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BORDER EFFECTS ON DSM-5 ALCOHOL USE DISORDERS ON BOTH SIDES OF THE U.S.-MEXICO BORDER

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Abstract

Background—Little epidemiological evidence exists on alcohol use and related problems along the U.S.-Mexico border, although the borderlands have been the focus of recent media attention related to the escalating drug/violence "epidemic". In the present study the relationship of proximity of living at the border and alcohol use disorders (AUDs) is analyzed from the U.S.-Mexico Study on Alcohol and Related Conditions (UMSARC).

Methods—Household surveys were conducted on 2,336 Mexican Americans in Texas (771 in a non-border city and 1,565 from three border cities located in the three poorest counties in the U.S.) and 2,460 Mexicans from the states of Nuevo Leon and Tamaulipas in Mexico (811 in a non-border city and 1,649 from three cities which are sister cities to the Texas border sites).

Results—Among current drinkers, prevalence of AUD was marginally greater ($p<0.10$) at the U.S. border compared to the non-border, but the opposite was true in Mexico ($p<0.001$), and these trends continued on both sides across volume and 5+ drinking days. Prevalence was greater in Laredo/Nuevo Laredo relative to their respective sister city counterparts on the same side. Border effects appeared greater for males than females in the U.S. and the opposite in Mexico.

Conclusion—The data suggest that border proximity may affect AUD in both the U.S. and Mexico, but in the opposite direction, and may be related to the relative perceived or actual stress of living in the respective communities.

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Keywords

alcohol use disorders; U.S./Mexico border; drinking patterns

1.0 INTRODUCTION

People of Mexican origin constitute the largest subgroup of Hispanics in the U.S. (66.9%); of these 10.2 million were born in Mexico and 16.6 million are second and third generation (Consejo Nacional de Población, 2005). Alcohol problems have been found to disproportionately affect Mexican-origin men, with nativity, acculturation and recency of immigration to the U.S. linked to alcohol dependence and abuse in this group, but findings have been mixed (Caetano and Tam, 1995; Saadatmand et al., 2000). This and uncertain access to alcohol-related health services constitute an important health disparity in the U.S. (Greenfield, 2001; Schmidt et al., 2006; Schmidt et al., 2007).

Mexico is the largest source of immigrants to the U.S. (29%) and more than 30% of Mexicans in the U.S. come from border areas in Mexico (Marcelli and Cornelius, 2001; Sánchez-Huesca et al., 2006). The U.S. – Mexican border stretches approximately 2,000 miles (from the Pacific Ocean to the Gulf of Mexico) and is defined by the U.S. – Mexico Border Health Association as the 25 counties (16 of which are in Texas) touching the border across four U.S. states, and the 39 municipalities touching the border across six Mexican states (Driessen and de Cosío, 1995). About 90% of those living on both sides of the border are concentrated in 12 bi-national metropolitan areas, including nine sister-city pairs, six of which are in Texas.

These U.S. border counties are home to the heaviest concentration of those of Mexican origin in the U.S., and are considered among the poorest in the country, although more prosperous than their Mexican counterparts (Cepeda and Valdez, 2004), which, in turn, are generally better off economically than the rest of Mexico (de Cosío and Boadella, 1999). In Mexico, border areas generally have a lower Marginalization Index compared to other areas of the country, as measured by inequality between households based on several indicators including education, health, household conditions and income (Anzaldo and Prado, 2009). Prior research has found a mixed literature on the effects of social disadvantage and poverty on drinking patterns and problems with both negative (Hilton, 1991; Lantz et al., 2001) and positive associations (Mulia et al., 2008; Karlamangla et al., 2006). While the prevalence of drinking and of low risk drinking among drinkers is greater among those with higher socioeconomic status (SES) compared to those lower, low SES has been found to be associated with a greater likelihood of dependence among lighter drinkers (Mulia et al., 2009), and recent studies have found lower SES to be associated with alcohol problems among Latino populations (Cook and Caetano, in press; Mulia et al., 2009).

Culturally, the border on both sides is characterized by economic interdependence, and metropolitan areas are major points of commerce, population growth, and heightened trans-border movement (Ward, 1999). Residents on either side are able to enter a designated zone with legal exceptions and fewer restrictions than those governing entry past secondary checkpoints further away from the border zone (Martínez, 1994), facilitating cross-border mobility for a variety of reasons including shopping, visiting or employment (Richardson, 1999), and providing a blending to the two cultures, evidenced in the language, food, clothing and customs, and with a similar demographic profile of high mortality and fertility, and a large population under age 20 (Loustaunau and Sánchez-Bane, 1999; Valdez, 1993).

Little epidemiologic data exist on alcohol or other substance use and related problems on either side of the U.S.-Mexico border, although the borderlands have been the focus of recent media attention directed toward the escalating drug/violence “epidemic”, including high rates of violence, homicide and smuggling on both sides (Archibold, 2009; Hendricks, 2007; Rhee, 2009; Swarns, 2006), as well as increasing policy and legal tension, as heightened security measures mandate increased border protection.

Although there is reason to believe that such stresses may affect both mental health and substance use patterns, little is known about the impact of these issues on those living on either side of the border. Those residing at the border may also be especially vulnerable to harmful drinking and related problems, due to effects of alcohol advertising, and in Mexico, under-enforced drinking age (18 years) and greater availability of alcohol at low cost (Baker, 1997; Lange et al., 2002; Power, 1998). Additionally, the border region is thought to be at high risk for substance abuse due to stresses related to high unemployment, poverty, and the convergence of cultures (Wallisch and Spence, 2006).

