ref	Ref
Border	1.38 (0.70–2.70)	1.46 (0.70–3.07)	1.15 (0.52–2.56)
Age (years)	0.96 (0.94–0.98)	0.98 (0.95–1.00)	0.95 (0.92–0.98)
Female (Ref: male)	0.59 (0.26–1.33)	0.47 (0.17–1.34)	0.49 (0.17–1.38)
Indigenous ethnic	0.98 (0.35–2.70)	0.74 (0.23–2.39)	0.54 (0.13–2.24)
Married (Ref: non-married)	1.06 (0.63–1.78)	1.11 (0.64–1.92)	0.43 (0.22–0.81)
Completed high school education	0.78 (0.43–1.42)	0.73 (0.38–1.39)	0.48 (0.22–1.01)

	<u>Last 12-month at-risk drinking</u>	<u>Current Smoking</u>	<u>Last 12-month illicit Drug Use</u>
	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)
Employment status			
Full time employed	Ref	Ref	Ref
Part time employed	1.84 (0.80–4.24)	1.01 (0.40–2.54)	0.98 (0.34–2.84)
Other employment status	1.43 (0.82–2.51)	0.58 (0.32–1.05)	1.64 (0.87–3.11)
Plan to return to the U.S.	1.12 (0.63–1.99)	2.23 (1.18–4.19)	0.78 (0.40–1.53)

* **ATOD**: alcohol, tobacco, and other drug; **AOR**: adjusted odds ratio; **CI**: confidence interval