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## The role of acculturation and alcohol problems on frequency of cannabis use among Latinas at risk of an alcohol-exposed pregnancy

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### Abstract

**Background:** Along with alcohol, cannabis is one of the most commonly used substances among women of childbearing age. Recent studies indicate detrimental effects of prenatal cannabis use. Because many women use these substances before realizing they are pregnant, these serious health consequences for women and their offspring are of great concern. Despite the recent upsurge in cannabis use, little is known about individual and sociocultural factors that may contribute to risk of a cannabis-exposed pregnancy (CEP), particularly among Latinas of child-bearing age also at risk of an alcohol-exposed pregnancy (AEP).

**Objectives:** Examine the relationships of acculturation, alcohol use, alcohol problems, and psychological distress with frequency of cannabis use among adult Latinas at risk of an AEP.

**Methods:** The hypothesized model included 76 Latinas and was analyzed using path analysis. The study used baseline data from a randomized controlled trial of an intervention targeting risky drinking and tobacco use among women at risk of an AEP in primary care clinics.

**Results:** Greater acculturation was associated with more frequent cannabis use and greater psychological distress. There was a positive indirect relationship between acculturation and alcohol use and alcohol problems through psychological distress. Greater alcohol problems were associated with more frequent cannabis use. Greater psychological distress and alcohol use were indirectly related to more frequent cannabis use through alcohol problems.

**Conclusions:** Findings underscore the critical role of acculturation and alcohol-related problems in cannabis use frequency and have relevant implications for preventive efforts addressing cannabis use among Latinas at risk of an AEP.

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## Keywords

acculturation; alcohol; cannabis; Latinas; minority; alcohol-exposed pregnancy

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## Introduction

Cannabis is the most commonly used illicit substance in the United States and its frequency of use is growing, with 8.1 million people using on a daily or almost daily basis (Substance Abuse and Mental Health Services Administration [SAMHSA], 2014). Cannabis use has been associated with adverse health and social consequences, particularly when used by women during pregnancy, including complications for mother and offspring (National Academies of Sciences, Engineering, and Medicine, 2017; Volkow, Baler, Compton, & Weiss, 2014). Prenatal cannabis exposure has been linked to pregnancy complications for the mother, and low birth weight and neurodevelopmental problems, along with other short- and long-term complications for their offspring (Gunn et al., 2016; National Academies of Sciences, Engineering, and Medicine, 2017; C. S. Wu, Jew, & Lu, 2011). Despite these potential health risks, data from 2002 to 2014 indicate a rise in cannabis use from 2.4% to 3.9% among adult pregnant women in the United States (Brown et al., 2017). Recognizing risk and protective factors associated with frequency of use may lead to efforts to reduce cannabis use during pregnancy and thus prevent negative consequences of a cannabis-exposed pregnancy (CEP; Forray & Foster, 2015; Ko, Farr, Tong, Creanga, & Callaghan, 2015; Volkow et al., 2017). Given that alcohol use is common among women who use cannabis during pregnancy, examining the interplay of alcohol use and its related problems on cannabis frequency among women with risky alcohol use behavior is critical (Ko et al., 2015; Ko et al., 2018).

An intersectional framework that considers the role of race and ethnicity (Alegría et al., 1998; Cole, 2009; Viruell-Fuentes, Miranda, & Abdulrahim, 2012) in the frequency of cannabis use is needed to address disparities in care among minority women. As the largest ethnic minority group in the United States, comprising 18.1% of the population (U.S. Census Bureau, 2018a), Latinos experience significant disparities in access to and quality of treatment for substance misuse (Alegría et al., 2006; Vaeth, Wang-Schweig, & Caetano, 2017; Zemore et al., 2014). For instance, Marsh, Cao, Guerrero, and Shin (2009) found that compared to Whites and African Americans, Latinos receive less frequent substance use treatment services, and when they do receive services, they are more likely to be served by programs with fewer on-site resources. In addition, Latina women with alcohol use disorder access substance use treatment at a lower rate than Latino men (2.5% vs. 6.8%, respectively; Zemore et al., 2014). Even though Latinos use less cannabis than Whites and African Americans (SAMHSA, 2017), more knowledge is needed about use among Latinas and other racial and ethnic minority adult women, particularly given noted disparities that increase the probability of having worse outcomes (Alegría et al., 2006; Vaeth et al., 2017; Zemore et al., 2014).

National representative data examining days of cannabis use per week in the prior 12 months found that White adult women had the highest percentage of 7-day use (27.24%), closely

followed by Latina (23.30%) and African American (21.79%) women (SAMHSA, 2015). A recent study found that although African American and White women had lower levels of blunt (cannabis and tobacco combined) use compared to African American and White men, Latinas' blunt use did not differ from their Latino male counterparts (Montgomery & Mantey, 2017).

Acculturation may play a critical role in cannabis use and frequency of use among Latinas. Acculturation is a multifaceted process involving the exchange of beliefs and practices between groups that results in changes in cultural practices in one or both groups (Berry, 2017). Acculturation has been found to have a greater impact on women's substance use compared to men (Amaro, Whitaker, Coffman, & Heeren, 1990; Lee, Almeida, Colby, Tavares, & Rohsenow, 2016; Vega, Alderete, Kolody, & Aguilar-Gaxiola, 1998). Highly acculturated Latinas have a higher risk of substance use than highly acculturated Latino men. It has been suggested that highly acculturated Latinas' rapid progression from alcohol and cannabis use to heavy use may be due to incongruity between their substance use behavior and cultural expectations, such that once they go against expected cultural norms regarding use, they are more prone to heavy and problematic use (Canino, Vega, Sribney, Warner, & Alegría, 2008).

Incorporating acculturation in health behavior research can inform the field about changes and adaptations in cultural values and behaviors that can influence health outcomes (Fox, Thayer, & Wadhwa, 2017; Schwartz, Unger, Zamboanga, & Szapocznik, 2010) among Latinas. For instance, studies using an acculturation measure that included language and values, among other domains, found that greater acculturation predicted more alcohol use among Latinas (Caetano, 1987; Vaeth, Caetano, & Rodriguez, 2012; Zemore, 2005). Another study which included bidimensional acculturation items examining retention of cultural values and behaviors along with the adoption of values and behaviors of the majority culture, found a relationship between high acculturation scores and alcohol use among Latinas (Lee et al., 2016). Other studies examining substance use among Latinas using proxy measures for acculturation such as language (Vega et al., 1998) or a combination of language and nativity (Amaro et al., 1990; Bakhireva, Young, Dalen, Phelan, & Rayburn, 2009) have also found a relationship with use of alcohol (Bakhireva et al., 2009) and other substances, including cannabis (Amaro et al., 1990; Vega et al., 1998). U.S.-born Latinas have been found to engage in more preconception binge-drinking compared to foreign-born Latinas, and predominantly English-speaking pregnant Latinas were also at higher risk of binge drinking compared to Latinas who predominantly spoke Spanish (Bakhireva et al., 2009), placing them at high risk of an alcohol-exposed pregnancy (AEP).

