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Short communication

# The role of acculturation and binge drinking on smoking status among Mexican Americans: Comparison by border residence

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ABSTRACT

*Background:* Border Mexican Americans (MA) are exposed to poverty and under-education, all of which are predictors of cigarette smoking.
*Methods:* This study analyzed two epidemiologic surveys among border and non-border MA. In the border sample, interviews were conducted in urban areas of U.S.-Mexico border counties of California, Arizona, New Mexico, and Texas. The non-border sample consisted of respondents interviewed in Los Angeles, Houston, New York, Philadelphia, and Miami. Analyses were stratified by gender, adjusted for age and education, and modeled the effects of acculturation and binge drinking on cigarette smoking behavior.
*Results:* There were 2595 respondents, 1307 residing in border counties and 1288 from 5 other cities. There was no difference in cigarette smoking in the past 12 months between border and non-border MA among men (25.8% vs. 29.4%) or women (9.4% vs. 9.9%), respectively. Acculturation was not significantly related with cigarette smoking among men; however, women with high acculturation levels were more marginally likely to be past year smokers than those with low acculturation (RRR = 2.06, 95% CI 0.97–4.78). Binge drinking was associated with being past year smoker in both men (RRR = 3.54, 95% CI = 2.31–5.42) and women (RRR = 2.23, 95% CI 1.17–4.27), but not with being a former smoker.
*Conclusions:* Border residence did not influence cigarette smoking behavior among Mexican Americans and both groups had significant associations between smoking and binge drinking.

## 1. Introduction

The U.S.-Mexico border area is affected by high rates of poverty, limited education, and poor indices of health (Bhavsar et al., 2014) that may influence smoking behaviors. There is an established association between binge drinking and being a smoker in the general population (Guydish et al., 2016; Guydish et al., 2011). However, there is limited evidence on the association between binge drinking and smoking among border or non-border Mexican American adults. National surveys do not oversample respondents on the border so that comparisons of Mexican Americans by border residence are limited.

How smoking status may vary between Mexican Americans residing near the border compared to those in other areas has not been established. However, recent evidence suggests that Mexicans living in Mexico are more likely to smoke than those who immigrate to the U.S. even though smoking rates were highest for U.S. born Mexican Americans (Tong et al., 2012). Most studies on the role of acculturation among Latinos on smoking have found that being more acculturated is related with increased odds of smoking for women but not for men (Kaplan et al., 2014; Marin et al., 1989; Perez-Stable et al., 2001). However, no studies have been conducted on the relationship between acculturation and smoking among Mexican Americans on or off the border. There is only one recent study in Mexican American young adults residing on the border found that smokers were three times more likely to binge drink than non-smokers (Woolard et al., 2015). Given this background, the current study utilized data from two independent samples of Mexican Americans to examine the associations between border residence, acculturation and binge drinking with smoking status.

## 2. Methods

### 2.1. Settings

Interviews were conducted among 1307 self-identified Mexican

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Americans in urban areas of selected counties on the U.S.-Mexico border of California (Imperial County: N = 365), Arizona (Cochise, Santa Cruz, and Yuma Counties: N = 173), New Mexico (Dona Ana County: N = 65), and Texas (Cameron, El Paso, Hidalgo and Webb Counties: N = 704) between March 2009 and July 2010.

The non-border self-identified Mexican American respondents were interviewed as part of the 2006 Hispanic Americans Baseline Alcohol Survey (HABLAS). Most of the 1288 respondents were interviewed in Los Angeles (N = 629) and Houston (N = 513), and additional interviews were conducted in New York (N = 86), Philadelphia (N = 59), and Miami (N = 21).

### 2.2. Measures

#### 2.2.1. Smoking behavior

Since the two parent studies of the current analyses were large epidemiological studies on alcohol use among Mexican Americans, (Caetano et al., 2012; Caetano et al., 2009; Caetano et al., 2013) we used the smoking status definition from the National Institute on Alcohol Abuse and Alcoholism National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) (https://www.niaaa.nih.gov/research/nesarc-iii). Participants were first asked if they had ever smoked ≥100 cigarettes in their lifetime. Participants were then asked if they had smoked any cigarettes in the previous 12 months of the interview. If participants had never smoked ≥100 cigarettes, then they were considered never smokers. If participants had smoked ≥100 cigarettes but had not smoked any cigarettes in the past 12 months, then they were considered former smokers. If participants had smoked ≥100 cigarettes and had smoked any cigarettes in the past 12 months, then they were considered past year smokers.

