



## Full length article

## Area-level disadvantage and alcohol use disorder in northern Mexico



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## ARTICLE INFO

## Keywords:

Alcohol use disorder

Mexico

Epidemiology

Border area

Neighborhood characteristics

## ABSTRACT

**Background:** In Mexico, the Northern States are highly impacted by alcohol consumption and associated problems. Little is known about the association between contextual social disadvantage and alcohol use disorder in this region.

**Methods:** Information from 1265 current drinkers surveyed in the *U.S.-Mexico Study on Alcohol and Related Conditions* (UMSARC) was combined with official data on neighborhood disadvantage (index of urban marginalization, a composite of ten indicators of area-level social disadvantage) for 302 neighborhoods. Using statistical marginal models, we estimated the association of neighborhood disadvantage with alcohol use disorder (AUD; based on DSM-5 criteria), alone and with adjustment for individual and contextual covariates. We also tested for moderation of neighborhood disadvantage effects by sex, education, internal migration and border area.

**Results:** There was a statistically significant increase in the odds of AUD of 59% (AOR = 1.59; 95%CI = 1.03, 2.46) for every one-point increase on the neighborhood disadvantage scale, after adjustment for covariates. A significant interaction between sex and neighborhood disadvantage was indicated by two measures of additive interaction (AP = 0.55;  $p < 0.001$  and S = 2.55;  $p < 0.001$ ), with higher neighborhood disadvantage related to higher prevalence of AUD for men but not for women. No moderation effects were observed for education, internal migration or border area.

**Conclusions:** Neighborhood disadvantage is a risk factor for AUD independent of other variables, specifically in men. Studies of contextual variables offer the possibility for understanding the role of collective circumstances on individuals in society. Future studies of alcohol use in this geographic area should consider effects of contextual determinants such as disadvantage.

## 1. Introduction

According to the Global Burden of Disease Study, in Mexico, alcohol use disorder (AUD) is one of the principal causes of years lived with disability (Lozano et al., 2013). In the population aged 15–49, AUD is one of the leading mental and behavioral disorders contributing to disability-adjusted life years (IHME, 2016). Some of the highest prevalence estimates of substance use disorders (SUD) have been reported in northern Mexico, with 5% of the population aged 18–65 meeting International Classification of Diseases (ICD-10) diagnostic criteria for past-year SUD (Medina-Mora et al., 2003). Results from the

U.S.-Mexico Study on Alcohol and Related Conditions (UMSARC), a population-based survey conducted in the U.S.-Mexico border region, estimated that 11.3% of current drinkers in three border cities in the State of Tamaulipas and 18.7% in the non-border city of Monterrey (State of Nuevo León) met DSM-5 criteria for past-year AUD (Cherpitel et al., 2015).

Six states of Northern Mexico share border with the U.S., and approximately 15 million people live in cities along the Mexican side of the border (PAHO, 2007). Each of the border cities includes a significant proportion of its population who arrived by distinct migratory flows from other states in the country. For example, while most

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<http://dx.doi.org/10.1016/j.drugalcdep.2017.02.011>

Received 28 June 2016; Received in revised form 10 February 2017; Accepted 13 February 2017

Available online 13 April 2017

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people who migrated to Tijuana, in the state of Baja California Norte, arrived from states in the south-west of Mexico, those who migrated to Reynosa, in the State of Tamaulipas, arrived from its neighbor State of Veracruz (El Colef, 2011).

In the current study of AUD in Northern Mexico, we take a social epidemiological approach (Kaufman, 2008), considering social, economic, and cultural factors at the individual and community levels (Galea et al., 2004) that contribute to AUD. Although individual and family-level predictors of AUD in Mexico have been well documented (Ortiz-Hernández et al., 2007), community factors have received less attention. However, in other countries, like the U.S., the relationship between neighborhood socioeconomic level and alcohol use has been the subject of study for many years.

It has been proposed that living in an urban environment may influence the behavior of individual residents through determinants at several levels of aggregation. Galea et al. have proposed a framework that lists a set of urban features most proximal to the individual, that is, the urban living conditions with which an individual regularly interacts. These are the surrounding population structure (i.e., demographic composition), the physical environment (including housing quality, population density, infrastructure), the social environment (including social networks, social support and social capital), and formal and informal health and social services (Galea et al., 2005). Since inequality may arise from any or all of these urban features (Galea and Vlahov, 2005), it is necessary to assess the role of living conditions as a potential determinant of health and, in particular, of mental health and addictions, through analyzing the environmental systems that shape human development (Bonfenbrenner, 1988).

In general, and as summarized by Karriker-Jaffe (2011), hypotheses related to neighborhood disadvantage assert that disadvantaged neighborhoods often have less-protective social environments that fail to control antisocial or illegal behaviors of the residents. These areas also have diminished physical environments, manifested through signs of decay such as vacant housing, litter, and graffiti (which also may result from lower social control of deviance). These stressful social and physical environments can exert a negative impact on mental health (Latkin and Curry, 2003), as well as on health risk behaviors such as unsafe injection practices of drug users (Latkin et al., 2005). Moreover, there are likely psychosocial mechanisms at work in disadvantaged neighborhoods, such as perceived lack of control or feelings of hopelessness, which also may contribute to substance use. These processes may vary according to individuals' relative position in society, as indicated by different aspects of SES such as education, occupation or income (Kaufman, 2008); theories of “differential vulnerability” (McLeod and Kessler, 1990) propose that people with lower SES have fewer resources such as social support and general resilience to cope with exposure to chronic stressors, such as those that accompany life in disadvantaged urban areas.