In the U.S. males from Mexico have been found to adopt quantity and frequency patterns of heavy drinking similar to U.S. males within five years of migration (Caetano and Medina-Mora, 1988; Medina-Mora, et al., 2002), while among females, drinking rates were greater for those who migrated, but were not related to length of residency in the U.S. A prior study at the U.S. - Mexico border in Texas found that while volume of consumption among Mexican-origin adults was no greater than that for their non-border counterparts, rates of abuse and dependence were higher (Wallisch and Spence, 2006; Caetano et al., 2008). Compared to the remainder of Texas (across all ethnic groups), and Hispanics nationally, those at the border were similarly less likely to have used alcohol, but more likely to report alcohol-related problems and abuse and dependence. Comparison of these data with an earlier Texas survey found that past-year alcohol dependence and abuse rose significantly between 1996 and 2003, doubling in border sites (Wallisch and Spence, 2006). A more recent comparison of Mexican-Americans in border counties across the four U.S. border states with those residing in several metropolitan areas throughout the U.S. found no overall difference in volume of consumption or binge drinking (Caetano et al., 2012), alcohol-related problems (Vaeth et al., 2012) or abuse and dependence (Caetano et al., 2013) between border and non-border locations, although young adults aged 18–29 on the border appeared to report higher rates than non-border counterparts.

In Mexico, general population surveys have typically found high rates of infrequent but heavy drinking leading to drunkenness among males, and high rates of abstention or infrequent intake among females (Caetano and Medina-Mora, 1986; Medina-Mora, et al., 2000), but studies on border drinking in Mexico are relatively scarce. The 1998 Mexican National Survey on Addictions (Encuesta Nacional de Adicciones: ENA) found the percentage of heavy drinkers at the Mexican border to be twice as high as that from other regions in Mexico (Medina-Mora et al., 2002). A more recent study found those migrating to the U.S. and returning to Mexico, as well as those with family members living in the U.S., were more likely to report alcohol use disorders than non-migrating Mexicans (Borges et al., 2007).

The present study analyzes data from the U.S.-Mexico Study on Alcohol and Related Conditions (UMSARC), addressing border proximity and alcohol use disorders (AUD) among Mexican-origin adults living in three pairs of sister metropolitan areas at the Texas-Mexico border and one adjacent non-border metropolitan area on each side of the border. Texas was chosen as the site of the U.S. border cities as it is the largest U.S. border state and includes almost two-thirds of all U.S. border counties.

The primary objective of this paper is to identify whether the border is a risk environment for alcohol problems both in the U.S. and Mexico. Given the presumed stresses of living at the U.S.-Mexico border associated with the drug/violence “epidemic” and high rates of unemployment and poverty, coupled with greater availability of low cost alcohol in Mexico, we hypothesized that rates of heavy drinking and related problems may be higher among those living at the border compared to non-border locations on both sides. This is the only comparative, bi-national study of border effects at the U.S. – Mexico border; data from both sides of the border are important for increasing our understanding of the potential effects living at the border may have on drinking problems on both sides, and for extending our knowledge of hazardous and harmful drinking patterns among those in Mexico, and those who have migrated to the U.S. Data here on alcohol use, consequences of use and potential service needs will inform development of the most appropriate prevention and treatment approaches in these underserved populations.

2.0 METHODS

2.1 Household Survey Sample

Area probability sampling with face-to-face interviewing was carried out on Mexican-origin respondents between the ages of 18 and 65, living in the three Texas border metropolitan areas of Laredo (Webb County) (n=751) and McAllen/Brownsville (Cameron/Hidalgo Counties) (n=814), and in the non-border metropolitan area of San Antonio (San Antonio county) (n=771), reflecting a combined cooperation rate of 84% (53.1% response rate), using version 4 of the American Association for Public Opinion Research (AAPOR) (The American Association for Public Opinion Research, 2011). Parallel sampling was carried out in Mexico on respondents living in the respective border sister metropolitan areas (sister cities) of Nuevo Laredo (n=828) and Reynosa/Matamoros (state of Tamaulipas) (n=821) and in the non-border metropolitan area counterpart of Monterrey (state of Nuevo Leon) (n=811), reflecting a combined cooperation rate of 71.4% (63.3% response rate).

The cooperation rate was based on including only those households in which enumeration indicated that an eligible respondent (i.e., a Mexican-origin adult in appropriate age range) was confirmed to reside, while the response rate was based on including the fraction of those households in which enumeration was not conducted that were estimated to contain eligible residents.

2.11 Border Sister Metropolitan Area Pairs—These metropolitan area pairs were selected because they comprise a large proportion of Mexican-origin individuals living in border counties on the Texas side, and because all three sister metropolitan areas are within 150 to 250 miles of a large non-border metropolitan area on both sides of the border, connected by a major transportation corridor.

The *Laredo* metropolitan area, located midway along the Texas-Mexico border, had a Mexican-origin population of 76% (United States Census Bureau, 2003), with Webb County considered the third poorest county in the U.S (Wallisch and Spence, 2006). Laredo is a major commercial and retail link between Mexico and Texas, and, together with its Mexican sister metropolitan area, *Nuevo Laredo* (connected by four international bridges), comprises a combined population of 737,396. The *McAllen* and *Brownsville* metropolitan areas, located along the eastern side of the Texas-Mexico border, lie in the southernmost part of the Rio Grande river valley, and have a combined population of 904,690. This area, commonly known as “the Valley”, includes the counties of Cameron and Hidalgo, considered to be the two poorest counties in the US (Wallisch and Spence, 2006). The McAllen metropolitan area has a Mexican-origin population of 76%, while the Brownsville metropolitan area has a Mexican-origin population of 74% (United States Census Bureau, 2003). The Mexican sister metropolitan areas of *Reynosa* and *Matamoros*, with a combined population of 860,137, are connected by eight international bridges to the metropolitan areas of McAllen and Brownsville, respectively.