#### 2.2.2. Alcohol consumption

Current alcohol consumption was ascertained by the average number of drinks in the past week was computed. Abstainers were defined as no alcohol consumption at all. Binge drinking was defined as drinking four or more (for women) and five or more (for men) standard drinks (wine, beer, liquor) per occasion within a two-hour period in the past 12 months (National Institute on Alcohol Abuse and Alcoholism, 2004). NIAAA defines drinking at low-risk for developing alcohol use disorders as no more than 3 drinks on any single day and no more than 7 drinks per week for women and no more than 4 drinks on a single day and no more than 14 drinks per week for men. NIAAA moderate drinkers is defined as up to 1 drink per day for women and up to 2 drinks per day for men. This variable only includes current drinkers.

#### 2.2.3. Acculturation

A previously validated measure of acculturation was used in the present analyses (Caetano, 1987). Items covered daily use of and ability to speak, read, and write English and Spanish; preference for media (books, radio, and TV) in English or Spanish; ethnicity of people with whom respondents interact at church, at parties, the neighborhood in which respondents currently live and lived while growing up; and questions about values thought to be characteristic of the Latino lifestyle. With the exception of the items used to assess language use, all other items were coded in a 4-point Likert scale (strongly agree to strongly disagree). A continuous score of acculturation was computed, then participants were grouped into tertile categories to form low, medium, and high acculturation levels.

#### 2.2.4. Demographic variables

*2.2.4.1. Gender.* Man or woman.

*2.2.4.2. Age.* Measured in continuous years for the multivariate models and categorized into four groups for the bivariate analysis (18–29, 30–39, 40–49, and 50+ years).

*2.2.4.3. Education.* 1) Less than a high school education, 2) high school diploma/general equivalency diploma (GED), 3) some college, technical/vocational school, or beyond. Birthplace (US versus Mexico) and the language the survey was conducted in (English versus Spanish) were also considered.

*2.2.4.4. Age at immigration.* 1) < 12 years old, 2) 12–14 years old, 3) 15–17 years old, 4) 18–20 years old, 5) 21+ years old.

#### 2.2.5. Statistical analysis

To account for the multistage cluster sampling used in both the border and HABLAS surveys, STATA 13.1 was used. Analyses were conducted on data weighted to correct for unequal probabilities of selection into the sample. In addition, a post-stratification weight was applied to correct for nonresponse and to adjust the sample to known Latino population distributions on demographic variables.

Bivariate associations between border and the main variables used in the current study were conducted. The tables depict weighted percentages with un-weighted Ns. Multivariable multinomial logistic regressions were conducted with smoking status as the outcome and border status, binge drinking and acculturation as the predictors when controlling for age and education with separate gender-specific models (Marin et al., 1989). We also tested for interactions between education and acculturation with each gender.

## 3. Results

The sample was composed of 2595 Mexican Americans: 1307 residing in U.S.-Mexico border areas and 1288 residing in Los Angeles, Houston, New York, Philadelphia, and Miami (Table 1). There was no significant difference in education among border and non-border residents. However, for both men and women, over 45% of the sample had less than a high school diploma. For men, mean age of 37.3 (SD = 0.66) for non-border versus. 40.2 (SD = 1.22) for border residents. For women, mean age of 38.3 (SD = 0.87) for non-border versus 42.2 (SD = 1.16) for border residents. There were no significant differences in smoking status, acculturation status, and birthplace in the US by border residence in both men and women. Approximately 55% of border participants completed the survey in English and approximately 71% of non-border participants completed the survey in English. Border residents immigrated to the US at a younger age than non-border residents. There were no differences in average number of drinks per week, proportion of abstainers from alcohol, NIAAA moderate drinker, NIAAA low risk for alcohol use disorders, and binge drinking among men or women by border residence status. (Table 1).

### 3.1. Predictors of past year smoking

Among men, age was not associated with being a past year smoker. However, having some college, technical/vocational school or beyond was associated with lower odds of being a past year smoker in comparison to participants having less than a high school education. Border residence and acculturation level were not associated with current smoking. Binge drinking was positively associated with being a past year smoker. There was no significant interaction between education and acculturation. Younger age at immigration was associated with past year smoking (Table 2).