An association between cannabis use and self-reported mental health-related quality of life among women has also been found (Lev-Ran et al., 2012) and between cannabis use, mood, and anxiety disorders (Khan et al., 2013). Little is known, however, about how acculturation affects mental health and frequency of cannabis use among Latinas at risk of an AEP. Given that acculturation-related factors such as nativity have been associated with higher levels of psychological distress, mental illness, and other substance use (Alegría et al., 2008; Vega, Canino, Cao, & Alegría, 2009), high-acculturated Latinas at risk of an AEP

may be particularly susceptible to more frequent cannabis use and its effects compared to low-acculturated Latinas.

Given observed differences in cannabis use by gender and race and ethnicity, it is important to examine whether known determinants of cannabis use such as age, education, and marital status (Ko et al., 2015; Ko et al., 2018; National Academies of Sciences, Engineering, and Medicine, 2017; L. T. Wu, Zhu, & Swartz, 2016; Zhu & Wu, 2017) also differ based on these factors among Latinas. There are racial and ethnic group differences in age and education, with Latinos on average being younger and having fewer years of education compared to Whites (U.S. Census, 2018b), which may place them at higher risk of cannabis use. Moreover, foreign-born and low-income Latinos have been found to have high rates of marriage (Wildsmith, 2014), which is associated with less cannabis use among women. Therefore, examining these determinants and their relationship to cannabis and alcohol use may be particularly relevant among Latinas.

Efforts to understand factors contributing to cannabis use among women at risk of an AEP have primarily focused on population-level predictors, with limited emphasis on unique contextual factors that may affect Latinas and other racial and ethnic minority women with risky alcohol use (Alegría et al., 1998; Amaro et al., 2005). As such, little is known about cannabis use among Latina adults at risk of an AEP. Given that cannabis is the preferred illicit substance among individuals with heavy or binge alcohol use (SAMHSA, 2017), which has been found to be comparable among racial and ethnic groups (SAMHSA, 2014), more knowledge is needed regarding the interplay of acculturation and alcohol severity and the consequences of this combination for frequency of cannabis use.

Considering these gaps in the literature, this study aimed to examine the relationships of acculturation, alcohol use, alcohol problems, and psychological distress with the frequency of cannabis use among adult Latinas at risk of an AEP. Specifically, informed by research (Amaro et al., 1990; Bakhireva et al., 2009; Caetano, 1987; Lee et al., 2016; Vaeth et al., 2012; Vega et al., 1998; Zetmore, 2005), we hypothesized that: (a) higher levels of acculturation would be related to greater number of alcoholic drinks consumed, greater alcohol problems, more psychological distress, and greater cannabis use frequency; and (b) number of alcoholic drinks consumed, alcohol problems, and psychological distress would mediate the relationship between acculturation and frequency of cannabis use. Findings have the potential to inform on individual and sociocultural factors associated with cannabis use frequency, contributing to knowledge regarding areas for further research on the risk of CEP and treatment among Latinas.

## Methods

### Participants and procedures

This study used baseline data from a randomized controlled trial testing the efficacy of CHOICES Plus, an intervention targeting risky drinking and tobacco use among women at risk of pregnancy to reduce alcohol- and tobacco-exposed pregnancies (Velasquez et al., 2017). Although cannabis use was not a targeted behavior of the intervention, the protocol included questions on cannabis use and frequency due to the prevalence of use among

women who drink alcohol. Women ( $N = 261$ ) were recruited from primary care clinics operated by Harris Health, a large urban safety-net health care system in Houston, Texas. Data were collected by trained research assistants in the participants' preferred language at 12 participating primary care clinics. Further information on data collection procedures can be found in the parent study (Velasquez et al., 2017). Participants met the following inclusion criteria: (a) aged 18-44; (b) not sterile; (c) not pregnant or planning to become pregnant in the next 9 months; (3) had vaginal intercourse with a man with no known fertility problems during the past 3 months without using effective contraception; (4) drank at risky levels (more than three drinks per day on any day or more than seven drinks per week on average) in the previous 3 months. All participants provided written informed consent under protocols approved by the institutional review boards of the University of Texas at Austin, Baylor College of Medicine, and Harris Health System.

## Measures

**Cannabis use frequency.**—Cannabis use frequency was the outcome of interest for the current study and was assessed by asking participants who had endorsed ever using cannabis how often they had used in the past 12 months. Frequency was assessed using a 7-point scale ranging from 1 (daily) to 7 (not at all). For ease of interpretability, the variable was reverse coded so that higher values indicated higher use.

**Acculturation.**—Participants' acculturation was assessed using the Short Acculturation Scale for Hispanics (Marin, Sabogal, Marin, Otero-Sabogal, & Perez-Stable, 1987). This instrument has been used extensively in studies examining substance use among Latinos. The 12-item measure examines three components of acculturation—language, media, and ethnic relations—using a 5-point Likert scale ranging from 1 (low acculturation) to 5 (high acculturation) regarding American culture. Items include “What language(s) do you usually speak at home?” for the language subscale, “In what language(s) are the T.V. programs you usually watch?” for the media subscale, and “The persons you visit or who visit you are?” for the ethnic relations subscale. Average scores range from 1 to 5, with scores below 2.99 representing low acculturation and those above 2.99 indicating higher levels of acculturation. The internal consistency was excellent ( $\alpha = .913$ ).

**Alcohol use.**—Alcohol use was assessed using the timeline follow-back (TLFB) method, a widely used and valid measure of alcohol use among diverse populations (Sobell & Sobell, 1992). The TLFB has been found to provide reliable and valid data on alcohol use by Latinos (Dillon, Turner, Robbins, & Szapocznik, 2005). Drinks consumed were assessed for each day for the 30 days prior to baseline. Alcohol use was the total number of drinks consumed in the 30 days prior to baseline based on daily drinking recorded on the TLFB. Given that the variable exhibited high skewness and kurtosis, it was corrected using a log transformation. The transformation improved the variable's distribution and fell within acceptable limits based on z-score values and graphical methods (Tabachnick & Fidell, 2007).