2.12 Non-Border Metropolitan Areas—Providing a contrast for analyzing the border context, one non-border metropolitan area, equal distance from the border on each side, was selected in order to examine the influence of border proximity and the effect of being an ethnic ‘minority’ but living in neighborhoods surrounded by ethnic peers (an aspect that characterizes the border on the U.S. side) vs. living in a more ethnically diverse city (off the border) in the U.S.

The *San Antonio* metropolitan area, population 1.9 million (1.3 million in the city), has a Hispanic population of 61% (United States Census Bureau, 2012), with approximately 26% of the Mexican-origin population living in high density (>77%) Mexican-origin census tracts. *Monterrey,* the capital of the state of Nuevo Leon, is a modern industrial and business center with a population of 1.1 million, and a metropolitan area population of 3.8 million.

2.2 Fieldwork Data Collection

Household face-to-face interviews of about 45 minutes in length were conducted in the U.S. by the Public Policy Institute (PPRI) at Texas A&M University, and in Mexico by the National Institute of Psychiatry (INP) in Mexico City. Using multistage area-probability sampling, with stratification by city on both sides of the border, primary sampling units (PSU), defined as census block groups with at least 70% Hispanic population in the U.S., were identified, with blocks serving as the secondary sampling unit (SSU). In Mexico, PSUs were defined using the catalog of the census Basic Geo-statistical Areas (“Areas Geoestadísticas Básicas-AGEB”), with blocks within the AGEB serving as SSUs. On both sides, 3 households per SSU were randomly selected and screened for the presence of a resident between the ages of 18 and 65, and in the U.S. also one of Mexican-origin. Eligible residents were then enumerated, and the one with the most recent birthday selected as the respondent. In order to minimize any biases related to timing of data collection across sister metropolitan area pairs on each side of the border, data collection was staged so that sister-city pairs were sampled approximately simultaneously on each side.

Following informed consent, in-person interviews were conducted by extensively trained interviewers recruited from the local community (e.g. schoolteachers, health workers, graduate students, local residents) and supervised by the respective PPRI and INP experienced field supervisors. In the U.S. respondents were given the choice of being interviewed in either English or Spanish, and respondents were offered a $25. gift card for completing the interview, as a token of appreciation for their time.

2.3 Instruments

Using a common methodology and instrumentation on both sides, the interview was obtained using a Computer Assisted Personal Interviewing (CAPI) system in the respondents' own homes. The instrument included, among other items, questions regarding the 11 diagnostic criteria for a Diagnostic and Statistical Manual, 5^{th} revision (DSM-5) diagnosis of AUD (American Psychiatric Association, 2013), using an adaptation of the Alcohol Section of the Composite International Diagnostic Interview (CIDI) core (World Health Organization, 1993). DSM-5, as opposed to DSM-IV, collapses the alcohol abuse and dependence criteria into a single, unidimensional construct, and drops the criterion on legal problems while adding the criterion on craving, with a score of ≥ 2 positive for AUD (Hasin et al., 2013).

Usual volume of alcohol consumption was obtained using a series of questions regarding the frequency of drinking, and the amount usually consumed per day, separately for each beverage type over the last year (Greenfield and Kerr, 2008; Room, 1990), and summed across beverages and divided by 12 to estimate an average volume (number of drinks) over the last 30 days. Usual drink size was also elicited for each beverage type using pictures of common glassware and converted to units and decimals of standard drinks, each containing 14 g pure ethanol and volume was adjusted to reflect this. The frequency of consuming 5 or more drinks per day was calculated from a series of combined alcoholic beverage graduated frequencies questions (Greenfield, 2000) eliciting the frequency of consuming 12 or more drinks in a day, 8–11 drinks, and 5–7 drinks, and summed across categories for the frequency of 5+ drinking days in the last year.

2.4 Data Analysis

Analysis was restricted to drinkers only due to the disproportional prevalence of current (12-month) drinking between the two countries (71% across all sites in Texas, and 51.8% across sites in Mexico). Among drinkers, the prevalence of current DSM-5 AUD was compared between border and non-border sites, separately for each side. Risk curves for the predicted probability of DSM-5, at a given alcohol volume level (adjusted for drink size) over the last 30 days (12-month mean volume expressed as drinks/month), and, separately, at a given level of 5+ days, were calculated using fractional polynomial modeling, separately for border and non-border sites in the U.S. and Mexico. Risk curves were also generated for males and females, separately. The second-degree fraction polynomial (Royston et al., 1999) is used to model the relationship between continuous volume of consumption and 5+ days and the odds of reporting DSM-5 AUD. Fraction polynomials estimate the probability of AUD using logistic regression model via the model: logit(injury)=$b_0+b_1x^p+b_2x^q$ (or $b_0+b_1x^p+b_2x^p(\ln x)$ if $p=q$) where p and q are chosen from −2, −1, −0.5, 0, 0.5, 1, 2 and 3 ($x^0=\ln x$) and X is volume in standard drinks or (separately) 5+ days. The best fit among the 36 possible models (produced from all possible combinations of p and q) is determined for the model producing the largest maximized likelihood function. Gender and age were also controlled, and all models were fitted using the STATA version 11 (Stata Corp., 2009) ***fracpoly*** command. The predicted probabilities of AUD across various levels of volume of consumption and, separately, 5+ days, based on fractional polynomial models, are then shown as risk curves. Risk curves were also calculated controlling for SES (education, household income and employment).