Among women age, education and border status were not associated with being a past year smoker, but high acculturation level was marginally associated. Binge drinking was also associated with being a past year smoker, but age at immigration was not associated with past year smoking.

### 3.2. Interaction between education and acculturation

Among women there was a significant interaction between

**Table 1**
Percentages by U.S.-Mexico border residency and gender for cigarette smoking status, binge drinking and demographics, 2006–2010.

| | Men | | | Women | | |
|---|---|---|---|---|---|---|
| | Non-border | Border | p-value | Non-border | Border | p-value |
| Place of birth | (n = 640) | (n = 565) | 0.0001 | (n = 646) | (n = 738) | 0.02 |
| Mexico | 71.8% | 50.8% | | 70.6% | 59.1% | |
| U.S.-born | 28.2% | 49.2% | | 29.3% | 40.8% | |
| Number of drinks per week | (n = 640) | (n = 568) | | (n = 648) | (n = 739) | 0.08 |
| Mean ± standard deviation | 7. 9 ± 0.93 | 9.1 ± 0.88 | 0.36 | 0.99 ± 0.28 | 1.76 ± 0.33 | |
| Proportion of abstainers from alcohol | (n = 634) | (n = 559) | 0.96 | (n = 647) | (n = 733) | 0.80 |
| Abstainers | 27.6% | 28.2% | | 51.5% | 53.4% | |
| NIAAA moderate drinker[a] | (n = 637) | (n = 566) | 0.71 | (n = 647) | (n = 737) | 0.67 |
| Abstainer or Former drinker | 33.4% | 33.1% | | 60.8% | 62.1% | |
| Does not exceed recommended guidelines | 13.2% | 10.9% | | 9.1% | 7.1% | |
| Exceeds recommended guidelines | 53.5% | 56.1% | | 29.9% | 30.6% | |
| NIAAA low risk for developing alcohol use disorders[b] | (n = 439) | (n = 394) | 0.28 | (n = 217) | (n = 293) | 0.02 |
| Does not exceed recommended guidelines | 74.7% | 69.6% | | 93.2% | 82.6% | |
| Exceeds recommended guidelines | 25.4% | 30.4% | | 6.7% | 17.3% | |
| Cigarette smoking status | (n = 637) | (n = 568) | 0.62 | (n = 646) | (n = 738) | 0.71 |
| Never smoker | 55.8% | 57.07% | | 84.5% | 83.4% | |
| Former smoker | 14.8% | 17.1% | | 5.5% | 7.1% | |
| Past year smoker | 29.4% | 25.8% | | 9.9% | 9.3% | |
| Education status | (n = 638) | (n = 568) | 0.29 | (n = 645) | (n = 739) | 0.19 |
| Less than high school diploma | 45.0% | 48.4% | | 51.1% | 49.4% | |
| High school diploma | 29.6% | 23.1% | | 26.1% | 21.6% | |
| Some college, technical/vocational school or beyond | 25.4% | 28.5% | | 22.6% | 28.9% | |
| Age | (n = 636) | (n = 562) | 0.004 | (n = 644) | (n = 726) | 0.007 |
| 18–29 years | 31.9% | 33.6% | | 28.9% | 27.6% | |
| 30–39 years | 29.7% | 20.1% | | 31.6% | 23.1% | |
| 40–49 years | 22.4% | 18.4% | | 19.9% | 16.9% | |
| 50+ years | 15.9% | 27.9% | | 19.4% | 32.2% | |
| Age at immigration | (n = 626) | (n = 563) | 0.0001 | (n = 641) | (n = 730) | 0.035 |
| Born in the U.S. | 28.76% | 49.3% | | 29.5% | 41.2% | |
| < 12 years old | 5.9% | 6.1% | | 7.9% | 7.6% | |
| 12–14 years old | 3.4% | 3.4% | | 2.4% | 3.2% | |
| 15–17 years old | 10.4% | 7.1% | | 7.4% | 7.5% | |
| 18–20 years old | 15.0% | 4.2% | | 13.01% | 7.0% | |
| 21+ years old | 36.6% | 29.9% | | 39.59% | 33.29 | |
| Acculturation status | (n = 640) | (n = 568) | 0.30 | (n = 648) | (n = 739) | 0.43 |
| Low | 30.4% | 23.4% | | 35.55% | 34.7% | |
| Medium | 36.8% | 36.8% | | 30.78% | 36.2% | |
| High | 32.9% | 39.8% | | 33.67% | 29.0% | |
| Binge drinking | (n = 634) | (n = 559) | 0.68 | (n = 647) | (n = 733) | 0.56 |
| No binge | 69.1% | 67.2% | | 89.78% | 88.1% | |
| Binged at least once in the past 12 months | 30.9% | 32.8% | | 10.22% | 11.8% | |

*Note*: Percentages are weighted and numbers in parenthesis are denominators.