**Alcohol problems.**—Alcohol problems were measured using items from the Alcohol Use Disorder Identification Test (AUDIT; Saunders, Aasland, Babor, de la Fuente, & Grant,

1993). The measure has been validated with Latinos and found to have good validity for this group (Cherpitel & Borges, 2000). The self-rated screening instrument consists of 10 items examining harmful alcohol consumption, drinking behaviors, and alcohol problems. The items are scored from 0 to 4, yielding a maximum possible score of 40. Only items related to drinking behaviors and problems (Items 4-10) were included in the model, creating a range of 0-28. A systematic review found seven studies that indicated that a two-factor solution (Items 1-3 consumption, Items 4-10 problems) is preferable for this measure (de Meneses-Gaya, Zuardi, Loureiro, & Crippa, 2009). A score of at least 1 on the AUDIT items comprising alcohol problems improves the sensitivity of the instrument in screening for alcohol problems (Selin, 2006). Consumption items (1-3) were replaced in this study with total drinks in 30 days from the TLFB. Items 4-10 included in the model had high internal consistency ( $\alpha = .830$ ).

**Psychological distress.**—The Brief Symptom Inventory-18 (Derogatis & Melisaratos, 1983) was used to examine psychological distress. This well-established, self-administered measure assesses three symptom dimensions of distress—somatization, depression, and anxiety—during the preceding 7 days using a 5-point Likert scale ranging from 0 (not at all) to 4 (extremely). The 18-item instrument has been used with racial and ethnic minorities, including immigrants, and a one-factor global dimension was found to better assess distress among these groups (Asner-Self, Schreiber, & Marotta, 2006; Negi & Iwamoto, 2014; Prelow, Weaver, Swenson, & Bowman, 2005). A composite score, the global severity index, representing the participants' overall level of psychological distress was calculated using the measure's scoring guidelines to obtain standardized scores (Derogatis & Melisaratos, 1983). The range for standardized scores is 28-81. The internal consistency for the sample was excellent ( $\alpha = .937$ ).

## Analysis

Primary analyses were conducted using path analysis with maximum likelihood estimation to test our hypothesized model examining acculturation, alcohol use, alcohol problems, and psychological distress as predictors of cannabis use frequency. In addition, age, education, and marital status were included as control variables. Covariation paths between control variables were included in the path model if the variables were significantly related. Three participants had missing items in the acculturation measure. One participant had two items missing and two participants had one item missing. For these participants, we used the remaining 10 items and 11 items, respectively, to calculate the mean. Model fit statistics included the comparative fit index (CFI; target  $.95$ ) and the root mean square error of approximation (RMSEA; target  $.05$ ; Kline, 2011). Alcohol use, alcohol problems, and psychological distress were examined as mediators of the relationship between acculturation and cannabis use frequency. Bootstrapping included 10,000 resamples to obtain confidence intervals for mediation analysis. The hypothesized model was examined, and in consideration of parsimony, nonsignificant paths were deleted except for paths that included control variables for the final model (Figure 1). Nonsignificant paths were removed one at a time and alcohol-related paths were removed last because of the strong known relationship from alcohol use to cannabis use, with no change in model fit from initial to final model. Analyses were performed using AMOS 25.

## Results

### Participant characteristics

Of the 261 women who participated in the study, 123 (47%) self-identified as Latinas. Of these women 76 (62%) reported ever using cannabis. Table 1 presents correlations and participant characteristics (i.e., means, standard deviations). Participants had an average age of 28 ( $SD = 6.709$ ) years with 11.62 ( $SD = 2.870$ ) years of education. On average, Latinas had an acculturation score of 3.348 ( $SD = .716$ ). The average total number of drinks 30 days before baseline was 53.171 ( $SD = 70.900$ ), and the average score for alcohol problems was 5.79 ( $SD = 6.353$ ). The psychological distress average score was 55.684 ( $SD = 10.891$ ), and on average, participants had a mean score of 2.70 ( $SD = 2.179$ ) for frequency of cannabis use.

Twenty-five (33%) Latinas were foreign born. Specifically, 23 (92%) were born in Mexico and two (8%) in Central America. On average, these 25 women had lived in the U.S. for 18.24 years ( $SD = 5.118$ ) and had an average age of 25 years ( $SD = 5.567$ ) indicating that they had lived in the United States for most of their lives. Thirty-two (42%) participants reported being married or partnered. *T*-tests were conducted to examine relationships between marital status and variables of interest, and no significant results were found.

As seen in Table 1, there was a significant positive association between age and alcohol use ( $r = .339$ ) and alcohol problems ( $r = .346$ ). Education was positively related to acculturation ( $r = .303$ ). However, education was negatively associated with alcohol problems ( $r = -.299$ ) and psychological distress ( $r = -.357$ ). There was a positive relationship between acculturation and cannabis frequency ( $r = .302$ ) and alcohol use and cannabis frequency ( $r = .254$ ). A significant positive association was found between alcohol use and alcohol problems ( $r = .618$ ). Psychological distress was positively associated with alcohol use ( $r = .350$ ) and alcohol problems ( $r = .507$ ).

### Model evaluation

Results suggested an acceptable fit of the data to the overall model,  $\chi^2 = 8.163$ ,  $df = 5$ ,  $p = .147$ , CFI = .968, RMSEA = .092. Table 2 summarizes the overall model results. When nonsignificant paths were removed in the final model for parsimony (except for control variables), the fit was similar,  $\chi^2 = 13.212$ ,  $df = 9$ ,  $p = .153$ , CFI = .958, RMSEA = .079, and explained a modest amount of variance ( $R^2 = .195$ ) in cannabis use frequency.