In both the US and Mexico, data were weighted to reflect the multistage clustered sampling design. Then a ranking algorithm [(Deville et al., 1993; Izrael et al., 2004) #23663] approach was used to iteratively adjust the sampling weights to match census marginal distributions of education and the combined gender by age distribution, separately within each site. Weighted prevalence rates and means are reported, with statistical tests accounting for design effects inherent in multistage clustered sampling using Stata’s (Stata Corp., 2009) svy commands. Risk curve analysis using fractional polynomial models, however, was unweighted, given some of the weighted estimations were unable to converge. This is deemed acceptable since risk curve analysis is aimed to investigate the relationship between AUD and drinking volume (or 5+days) rather than population prevalence per se.

3.0 RESULTS

Table 1 shows demographic and drinking characteristics by border proximity separately for the U.S. and Mexico. Among drinkers, while the prevalence of last year DSM-5 AUD was marginally higher ($p<.10$) at the border compared to the non-border site in the U.S. (24.3% vs 20.1%), the opposite was true in Mexico, with the non-border site significantly ($p < .001$) higher (18.7%) compared to border sites (11.3%). While no difference in adjusted volume was found for border vs. non-border sites in either the U.S. or Mexico, in Mexico prevalence of 5+ drinking was lower at the border compared to the non-border. The prevalence of DSM-5, number of drinks monthly (volume) and number of 5+ drinking days varied between border sites on the same side, however. The sister city pairs of Laredo and Nuevo Laredo showed a significantly greater prevalence of AUD and heavier drinking than their respective sister city counterparts of Brownsville/McAllen and Reynosa/Matamoros.

Table 2 shows the probability of DSM-5 AUD at a given level of adjusted 12-month volume (expressed as drinks/month), controlling for gender and age, estimated from fractional polynomial analysis. While differences between border and non-border sites were not significant for either the U.S. or Mexico (except at the very lowest and highest volume categories for Mexico), a trend is apparent, with border sites in the U.S. showing a greater probability of AUD than non-border sites at all volume levels, while the opposite is true in Mexico.

The top half of Figure 1 shows the risk curves for the probability of AUD with volume for border and non-border sites. The U.S. border and non-border sites and the Mexico border sites all showed a relatively similar increase in the likelihood of AUD with increasing volume, while the association of AUD and volume in the Mexico border sites appeared to level off at high volume levels.

Table 3 shows the probability of DSM-5 AUD at a given level of 5+ drinking, controlling for gender and age. Similar trends are seen as that observed for volume, with border sites in the U.S. showing a greater probability of AUD than non-border sites at most 5+ levels, while the non-border site in Mexico showed a greater probability of AUD than border sites, with the magnitude of differences quite substantial at all 5+ levels, although only significant at the top levels.

The bottom half of Figure 1 shows the risk curves for the probability of AUD with 5+drinking days. Again, the U.S. border and non-border sites and the Mexico border sites all showed a relatively similar increase in the likelihood of AUD with increasing frequency of 5+ days, while the Mexico non-border site showed relative little increase in the likelihood of AUD with increasing 5+ days which flattened after seven 5+ days per year.

Figure 2 shows the probability of DSM-5 AUD at a given level of adjusted volume (top half) and number of 5+ days (lower half) for males, controlling for age. Similar trends are seen, with U.S. males at the border more likely to report symptoms of AUD than non-border males at increasing volume and 5+ levels, and this was significant up to increasing volume levels of 6 drinks/month (significance not shown in figure), while in Mexico the opposite trend was seen for both volume and 5+ drinking.

Figure 3 shows the probability of DSM-5 AUD at a given level of adjusted volume (top half) and number of 5+ days (lower half) for female drinkers, controlling for age. AUD risk is, again, higher at the border than non-border sites at volume levels and also higher when 5+ days is greater than 15 in the U.S., but in Mexico the opposite relationship is observed at all volume and 5+ levels. While risk appears to be most divergent between Mexican border and non-border females at higher levels of volume and 5+ days, differences are not significant due to relatively small numbers of both border (n=251) and non-border (n=116) Mexican female drinkers.

All risk curves were also calculated controlling for SES (not shown), with little difference in findings.

4.0 DISCUSSION

Among current drinkers, prevalence of AUD, based on two or more DSM-5 criteria, was higher in border sites in the U.S. than in Mexico, but rates were similar between the U.S. and Mexico in non-border locations. AUD prevalence was greater at the U.S. border compared to the non-border, but the opposite was true in Mexico, with a significantly greater prevalence of AUD in the non-border site than the border sites, and these trends continued on both sides across volume and 5+ drinking days. Although the magnitudes of difference in border vs. non-border sites were substantial at some volume and 5+ levels on both sides, differences generally were not significant, due to small numbers. A comparison by inspection of males with females in Figures 2 and 3 suggests that border effects may be greater for males than females in the U.S. while the opposite appears to be the case in Mexico.