Two recent reviews of studies examining the relationship between neighborhood socioeconomic status (SES) and alcohol use in individuals (Bryden et al., 2013; Karriker-Jaffe, 2011) showed mixed support for the hypothesis that area-level disadvantage is associated with alcohol outcomes; nevertheless, there are fairly consistent evidence of neighborhood effects in substance use outcomes, especially for alcohol problem measures (rather than general consumption measures) and for adults (Karriker-Jaffe, 2011). To date, studies of alcohol and neighborhood disadvantage have had three important limitations: 1) a lack of consistency in the definition of neighborhood socioeconomic status; 2) limitations in the geographic areas available for analysis; and 3) varied criteria for measurement of alcohol outcomes (e.g., use, risky use, hazardous use, psychiatric diagnosis of AUD). Only five known studies have examined AUD according to the criteria of the Diagnostic and Statistical Manual of Mental Disorders (DSM) in what are known as “small areas” such as census tracts or zip codes (Buu et al., 2007; Karriker-Jaffe et al., 2012; Molina et al., 2012; Mulia and Karriker-Jaffe et al., 2012; Silveira et al., 2014), and another two have studied DSM-IV

AUD in combination with other drugs (Karriker-Jaffe, 2011; Savage and Mezuk, 2014).

In the study by Karriker-Jaffe et al. (2012), it was suggested that the association between neighborhood disadvantage and alcohol use in small areas may be moderated by gender, whereby men could have elevated heavy drinking in stressful situations or environments due to relaxed social norms, while women could be more negatively affected by worsened conditions of their neighborhoods because they may be more “place-bound” due to their lack of resources. The study reported a small moderation effect ( $p < 0.10$ ) of neighborhood disadvantage on DSM-IV alcohol dependence among Hispanic men who were current drinkers.

When considering moderation of neighborhood effects, one of the most important individual characteristics that has been studied is SES, and several theoretical explanations of how individual SES may moderate the association between neighborhood disadvantage and alcohol use have been proposed. Mulia and Karriker-Jaffe (2012) explicitly tested three of these, analyzing the U.S. National Alcohol Survey: double jeopardy (i.e., living in a disadvantaged neighborhood has a worse effect among those with low individual SES); status inconsistency (i.e., people with low SES living in neighborhoods with high SES may experience higher stress due to not meeting others' expectations or due to being unfamiliar with social norms), and relative deprivation (i.e., people with low SES in any given neighborhood may experience frustration and stress compared to those better off in the same neighborhood). Results from this study found that among both male and female drinkers, the odds for alcohol problems (which included DSM-IV AUD) were greater in areas of low SES compared to those of medium level, and that the effect was independent of individual SES. Although current drinkers with low SES had higher rates of alcohol problems at each level of neighborhood disadvantage, they did not find statistical evidence supporting any of the three theories in relation to alcohol problems.

In addition to sex and individual SES as possible moderators of the association between neighborhood disadvantage and AUD, there are two features of Northern Mexico that are also likely to affect how the neighborhood environment is related to alcohol use. First, due to job opportunities in maquilas (large manufacturing factories), there is internal migration to border cities from inner states of Mexico, where lower prevalences of alcohol dependence and binge drinking have been reported (Medina-Mora et al., 2011). Second, proximity of the border cities to the U.S. affects urban environmental conditions and social norms. Some specific characteristics of the border area that are likely to be relevant to AUD are the high prevalence of drug trafficking and associated violence, a relatively young population, and stress related to unemployment and poverty (Wallisch and Spence, 2006; Zemore et al., 2016).

The objective of the present study is to examine, for the first time, the relationship between neighborhood disadvantage and AUD in the population living in Northern Mexico, and to test whether this association is moderated by sex, SES, internal migration history or border proximity. We use a secondary analysis of a four-city, representative survey combined with Mexican government data. Unlike most studies published to date, the DSM-5 definition of AUD is used (APA, 2013), which no longer makes a distinction between abuse and dependence and incorporates the criterion of craving (an intense desire to consume alcohol) in place of legal problems (Hasin et al., 2013). This last point is especially relevant to the present study, as a positive diagnosis for alcohol abuse using earlier diagnostic criteria could be inflated due to the relationship of social or cultural factors (such as discrimination) with alcohol-related legal problems (Babor and Caetano, 2008). Based on prior studies conducted in the U.S. and elsewhere, our hypothesis is that neighborhood disadvantage is an independent risk factor for AUD in this urban Mexican population, and that this association is moderated by sex (where we expect higher rates among males in disadvantaged neighborhoods), individual SES (higher

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