Table 3 presents the direct and indirect estimates for the final model. Greater acculturation was directly ( $b = 1.130$ ,  $p < .001$ ) and indirectly ( $b = .063$ , 95% CI = .002, .235) associated with higher frequency of cannabis use, and greater acculturation was associated with more psychological distress ( $b = 3.140$ ,  $p = .046$ ). There was a positive indirect relationship between acculturation and alcohol use (indirect effect = .049, 95% CI = .006, .123) and acculturation and alcohol problems (indirect effect = .747, 95% CI = .110, 1.763). Greater alcohol problems were directly related to greater cannabis use frequency ( $b = .084$ ;  $p = .038$ ). Greater alcohol use was directly related to more alcohol problems ( $b = 5.641$ ,  $p < .001$ ) and indirectly related to greater frequency of cannabis use (indirect effect = .475, 95% CI = .012, 1.126). Similarly, there was a significant positive relationship between

psychological distress and alcohol use ( $b = .016, p = .008$ ) and psychological distress and alcohol problems ( $b = .150, p = .008$ ) and a positive indirect effect of psychological distress on cannabis use frequency (indirect effect =  $.020, 95\% \text{ CI} = .001, .053$ ).

## Discussion

Findings partially supported our first hypothesis, showing a positive association between acculturation and cannabis use frequency and between acculturation and psychological distress. However, acculturation was not directly related to alcohol use or alcohol problems. Our second hypothesis examining alcohol use, alcohol problems, and psychological distress as mediators between acculturation and cannabis frequency was partially supported. Although acculturation was directly related to cannabis use frequency and psychological distress, psychological distress was not directly related to cannabis use frequency. However, psychological distress was indirectly related to cannabis use frequency through alcohol problems. Similarly, number of drinks was not directly related to cannabis use frequency; however, it was indirectly related through alcohol problems. Taken together, our findings demonstrate important relationships influencing cannabis use behavior. In particular, significant relationships were found among acculturation, alcohol problems, psychological distress, and cannabis use frequency among Latinas at risk of an AEP, suggesting that sociocultural factors play an important role in cannabis use in this vulnerable group.

Alcohol problems not only were directly related to frequency of cannabis use, but also contributed to substantial variance in the indirect effect of number of alcohol drinks and psychological distress on frequency of cannabis use. This suggests that women at risk of an AEP who consume more alcohol and have more psychological distress are susceptible to having problematic alcohol use patterns that contribute to frequency of cannabis use. Alcohol use and problems have been found to be associated with heavy cannabis use (National Academies of Sciences, Engineering, and Medicine, 2017), and our study adds to the literature by examining the pathways by which these relationships take place among Latinas at risk of an AEP.

Several studies have identified a link between acculturation and use of alcohol (Bakhireva et al., 2009; Caetano, 1987; Lee et al., 2016; Vaeth et al., 2012; Zemore, 2005) and other substances, including cannabis (Amaro et al., 1990; Vega et al., 1998), among Latina adults. Similarly, in our study, acculturation was directly and indirectly related to frequency of cannabis use. Although acculturation was not directly related to alcohol use and problems in our sample, there was a positive indirect relationship through psychological distress. This finding suggests that psychological distress plays an important role in the amount of alcohol consumed and the subsequent problems that may result from this behavior among high-accultured Latinas. The lack of a direct relationship may be indicative of the complex relationship among these variables.

Although not examined in our study, highly acculturated Latinas in our sample may have experienced acculturative stress. Studies have found that acculturative stress mediates discriminatory experiences and psychological distress for Latinos (Torres, Driscoll, & Voell, 2012). Another study found that longer time in the United States was related to more



discriminatory experiences and family cultural conflict, leading to worse mental health outcomes for Latinos (Cook, Alegría, Lin, & Guo, 2009). In our sample, acculturation was directly related to more psychological distress and cannabis use. Acculturation was also indirectly related to more alcohol use and problems through psychological distress. Moreover, psychological distress contributed to more alcohol use and problems, which indirectly affected frequency of cannabis use, suggesting that highly acculturated Latinas may have a greater risk of unhealthy coping patterns.

Findings also highlighted the influence of social context, as evidenced by the significant relationships of education and several variables of interest. As such, participants may have experienced additional stressors due to social disadvantages as found in other studies examining social determinants of cannabis use (Ko et al., 2015; Ko et al., 2018; National Academies of Sciences, Engineering, and Medicine, 2017; L. T. Wu et al., 2016) that placed them at greater risk of psychological distress and substance-related problems (Amaro et al., 2005). However, social contextual factors may also serve a protective function given the significant negative direct relationship between marital status and psychological distress. Given that Latinos tend to have a strong family orientation (Landale & Oropesa, 2007; Sabogal, Sabogal, Marín, Otero-Sabogal, Marín, & Perez-Stable, 1987), being in a committed relationship may be of particular relevance to this group. Future studies may want to examine how this social role might support or inhibit frequency of cannabis use, psychological distress, and alcohol use and problems in a larger sample with varying levels of acculturation.

Our study found important relationships among acculturation, alcohol use, alcohol problems, psychological distress, and cannabis use frequency. Along with these findings, it is also important to note some limitations. First, due to the cross-sectional nature of our study, we were not able to determine causation or direction for our variables; there may be bidirectional relationships. Second, although the acculturation measure used for this study has been widely used, it is a unidirectional measure of acculturation, meaning that it examines acculturation as a linear process leading to assimilation. It does not consider that acculturation can be bidirectional and include an individual's simultaneous process of moving toward their culture of origin and the new culture (Gamst, Liang, & Der-Karabetian, 2011); therefore, it may not fully capture the complex nature of this construct. Third, our sample consisted of mostly bicultural and highly acculturated Latinas; as such, our sample had limited variability in acculturation. However, even with limited variability, findings indicated that acculturation was an important predictor in our model. Fourth, we were not able to examine other aspects of cannabis use behavior because the parent study only included questions related to cannabis use and frequency of use. Fifth, due to sample size, we could not include other factors that may be related to cannabis frequency. Finally, given the heterogeneity of Latinos, it is not possible to generalize our findings to all Latino groups. Our findings, however, are likely to be applicable to other Latinas or women from minority groups at risk of an AEP.

As cannabis use gains greater social acceptance through policy changes permitting recreational use, there is a need to understand mechanisms associated with use (Cerdá, Wall, Keyes, Galea, & Hasin, 2012) among women at risk of an AEP. As our findings

suggest, efforts should be made to consider social and cultural factors that may contribute to frequency of cannabis use in this group. Specifically, our findings underscore the critical role of acculturation, alcohol use, alcohol problems, and psychological distress in cannabis use frequency and have important implications for preventive measures that could address problematic cannabis use among Latinas and other minority groups at risk of an AEP. Interventions targeting problematic cannabis use should consider the role of alcohol and related problems in addition to psychological distress in the assessment and treatment of women seeking services. Given the significance of acculturation for frequency of cannabis use, treatment models addressing AEP should consider the varying levels and fluidity of acculturation and its potential impact on Latinas' initiation and retention in treatment (Amaro, Arévalo, Gonzalez, Szapocznik, & Iguchi, 2006). Importantly, attending to possible acculturation-related stressors and enhancing cultural protective factors may better address their needs and lead to improved treatment outcomes.