Previous studies in both the U.S. and Mexico have found higher rates of alcohol problems, including abuse and dependence, on the border than in the interior of these countries (Medina-Mora et al., 2002; Wallisch and Spence, 2006). In an earlier Texas study, 21% of drinkers at the border were found to have AUDs (Wallisch and Spence, 2006), with those at the border less likely to have used alcohol, but more likely to have AUDs, compared to those in the remainder of Texas. While rates here (24% across border locations) are similar to those in the earlier Texas study, little difference was found in volume of consumption between border and non-border locations or in AUDs across volume levels. A more recent study comparing Mexican-Americans living in border counties with those residing in several metropolitan areas throughout the U.S. also found no overall difference in volume of consumption or binge drinking (Caetano et al., 2012), alcohol-related problems (Vaeth et al., 2012) or DSM-IV abuse and dependence, although females aged 18–29 living at the border were found to have significantly higher rates of dependence than their non-border counterparts (Caetano et al., 2013).

In Mexico, an earlier national survey data found the percentage of heavy drinkers at the border was twice as high as that from other regions in the country (Medina-Mora et al., 2002), with 11% reporting heavy drinking, somewhat lower than the 16% in the Mexican border sites report 5+ drinking days in the present study. Comparison of border data from Mexico with that from Texas in these earlier studies found that while rates of alcohol use were similar, heavy alcohol use was higher on the Mexican side (Wallisch, 1998), which was not supported in the present study, where over twice the percentage of drinkers on the U.S. border reported 5+ drinking days (37%) compared to their Mexican border counterparts (16%).

The three U.S. border counties where these data were collected are the poorest in the country, however, when SES was controlled, findings remained, lending support to our hypotheses that the escalating drug/violence “epidemic” and heightened border security brings increased stress for those living at the border, and coupled with more liberal alcohol advertising, and greater availability of low-cost alcohol, especially for those underage crossing the border to Mexico (Baker, 1997; Lange et al., 2002; Power, 1998), may have resulted in increased alcohol consumption and related problems on the U.S. side.

Findings here on the Mexican side are not supported by previous studies in Mexico, which found alcohol problems including AUD were elevated at the border compared to the rest of the country. While border areas in Mexico are generally considered to be better off economically than the remainder of Mexico (de Cosío and Boadella, 1999), Monterrey, the non-border site in this study, has the second lowest Marginalization Index in Mexico (just behind Mexico City), with 46% of the AGEBS (similar in area to U.S. ZIP codes) low on marginalization indicators, compared to only 13% of AGEBS in the three border sites combined (Anzaldo and Prado, 2009). When SES was controlled, observed differences remained, with Monterrey showing a higher prevalence of AUD than border sites, suggesting Monterrey may be experiencing added stress similar to that at the border in the U.S. During the period of data collection in Monterrey, a number of violent episodes occurred related to the drug cartels, which also likely resulted in the lower cooperation rate in that city due to potential respondents being fearful for their safety.

Differences were also found in drinking and problems across the border city sites on the same side of the border. The sister city pairs of Laredo and Nuevo Laredo showed a significantly greater prevalence of AUD and heavier drinking relative to their respective sister city counterparts of Brownsville/McAllen and Reynosa/Matamoros. This finding may reflect cross-border mobility within sister-city pairs with respect to drinking patterns and alcohol-related problems. Due to the nature of the sister metropolitan areas spanning both sides of the border and the fluidity of cross-border mobility in both directions, the “border” becomes a somewhat artificial barrier (particularly in regard to disease and social problems), reinforcing the importance of parallel research on both sides of the border.

A major strength of the study was parallel and simultaneous data collection on both sides of the border, which can be considered an artificial barrier with respect to sister cities, as noted above. Additionally, because Texas includes almost two-thirds of all U.S. border counties, findings here increase our understanding of alcohol use patterns and problems in a broader border context, especially on the U.S. side. Although Texas can be considered fairly representative of the U.S. border, data were not collected from the remaining three border states on the U.S. side (New Mexico, Arizona and California), and given the diversity of findings here across the sister-city pairs on the same side of the border in the same state, other sister cities may provide different data. Additionally, this single-state focus limits heterogeneity in the geographic, cultural and sociopolitical factors that could have affected findings, a potential study limitation. Sampling was also restricted to those residing in border and non-border metropolitan areas and may not reflect drinking patterns and problems of those living in the rural colonias at the border on the U.S. side, or rural areas on the Mexican side of the border. Sampling in San Antonio was restricted to Mexican-origin respondents living in high density (77%) Hispanic areas, possibly resulting in more conservative estimates of the differences in AUD between the border and non-border locations on the U.S. side.

Given the present study was cross-sectional in design, we are not able to determine whether those with particular substance use patterns and problems may gravitate to the U.S. border, or whether the border context (for example, the greater availability of low-cost alcohol in Mexico) influences these individuals, predisposing them to hazardous and harmful use of alcohol, and similarly for non-border areas in Mexico. While the data suggest that border proximity may affect AUD in both the U.S. and Mexico, but in the opposite direction, and may be related to the relative perceived or actual stress of living in the respective communities, future research is necessary to elucidate the manner in which border proximity may explain alcohol use and problems on both sides of the U.S. – Mexico border.