[a] NIAAA moderate drinkers is defined as up to 1 drink per day for women and up to 2 drinks per day for men.

[b] NIAAA defines drinking at low-risk drinking for developing alcohol use disorders as no more than 3 drinks on any single day and no more than 7 drinks per week for women and no more than 4 drinks on a single day and no more than 14 drinks per week for men. This variable only includes current drinkers.

education and acculturation, such that persons having a higher level of education (high school graduate or more) and being more acculturated were less likely to be an ever smoker. Non-significant trends were observed for women associating former smoking status with some college, technical/vocation school or beyond and medium acculturation level, and women with some college, technical/vocational school or beyond and having a high acculturation level. There was no significant interaction between education and acculturation among men.

## 4. Discussion

To our knowledge there have been no studies comparing smoking status prevalence among Mexican Americans by residence on the border. To our surprise, there were essentially no differences in demographic characteristics, acculturation level, or smoking behavior in this comparison. However, border residents tended to immigrate at a younger age. The implication for Mexican Americans living in the U.S. may be that health behaviors are similar in the overall population despite major differences in the socioeconomic conditions of the communities. However, future studies should explore the association between age, border residence, alcohol consumption and smoking status since a previous study (Woolard et al., 2015) found a strong association between alcohol consumption and smoking status among younger persons.

Only one previous study examined and found an association between binge drinking and smoking status among Mexican American young adults living at the border in El Paso, Texas (Woolard et al., 2015). Our study found a strong association between binge drinking and smoking in the previous year among both Mexican American men and women. In the El Paso study smoking status was the most robust predictor of binge drinking in comparison to gender, concerns about body weight, exercise, stress, marijuana use, medication use, and other drug use, although acculturation was not considered in their models (Woolard et al., 2015). In the El Paso data, the strong association between binge drinking and smoking status was attributed to proximity to the border and lower socioeconomic status (Woolard et al., 2015). In our study we found no difference in smoking status by border residence and no association with other factors other than binge drinking in men and women from multiple border urban areas.

Acculturation was not related with smoking status among men but was marginally significant among women. Others have reported that the association between increased acculturation and smoking status is