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## References

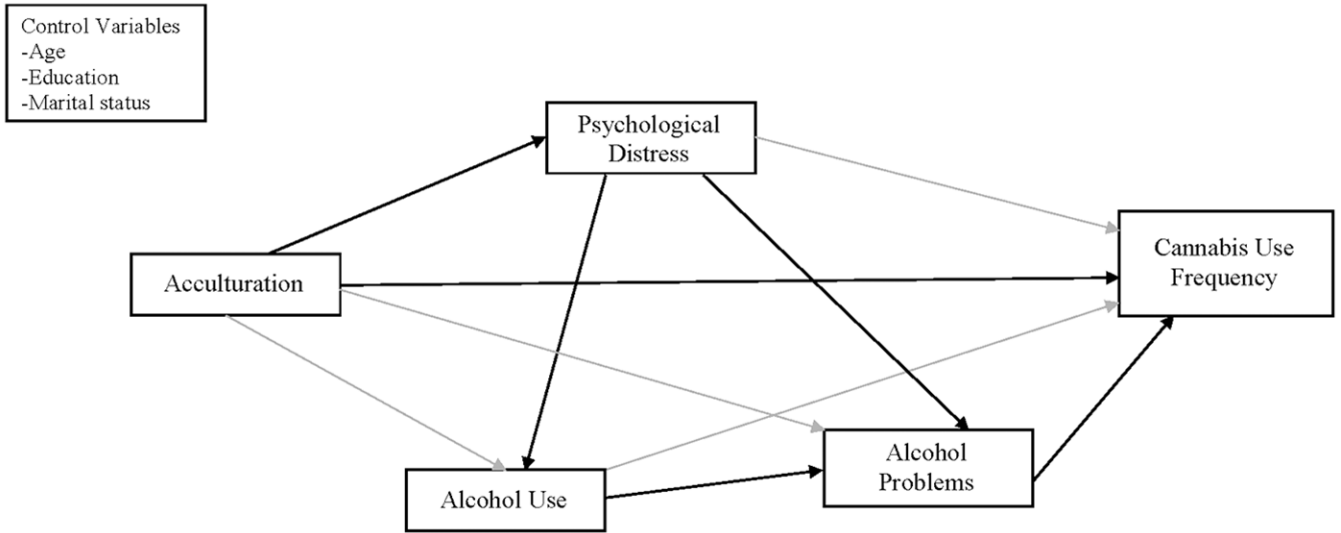
- Alegría M, Canino G, Shrout PE, Woo M, Duan N, Vila D, ... Meng XL (2008). Prevalence of mental illness in immigrant and non-immigrant U.S. Latino groups. *American Journal of Psychiatry*, 165, 359–369. doi:10.1176/appi.ajp.2007.07040704 [PubMed: 18245178]
- Alegría M, Page JB, Hansen H, Cauce AM, Robles R, Blanco C, ... Berry P (2006). Improving drug treatment services for Hispanics: Research gaps and scientific opportunities. *Drug and Alcohol Dependence*, 84, S76–S84. [PubMed: 16781087]
- Alegría M, Vera M, Negrón G, Burgos M, Albizu C, & Canino G (1998). Methodological and conceptual issues in understanding female Hispanic drug users. In Roman AB & Wetherington CL (Eds.), *Drug addiction research and the health of women* (pp. 529–550). Rockville, MD: U.S. Department of Health and Human Services.
- Amaro H, Arévalo S, Gonzalez G, Szapocznik J, & Iguchi MY (2006). Needs and scientific opportunities for research on substance abuse treatment among Hispanic adults. *Drug and Alcohol Dependence*, 84, S64–S75. doi:10.1016/j.drugalcdep.2006.05.008 [PubMed: 16766137]
- Amaro H, Larson MJ, Gampel J, Richardson E, Savage A, & Wagler D (2005). Racial/ethnic differences in social vulnerability among women with co-occurring mental health and substance abuse disorders: Implications for treatment services. *Journal of Community Psychology*, 33, 495–511. doi:10.1002/jcop.20065
- Amaro H, Whitaker R, Coffman G, & Heeren T (1990). Acculturation and marijuana and cocaine use: Findings from HHANES 1982–84. *American Journal of Public Health*, 80(Suppl.), 54–60. doi:10.2105/AJPH.80.Suppl.54
- Asner-Self KK, Schreiber JB, & Marotta SA (2006). A cross-cultural analysis of the Brief Symptom Inventory-18. *Cultural Diversity and Ethnic Minority Psychology*, 12, 367–375. doi:10.1037/1099-9809.12.2.367 [PubMed: 16719583]
- Bakhireva LN, Young BN, Dalen J, Phelan ST, & Rayburn WF (2009). Periconceptional binge drinking and acculturation among pregnant Latinas in New Mexico. *Alcohol*, 43, 475–481. doi:10.1016/j.alcohol.2009.08.002 [PubMed: 19801277]