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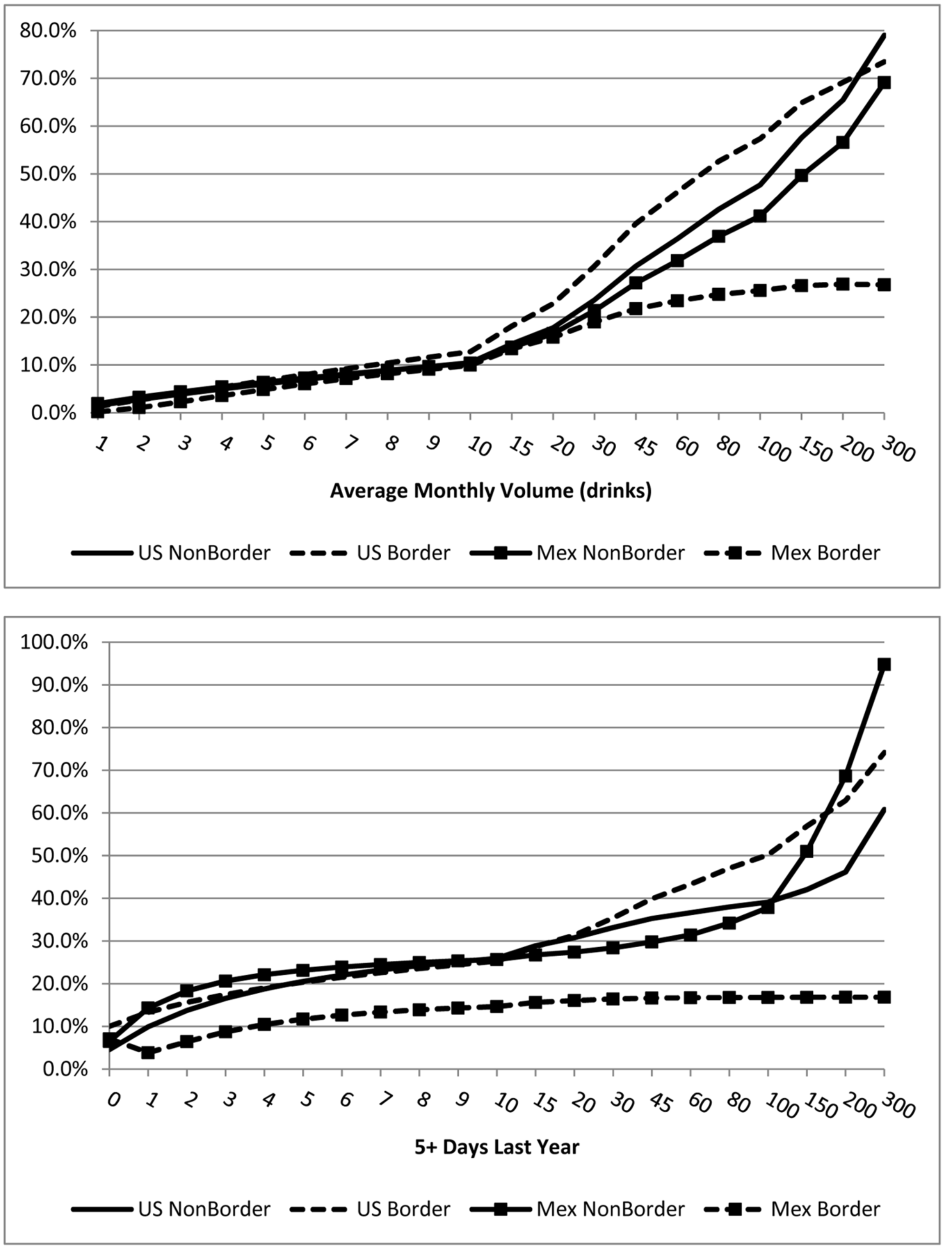

Figure 1.

Risk curves derived from fractional polynomial model showing probability of 2+ DSM-5 AUD by average volume consumption (top) and 5+ days (bottom), for all drinkers