**Table 2**
Multinomial logistic regression predicting smoking status by gender in 2595 Mexican Americans, 2006–2010.

| | Former smoker | | | Past year smoker | | |
|---|---|---|---|---|---|---|
| | RRR | 95% CI | p-value | RRR | 95% CI | p-value |
| Men | | | | | | |
| Border resident (Reference: Non-border resident) | 1.04 | 0.57–1.91 | 0.89 | 0.75 | 0.45–1.24 | 0.26 |
| Age (Reference: 18–29 years) | | | | | | |
| 30–39 years | 1.68 | 0.58–4.94 | 0.34 | 1.23 | 0.75–2.04 | 0.41 |
| 40–49 years | 2.67 | 0.93–7.67 | 0.07 | **1.84** | **1.01–3.35** | **0.047** |
| 50+ years | **5.31** | **2.01–14.03** | **0.001** | 1.41 | 0.70–2.81 | 0.33 |
| Education (Reference: Less than high school diploma) | | | | | | |
| High school diploma | 0.63 | 0.31–1.29 | 0.21 | 0.62 | 0.36–1.06 | 0.08 |
| Some college, technical/ vocational school or beyond | 0.62 | 0.31–1.24 | 0.18 | **0.45** | **0.25–0.80** | **0.007** |
| Acculturation (Reference: Low) | | | | | | |
| Medium | 1.09 | 0.52–2.32 | 0.81 | 1.14 | 0.66–1.97 | 0.64 |
| High | 1.36 | 0.54–3.40 | 0.51 | 0.97 | 0.49–1.91 | 0.93 |
| Binge drinking (Reference: Less than one time in the past 12 months) | | | | | | |
| One or more times in the past 12 months | 1.52 | 0.83–2.78 | 0.17 | **3.54** | **2.31–5.42** | **0.000** |
| Age at immigration (Reference: Born in the U.S.) | | | | | | |
| < 12 years old | 0.53 | 0.14–2.03 | 0.35 | **0.35** | **0.16–0.76** | **0.009** |
| 12–14 years old | 0.34 | 0.03–3.22 | 0.34 | **0.34** | **0.12–0.94** | **0.04** |
| 15–17 years old | 3.17 | 0.68–14.89 | 0.14 | 1.10 | 0.43–2.79 | 0.85 |
| 18–20 years old | 1.23 | 0.49–3.06 | 0.66 | 0.71 | 0.32–1.59 | 0.41 |
| 21+ years old | 0.92 | 0.42–2.02 | 0.84 | **0.48** | **0.26–0.88** | **0.02** |
| Women | | | | | | |
| Border resident (Reference: Non-border resident) | 1.47 | 0.73–2.97 | 0.29 | 0.92 | 0.47–1.80 | 0.81 |
| Age (Reference: 18–29 years) | | | | | | |
| 30–39 years | 0.61 | 0.18–2.10 | 0.43 | 1.01 | 0.49–2.10 | 0.97 |
| 40–49 years | 1.24 | 0.39–3.95 | 0.72 | **2.57** | **1.33–4.97** | **0.005** |
| 50+ years | 2.06 | 0.71–6.03 | 0.19 | 1.00 | 0.36–2.76 | 0.996 |
| Education (Reference: Less than high school diploma) | | | | | | |
| High school diploma | 1.79 | 0.75–4.24 | 0.19 | 0.53 | 0.28–1.02 | 0.06 |
| Some college, technical/ vocational school or beyond | 1.27 | 0.59–2.76 | 0.54 | 0.77 | 0.34–1.75 | 0.54 |
| Acculturation (Reference: Low) | | | | | | |
| Medium | 1.82 | 0.74–4.45 | 0.19 | 0.99 | 0.46–2.13 | 0.98 |
| High | 2.12 | 0.75–6.04 | 0.16 | 2.06 | 0.97–4.38 | 0.06 |
| Binge drinking (Reference: Less than one time in the past 12 months) | | | | | | |
| One or more times in the past 12 months | 1.51 | 0.44–5.18 | 0.51 | **2.23** | **1.17–4.27** | **0.02** |
| Age at immigration (Reference: Born in the U.S.) | | | | | | |
| < 12 years old | 0.99 | 0.31–3.23 | 0.99 | 0.47 | 0.10–2.26 | 0.34 |
| 12–14 years old | 0.22 | 0.02–2.01 | 0.18 | 0.62 | 0.15–2.62 | 0.51 |
| 15–17 years old | 3.46 | 0.86–13.94 | 0.08 | 0.50 | 0.11–2.20 | 0.36 |
| 18–20 years old | 1.47 | 0.44–4.94 | 0.53 | 0.34 | 0.05–2.15 | 0.25 |
| 21+ years old | 1.78 | 0.76–4.16 | 0.19 | 0.75 | 0.31–1.77 | 0.51 |

*Notes*: RRR = Relative risk ratio; CI = Confidence interval. Models adjusted for border residence, age, acculturation, and binge drinking with never smokers as reference group.

present for women but among men acculturation may be protective from smoking (Kaplan et al., 2014; Marin et al., 1989; Perez-Stable et al., 2001). Also of note, age at immigration was inversely related with past year smoking among men but not women (Bostean et al., 2017).

The results from the current study should be interpreted considering several study limitations. First, the measure of smoking was within the past 12 months which may be overly sensitive to define current smoking. Second, although a major strength of the current study is the unique sample from the border, the non-border residents from selected cities and may not be representative of the U.S. Mexican American population. Further, we did not examine protective factors, such as family support and having children at home. Despite these limitations, the finding that smoking behavior among Mexican Americans did not differ by border residence is noteworthy.

## Contributors

Frank Bandiera, Patrice Vaeth, Raul Caetano and Eliseo Perez-Stable conceived of the study. Frank Bandiera wrote a first draft of the manuscript. Frank Bandiera, Patrice Vaeth, Raul Caetano, and Eliseo Perez-Stable provided further scientific insight into a final version of the manuscript. All authors approved of the final manuscript before submission.

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## Conflict of interest

No conflict declared.

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