- Berry JW (2017). Theories and models of acculturation. In Schwartz SJ & Unger JB (Eds.), *The Oxford handbook of acculturation and health* (pp. 15–28). New York, NY: Oxford University Press.
- Brown QL, Sarvet AL, Shmulewitz D, Martins SS, Wall MM, & Hasin DS (2017). Trends in marijuana use among pregnant and nonpregnant reproductive-aged women, 2002–2014. *Journal of the American Medical Association*, 317, 207–209. doi:10.1001/jama.2016.17383 [PubMed: 27992619]
- Caetano R (1987). Acculturation and drinking patterns among U.S. Hispanics. *British Journal of Addiction*, 82, 789–799. [PubMed: 3311103]
- Canino G, Vega WA, Sribney WM, Warner LA, & Alegría M (2008). Social relationships, social assimilation, and substance use disorders among adult Latinos in the U.S. *Journal of Drug Issues*, 38, 69–101. [PubMed: 20011228]
- Cerdá M, Wall M, Keyes KM, Galea S, & Hasin D (2012). Medical marijuana laws in 50 states: Investigating the relationship between state legalization of medical marijuana and marijuana use, abuse and dependence. *Drug and Alcohol Dependence*, 120, 22–27. doi:10.1016/j.drugalcdep.2011.06.011 [PubMed: 22099393]
- Cherpitel CJ, & Borges G (2000). Performance of screening instruments for alcohol problems in the ER: A comparison of Mexican-Americans and Mexicans in Mexico. *American Journal of Drug and Alcohol Abuse*, 26, 683–702. doi:10.1081/ADA-100101902 [PubMed: 11097199]
- Cole ER (2009). Intersectionality and research in psychology. *American Psychologist*, 64, 170–180. doi:10.1037/a0014564 [PubMed: 19348518]
- Cook B, Alegría M, Lin JY, & Guo J (2009). Pathways and correlates connecting Latinos' mental health with exposure to the United States. *American Journal of Public Health*, 99, 2247–2254. doi:10.2105/AJPH.2008.137091 [PubMed: 19834004]
- de Meneses-Gaya C, Zuardi AW, Loureiro SR, & Crippa JAS (2009). Alcohol Use Disorders Identification Test (AUDIT): An updated systematic review of psychometric properties. *Psychology & Neuroscience*, 2, 83–97. doi:10.3922/j.psns.2009.1.12
- Derogatis LR, & Melisaratos N (1983). The Brief Symptom Inventory: An introductory report. *Psychological Medicine*, 13, 595–605. doi:10.1017/S0033291700048017 [PubMed: 6622612]
- Dillon FR, Turner CW, Robbins MS, & Szapocznik J (2005). Concordance among biological, interview, and self-report measures of drug use among African American and Hispanic adolescents referred for drug abuse treatment. *Psychology of Addictive Behaviors*, 19, 404–413. doi:10.1037/0893-164X.19.4.404 [PubMed: 16366812]
- Forray A, & Foster D (2015). Substance use in the perinatal period. *Current Psychiatry Reports*, 17, 91. doi:10.1007/s11920-015-0626-5 [PubMed: 26386836]
- Fox M, Thayer Z, & Wadhwa PD (2017). Assessment of acculturation in minority health research. *Social Science & Medicine*, 176, 123–132. doi:10.1016/j.socscimed.2017.01.029 [PubMed: 28135691]
- Gamst GC, Liang CT, & Der-Karabetian A (2011). *Handbook of multicultural measures*. Thousand Oaks, CA: Sage.
- Gunn JKL, Rosales CB, Center KE, Nuñez A, Gibson SJ, Christ C, & Ehiri JE (2016). Prenatal exposure to cannabis and maternal and child health outcomes: A systematic review and meta-analysis. *BMJ Open*, 6, e009986. doi:10.1136/bmjopen-2015-009986
- Khan SS, Secades-Villa R, Okuda M, Wang S, Pérez-Fuentes G, Kerridge BT, & Blanco C (2013). Gender differences in cannabis use disorders: Results from the National Epidemiologic Survey of Alcohol and Related Conditions. *Drug and Alcohol Dependence*, 130, 101–108. doi:10.1016/j.drugalcdep.2012.10.015 [PubMed: 23182839]
- Kline RB (2011). *Principles and practice of structural equation modeling* (3rd ed.). New York, NY: Guilford Press.
- Ko JY, Farr SL, Tong VT, Creanga AA, & Callaghan WM (2015). Prevalence and patterns of marijuana use among pregnant and nonpregnant women of reproductive age. *American Journal of Obstetrics and Gynecology*, 213, 201.e201–201.e210. doi:10.1016/j.ajog.2015.03.021
- Ko JY, Tong VT, Bombard JM, Hayes DK, Davy J, & Perham-Hester KA (2018). Marijuana use during and after pregnancy and association of prenatal use on birth outcomes: A population-

based study. *Drug and Alcohol Dependence*, 187, 72–78. doi:10.1016/j.drugalcdep.2018.02.017 [PubMed: 29627409]

- Landale NS, & Oropesa RS (2007). Hispanic families: Stability and change. *Annual Review of Sociology*, 33, 381–405. doi:10.1146/annurev.soc.33.040406.131655
- Lee CS, Almeida J, Colby SM, Tavares T, & Rohsenow DJ (2016). Acculturation, hazardous drinking and depressive symptomatology among Hispanics enrolled in a clinical trial. *Addiction Research & Theory*, 24, 69–79. doi:10.3109/16066359.2015.1072517 [PubMed: 26819573]
- Lev-Ran S, Imtiaz S, Taylor BJ, Shield KD, Rehm J, & Le Foll B (2012). Gender differences in health-related quality of life among cannabis users: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Drug and Alcohol Dependence*, 123, 190–200. doi:10.1016/j.drugalcdep.2011.11.010 [PubMed: 22143039]
- Marin G, Sabogal F, Marin BV, Otero-Sabogal R, & Perez-Stable EJ (1987). Development of a short acculturation scale for Hispanics. *Hispanic Journal of Behavioral Sciences*, 9, 183–205. doi:10.1177/07399863870092005
- Marsh JC, Cao D, Guerrero E, & Shin HC (2009). Need-service matching in substance abuse treatment: Racial/ethnic differences. *Evaluation and Program Planning*, 32, 43–51. doi:10.1016/j.evalprogplan.2008.09.003 [PubMed: 19019434]
- Montgomery L, & Mantey DS (2017). Correlates of blunt smoking among African American, Hispanic/Latino, and White adults: Results from the 2014 National Survey on Drug Use and Health. *Substance Use & Misuse*, 52, 1449–1459. doi:10.1080/10826084.2017.1284238 [PubMed: 28467153]
- National Academies of Sciences, Engineering, and Medicine. (2017). *The health effects of cannabis and cannabinoids: The current state of evidence and recommendations for research*. Washington, DC: National Academies Press.
- Negi NJ, & Iwamoto DK (2014). Validation of the revised BSI-18 with Latino migrant day laborers. *Research on Social Work Practice*, 24, 364–371. doi:10.1177/1049731513507980
- Prellow HM, Weaver SR, Swenson RR, & Bowman MA (2005). A preliminary investigation of the validity and reliability of the Brief-Symptom Inventory-18 in economically disadvantaged Latina American mothers. *Journal of Community Psychology*, 33, 139–155. doi:10.1002/jcop.20041
- Sabogal F, Marín G, Otero-Sabogal R, Marín BV, & Perez-Stable EJ (1987). Hispanic familism and acculturation: What changes and what doesn't? *Hispanic Journal of Behavioral Sciences*, 9, 397–412. doi:10.1177/07399863870094003
- Saunders JB, Aasland OG, Babor TF, de la Fuente JR, & Grant M (1993). Development of the alcohol use disorders identification test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption-II. *Addiction*, 88, 791–804. doi:10.1111/j.1360-0443.1993.tb02093.x [PubMed: 8329970]
- Schwartz SJ, Unger JB, Zamboanga BL, & Szapocznik J (2010). Rethinking the concept of acculturation: Implications for theory and research. *American Psychologist*, 65, 237–251. doi:10.1037/a0019330 [PubMed: 20455618]
- Selin KH (2006). Alcohol Use Disorder Identification Test (AUDIT): What does it screen? Performance of the AUDIT against four different criteria in a Swedish population sample. *Substance Use & Misuse*, 41, 1881–1899. doi:10.1080/10826080601025532 [PubMed: 17162595]
- Sobell LC, & Sobell MB (1992). Timeline follow-back. In Litten RZ & Allen JP (Eds.), *Measuring alcohol consumption* (pp. 41–72). New York, NY: Springer.
- Substance Abuse and Mental Health Services Administration. (2014). *Results from the 2013 National Survey on Drug Use and Health: Summary of national findings*. Rockville, MD: Author.
- Substance Abuse and Mental Health Services Administration. (2015). *National Survey on Drug Use and Health: Crosstab results*. Retrieved from [http://pdas.samhsa.gov/#/survey/NSDUH-2015-DS0001/crosstab/?column=SEXRACE&results\\_received=true&row=MRDAYPWK&weight=ANALWT\\_C](http://pdas.samhsa.gov/#/survey/NSDUH-2015-DS0001/crosstab/?column=SEXRACE&results_received=true&row=MRDAYPWK&weight=ANALWT_C)
- Substance Abuse and Mental Health Services Administration. (2017). *2016 National Survey on Drug Use and Health: Detailed tables*. Rockville, MD: Author.
- Tabachnick BG, & Fidell LS (2007). *Using multivariate statistics* (5th ed.). Boston, MA: Allyn & Bacon.