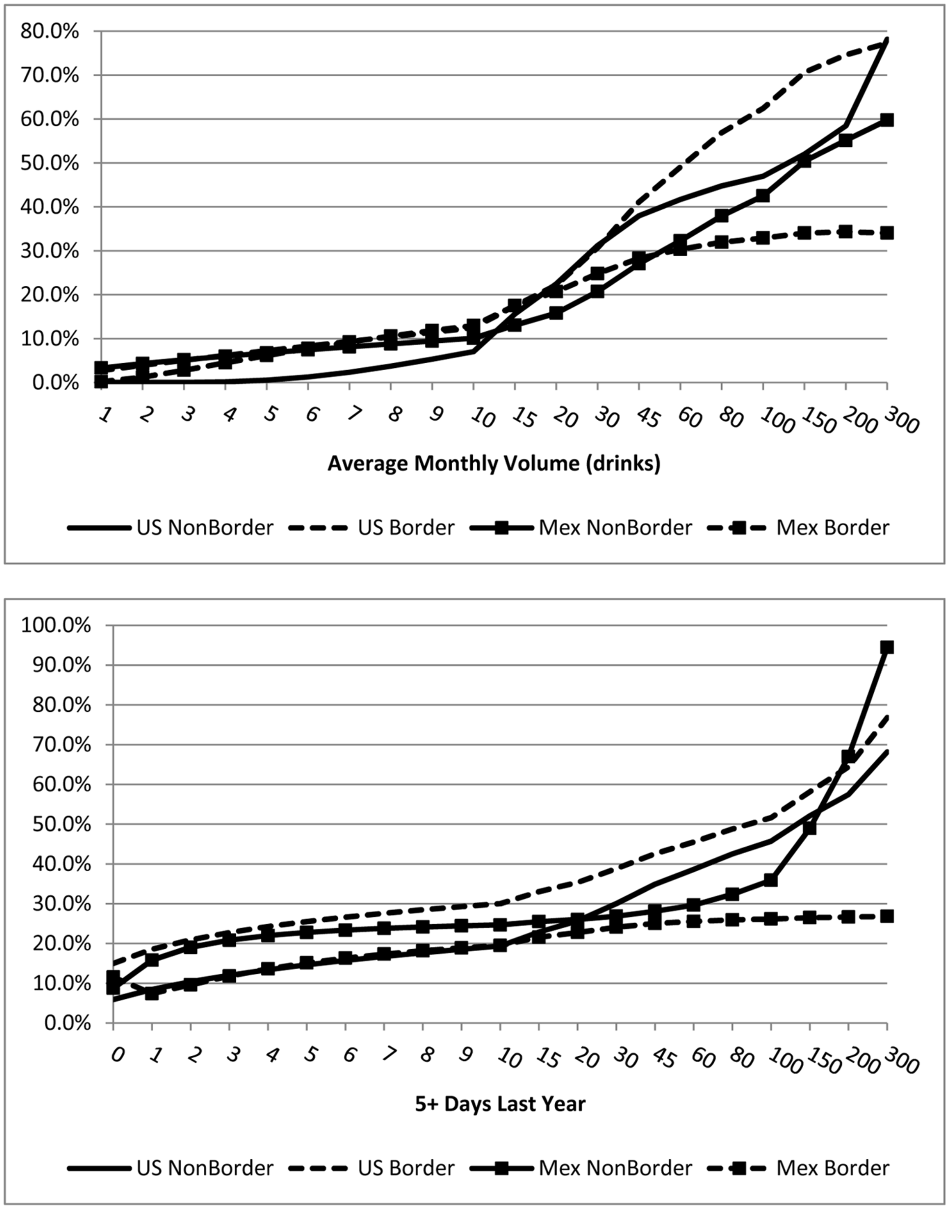

Figure 2.

Risk curves derived from fractional polynomial model showing probability of 2+ DSM-5 AUD by average volume consumption (top) and 5+ days (bottom), for male drinkers

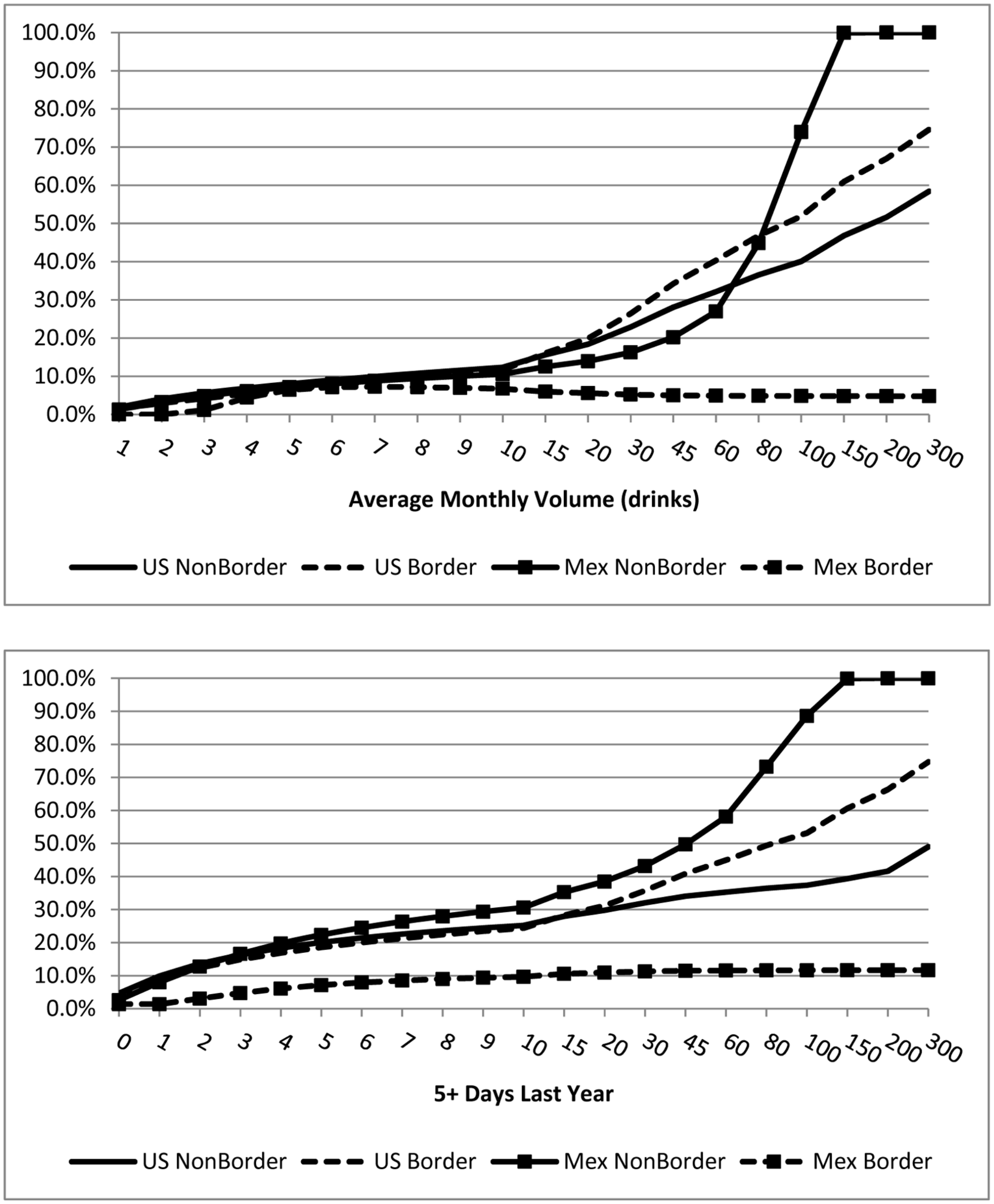

Figure 3.