- Torres L, Driscoll W, & Voell M (2012). Discrimination, acculturation, acculturative stress, and Latino psychological distress: A moderated mediational model. *Cultural Diversity and Ethnic Minority Psychology*, 18, 17–25. doi:10.1037/a0026710 [PubMed: 22250895]
- U.S. Census Bureau. (2018a). Facts for features: Hispanic Heritage Month 2018. Retrieved from <https://www.census.gov/newsroom/facts-for-features/2018/hispanic-heritage-month.html>
- U.S. Census Bureau. (2018b). The Hispanic population in the United States: 2016. Retrieved from <https://www.census.gov/content/census/en/data/tables/2016/demo/hispanic-origin/2016-cps.html>
- Vaeth PA, Caetano R, & Rodriguez LA (2012). The Hispanic Americans Baseline Alcohol Survey (HABLAS): The association between acculturation, birthplace and alcohol consumption across Hispanic national groups. *Addictive Behaviors*, 37, 1029–1037. doi:10.1016/j.addbeh.2012.04.015 [PubMed: 22613057]
- Vaeth PA, Wang-Schweig M, & Caetano R (2017). Drinking, alcohol use disorder, and treatment access and utilization among US racial/ethnic groups. *Alcoholism: Clinical and Experimental Research*, 41, 6–19. doi:10.1111/acer.13285 [PubMed: 28019654]
- Vega WA, Alderete E, Kolody B, & Aguilar-Gaxiola S (1998). Illicit drug use among Mexicans and Mexican Americans in California: The effects of gender and acculturation. *Addiction*, 93, 1839–1850. doi:10.1046/j.1360-0443.1998.931218399.x [PubMed: 9926572]
- Vega WA, Canino G, Cao Z, & Alegría M (2009). Prevalence and correlates of dual diagnoses in U.S. Latinos. *Drug and Alcohol Dependence*, 100, 32–38. doi:10.1016/j.drugalcdep.2008.08.018 [PubMed: 19028025]
- Velasquez MM, von Sternberg KL, Floyd RL, Parrish D, Kowalchuk A, Stephens NS, ... Mullen PD (2017). Preventing alcohol and tobacco exposed pregnancies: CHOICES Plus in primary care. *American Journal of Preventive Medicine*, 53, 85–95. doi:10.1016/j.amepre.2017.02.012 [PubMed: 28427955]
- Viruell-Fuentes EA, Miranda PY, & Abdulrahim S (2012). More than culture: Structural racism, intersectionality theory, and immigrant health. *Social Science & Medicine*, 75, 2099–2106. doi:10.1016/j.socscimed.2011.12.037 [PubMed: 22386617]
- Volkow ND, Baler RD, Compton WM, & Weiss SR (2014). Adverse health effects of marijuana use. *New England Journal of Medicine*, 370, 2219–2227. doi:10.1056/NEJMra1402309 [PubMed: 24897085]
- Volkow ND, Compton WM, & Wargo EM (2017). The risks of marijuana use during pregnancy. *Journal of the American Medical Association*, 317, 129–130. doi:10.1001/jama.2016.18612 [PubMed: 27992628]
- Wildsmith E (2014). Family structure and family formation among low-income Hispanics in the U.S. Bethesda, MD: National Research Center on Hispanic Children & Families.
- Wu CS, Jew CP, & Lu HC (2011). Lasting impacts of prenatal cannabis exposure and the role of endogenous cannabinoids in the developing brain. *Future Neurology*, 6, 459–480. doi:10.2217/fnl.11.27 [PubMed: 22229018]
- Wu LT, Zhu H, & Swartz MS (2016). Trends in cannabis use disorders among racial/ethnic population groups in the United States. *Drug and Alcohol Dependence*, 165, 181–190. doi:10.1016/j.drugalcdep.2016.06.002 [PubMed: 27317045]
- Zemore SE (2005). Re-examining whether and why acculturation relates to drinking outcomes in a rigorous, national survey of Latinos. *Alcoholism: Clinical and Experimental Research*, 29, 2144–2153. doi:10.1097/01.alc.0000191775.01148.c0 [PubMed: 16385184]
- Zemore SE, Murphy RD, Mulia N, Gilbert PA, Martinez P, Bond J, & Polcin DL (2014). A moderating role for gender in racial/ethnic disparities in alcohol services utilization: Results from the 2000 to 2010 national alcohol surveys. *Alcoholism: Clinical and Experimental Research*, 38, 2286–2296. doi:10.1111/acer.12500 [PubMed: 25041173]
- Zhu H, & Wu LT (2017). Sex differences in cannabis use disorder diagnosis involved hospitalizations in the United States. *Journal of Addiction Medicine*, 11, 357–367. doi:10.1097/ADM.0000000000000330 [PubMed: 28700366]