Risk curves derived from fractional polynomial model showing probability of 2+ DSM-5 AUD by average volume consumption (top) and 5+ days (bottom), for female drinkers

Table 1

Demographic characteristics, alcohol use and DSM-5 AUD measures across U.S. and Mexico border sites

					Drinkers[1] only		
	Gender male (%)	**Age Mean**	**Drinkers[1] (%)**	**2+ DSM-5 AUD (%)**	**2+ DSM-5 AUD (%)**	**Monthly Volume (drinks)**	**5+ Days last year (days)**
US Non-border	49.0	39.2	71.5	14.4	20.1	37.9	39.1
US Border	46.8	38.4	71.0	17.3	24.3†	42.7	36.9
Laredo	46.9	38.4	74.9	21.4	28.6	55.6	47.1
Brownsville/McAllen	46.6	38.4	67.4**	13.4**	19.9*	29.8***	26.4***
Mexico Non-border	49.6	37.9	49.5	9.3	18.7	40.8	22.8
Mexico Border	49.4	36.4**	52.9	6.0**	11.3***	33.3	16.2*
Nuevo Laredo	49.5	36.9	46.5	7.8	16.9	45.7	28.0
Reynosa/Metamoros	49.3	35.8	59.4***	4.1**	6.9***	23.5**	6.9***

[1] Defined as any alcohol consumption in last 12 months

† p<.10,

* p<.05,

** p<.01,

*** p<.001: pairwise test between border and non-border sites, and between the border sisters cities, for US and Mexico separately

Table 2

Probability of 2+ DSM-5 AUD (%) at given level of volume consumption (average volume in drinks/month) estimated from fractional polynomial model controlling for gender and age, for all drinkers

	US			Mexico		
12-month volume (drinks/month)	**Non-Border (n=572)**	**Border (n=1,118)**	**p[1]**	**Non-Border (n=415)**	**Border (n=878)**	**p[1]**
1	1.5	1.3	0.831	1.9	0.2	0.031
2	2.8	2.7	0.966	3.2	1.1	0.197
3	3.9	4.0	0.941	4.4	2.3	0.408
4	5.0	5.4	0.872	5.4	3.6	0.581
5	6.0	6.7	0.817	6.4	4.8	0.707
6	7.0	8.0	0.772	7.2	6.0	0.794
7	7.9	9.2	0.735	8.1	7.1	0.856
8	8.8	10.4	0.703	8.9	8.2	0.898
9	9.7	11.6	0.676	9.7	9.1	0.927
10	10.5	12.8	0.652	10.4	9.9	0.947
15	14.4	18.1	0.570	13.7	13.4	0.969
20	17.8	22.9	0.522	16.6	15.8	0.939
30	23.6	30.7	0.472	21.4	19.0	0.845
45	30.7	39.6	0.444	27.2	21.8	0.706
60	36.4	46.2	0.439	31.8	23.4	0.591
80	42.6	52.7	0.451	36.9	24.8	0.471
100	47.7	57.4	0.476	41.2	25.6	0.380
150	57.6	64.9	0.587	49.6	26.6	0.229
200	65.5	69.2	0.774	56.6	26.9	0.140
300	79.0	73.5	0.656	69.1	26.8	0.068

[1] Pairwise tests between border and non-border sites within a country

Table 3

Probability of 2+ DSM-5 AUD (%) at given level of heavy drinking days (5+ Days last year) estimated from fractional polynomial model controlling for gender and age, for all drinkers

	US			Mexico		
5+ Days	**Non-Border (n=572)**	**Border (n=1,118)**	**p[1]**	**Non-Border (n=415)**	**Border (n=878)**	**p[1]**
0	4.6	10.0	0.103	6.5	7.1	0.901
1	9.9	13.3	0.489	14.3	3.8	0.100
2	13.7	15.7	0.749	18.3	6.4	0.144
3	16.6	17.5	0.892	20.6	8.7	0.202
4	18.8	19.0	0.972	22.1	10.5	0.251
5	20.5	20.4	0.983	23.1	11.7	0.289
6	22.0	21.5	0.958	23.9	12.7	0.316
7	23.2	22.6	0.945	24.5	13.4	0.336
8	24.2	23.6	0.940	25.0	13.9	0.350
9	25.1	24.5	0.940	25.3	14.3	0.361
10	25.9	25.3	0.944	25.7	14.7	0.369
15	28.9	28.7	0.988	26.7	15.6	0.385
20	30.8	31.4	0.953	27.4	16.1	0.386
30	33.2	35.5	0.839	28.4	16.4	0.372
45	35.3	39.9	0.696	29.8	16.6	0.337
60	36.6	43.3	0.583	31.4	16.7	0.293
80	38.0	47.1	0.469	34.2	16.8	0.227
100	39.1	50.2	0.383	37.8	16.8	0.161
150	42.0	56.9	0.252	51.0	16.8	0.046
200	46.2	63.0	0.203	68.7	16.8	0.010
300	60.8	74.2	0.338	94.8	16.8	0.002

[1] Pairwise tests between border and non-border sites within a country