**Figure 1.**  
**Conceptual model** (nonsignificant pathways in gray)

**Table 1**

Correlations and Participant Characteristics ( $N=76$ )

	1	2	3	4	5	6	7
1. Age	1						
2. Education	-.171	1					
3. Acculturation <sup>a</sup>	.149	.303*	1				
4. Alcohol use <sup>b</sup>	.339**	-.069	.087	1			
5. Alcohol problems <sup>c</sup>	.346**	-.299*	-.055	.618***	1		
6. Psychological distress <sup>d</sup>	.222	-.357**	.121	.350**	.507***	1	
7. Cannabis frequency <sup>e</sup>	-.034	-.010	.302*	.254*	.178	.208	1
<i>M</i>	28	11.62	3.348	53.171	5.79	55.684	2.70
<i>SD</i>	6.709	2.870	.716	70.900	6.353	10.891	2.179

<sup>a</sup>Short Acculturation Scale for Hispanics;

<sup>b</sup>Based on timeline follow-back, total number of drinks consumed 30 days before baseline assessment;

<sup>c</sup>Alcohol Use Disorder Identification Test (items 4-10) summed;

<sup>d</sup>Brief Symptom Inventory-18;

<sup>e</sup>Higher values indicate more cannabis use in the last 12 months; two-tailed probability;

\*  $p < .05$ ;

\*\*  $p < .01$ ;

\*\*\*  $p < .001$ .

**Table 2**Full model of cannabis use frequency in the past 12 months ( $N = 76$ )

	Psychological distress	Alcohol use	Alcohol problems	Cannabis use frequency
	<b>b</b>	<b>b</b>	<b>b</b>	<b>b</b>
Age				
Direct Effect	.241	.024*	.114	-.073*
Indirect Effect, 95% (CI)	-	.004 (-.001,.014)	.194** (.078,.345)	.037* (.006,.086)
Education				
Direct Effect	-1.640***	.019	-.243	-.054
Indirect Effect, 95% (CI)	-	-.026* (-.053,-.007)	-.313* (-.670,-.005)	-.050 (-.191,.059)
Married or partnered				
Direct Effect	-6.035*	-.019	-.186	.298
Indirect Effect, 95% (CI)	-	-.096* (-.249,-.011)	-1.651 (-3.880,.026)	-.260 (-1.004,.224)
Acculturation <sup>a</sup>				
Direct Effect	3.140*	-.021	-1.041	1.025**
Indirect Effect, 95% (CI)	-	.050* (.006,.137)	.688 (-.695,2.191)	.075 (-.278,.501)
Psychological distress <sup>b</sup>				
Direct Effect	-	.016*	.166**	.018
Indirect Effect, 95% (CI)	-	-	.090* (.021,.176)	.021 (-.005,.062)
Alcohol use <sup>c</sup>				
Direct Effect	-	-	5.603***	.894
Indirect Effect, 95% (CI)	-	-	-	.143 (-.502,.875)
Alcohol problems <sup>d</sup>				
Direct Effect	-	-	-	.026
Indirect Effect, 95% (CI)	-	-	-	-

Note. Unstandardized estimates.

\*  $p < .05$ ,

\*\*  $p < .01$ ,

\*\*\*  $p < .001$ .

<sup>a</sup>Short Acculturation Scale for Hispanics.

<sup>b</sup>Brief Symptom Inventory-18.

<sup>c</sup>Based on timeline follow-back. Total number of drinks consumed 30 days before baseline assessment.

<sup>d</sup>Alcohol Use Disorder Identification Test (items 4–10).



**Table 3**Final model of cannabis use frequency in the past 12 months ( $N = 76$ )

	Psychological distress	Alcohol use	Alcohol problems	Cannabis use frequency
	<b>b</b>	<b>b</b>	<b>b</b>	<b>b</b>
Age				
Direct Effect	.241	.023 *	.094	-.062
Indirect Effect, 95% (CI)	-	.004 (-.001,.013)	.189 ** (.081,.333)	.024 * (.001,.071)
Education				
Direct Effect	-1.640 ***	.017	-.352	-.058
Indirect Effect, 95% (CI)	-	-.026 * (-.052,-.008)	-.295 * (-.627,-.015)	-.054 * (-.157,-.003)
Married or partnered				
Direct Effect	-6.035 *	-.019	-.190	.192
Indirect Effect, 95% (CI)	-	-.095 * (-.246,-.014)	-1.545 (-3.731,.095)	-.146 (-.655,.036)
Acculturation <sup>a</sup>				
Direct Effect	3.140 *	-	-	1.130 ***
Indirect Effect, 95% (CI)	-	.049 * (.006,.123)	.747 * (.110,1.763)	.063 * (.002,.235)
Psychological distress <sup>b</sup>				
Direct Effect	-	.016 *	.150 *	-
Indirect Effect, 95% (CI)	-	-	.088 * (.026,.175)	.020 * (.001,.053)
Alcohol use <sup>c</sup>				
Direct Effect	-	-	5.641 ***	-
Indirect Effect, 95% (CI)	-	-	-	.475 * (.012,1.126)
Alcohol problems <sup>d</sup>				
Direct Effect	-	-	-	.084 *
Indirect Effect, 95% (CI)	-	-	-	-

Note. Unstandardized estimates.

\*  $p < .05$ ,

\*\*  $p < .01$ ,

\*\*\*  $p < .001$ .

<sup>a</sup>Short Acculturation Scale for Hispanics.

<sup>b</sup>Brief Symptom Inventory-18.

<sup>c</sup>Based on timeline follow-back. Total number of drinks consumed 30 days before baseline assessment.

<sup>d</sup>Alcohol Use Disorder Identification Test (items 4-10).