



Published in final edited form as:

Alcohol. 2012 November ; 46(7): 695–701. doi:10.1016/j.alcohol.2012.06.002.

Alcohol use, alcohol problems, and problem behavior engagement among students at two schools in northern Mexico

Brent E. Mancha, PhD, MHS^a, Vanessa C. Rojas, PhD, MPhil, MSW^b, and William W. Latimer, PhD, MPH^c

^aDepartment of Mental Health, Johns Hopkins Bloomberg School of Public Health, 624 North Broadway, Hampton House Room 795, Baltimore, Maryland 21205 USA

^bDr. Vanessa Rojas, LLC, 1010 Wisconsin Avenue, NW, Suite 515, Washington, DC 20007 USA

^cDepartment of Clinical and Health Psychology, College of Public Health and Health Professions, University of Florida, 101 S. Newell Drive, Room 3151, Gainesville, FL 32611 USA

Abstract

This study examined the association between alcohol use problem severity, defined by number of DSM-IV alcohol Abuse and Dependence symptoms and frequency of alcohol use, and problem behavior engagement among Mexican students. A confidential survey was administered to 1229 students in grades 7–12 at two schools in a northern border city in Mexico. Youths were categorized into five groups based on their alcohol use frequency and symptoms of DSM-IV alcohol Abuse and Dependence, specifically: no lifetime alcohol use, lifetime alcohol use but none in the past year, past year alcohol use, one or two alcohol Abuse or Dependence symptoms, and three or more alcohol Abuse or Dependence symptoms. The association between five levels of alcohol use problem severity and three problem behaviors, lifetime marijuana use, lifetime sexual intercourse, and past year arrest/law trouble, was examined using chi-square or Fisher's exact tests. Several alcohol use problem severity categories were significantly different with respect to rates of lifetime marijuana use, lifetime sexual intercourse, and past year arrest/law trouble. Higher alcohol use problem severity was associated with greater endorsement of problem behaviors. Knowing about variations in adolescent alcohol use and alcohol problems may be instrumental in determining if youths are also engaging in a range of other risk behaviors. Considering varying levels of alcohol use and alcohol problems is important for effective targeted prevention and treatment interventions.

Keywords

adolescent; schools; alcohol-related disorders; classification; Mexico; problem behavior

Introduction

Adolescent alcohol use is a growing problem in Mexico (Secretaria de Salud, 2004; Felix-Ortiz et al., 2001; Medina-Mora et al., 1995; Rojas-Guiot et al., 1999). Twenty-five percent

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Correspondence should be sent to Brent Mancha at: brentmancha@gmail.com, 410-812-6707, or 1042 Rustling Oaks Drive Millersville, MD 21108.

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of youths aged 12 to 17 drank alcohol in the last year and 4% of those aged 12 to 65 met the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV; American Psychiatric Association [APA], 2000) criteria for alcohol Dependence (Secretaria de Salud, 2004). This is concerning given that adolescent alcohol use is associated with many adverse consequences, including unintended pregnancy (Naimi et al., 2003), HIV/AIDS infection (Leigh and Stall, 1993), aggressive behavior (Reiss and Roth, 1994), and traffic fatality (Zador et al., 2000). The present study is part of a series of investigations seeking to reduce alcohol-related morbidity and mortality among adolescents by examining how one might accurately classify adolescents into alcohol use problem severity groups and thereby target youths for prevention intervention and treatment. Specifically, this study set out to examine the prevalence of alcohol use and alcohol problems and their association to other problem behaviors in a sample of school youths in Mexico.

During the past 30 years, there has been a broad base of research using population-based samples to describe trends in adolescent alcohol use in Mexico (Secretaria de Salud, 2004; Felix-Ortiz et al., 2001; Medina-Mora et al., 1995). Surveys of adolescent health and substance use have focused on self-reported alcohol use frequencies for varying time periods, such as lifetime use, use in the past year, or use in the past 30 days as a means to gauge the range of alcohol use problems among Mexican youths (Secretaria de Salud, 2004; Felix-Ortiz et al., 2001; Medina-Mora et al., 1995). While some studies have estimated the prevalence of youths using different levels of alcohol (Secretaria de Salud, 2004; Medina-Mora et al., 1980; Rojas-Guiot et al., 1999; Victorio, 2001), few adolescent studies have examined levels of alcohol use problem severity by incorporating measures on diagnostic symptoms of alcohol Abuse and Dependence and items on alcohol use frequency. The National Survey on Addictions (2004) conducted in Mexico reported the prevalence of several levels of alcohol use in adolescents and the prevalence of symptoms of alcohol Abuse and Dependence in a combined sample of adolescents and adults. Although a quarter of youths aged 12 to 17 had drunk alcohol in the past year, the prevalence of alcohol Abuse and Dependence symptoms for this age group were not reported (Secretaria de Salud, 2004).

While some studies have examined alcohol use and alcohol problems in Mexican youths, few recent studies that we are aware of have examined the association between using alcohol and engaging in other problem behaviors among youths (Juarez et al., 1998; Rojas-Guiot et al., 1999). One study found that those who drank more alcohol had more behavioral problems (Rojas-Guiot et al., 1999). Another study found that alcohol and drug users committed more antisocial acts than nonusers (Juarez et al., 1998). It is important to understand the relationship between alcohol use and problem behavior engagement because knowing an adolescent's level of alcohol use may be predictive of their engagement in other behaviors. Problem behavior theory explains adolescent drinking behavior taking a psychosocial perspective which incorporates aspects of youths' personality, perceived environment, and behavior (Jessor, 1987; Jessor and Jessor, 1977). The behavior system of problem behavior theory states that engaging in one problem behavior, such as alcohol use, increases the propensity that one may engage in other problem behaviors, such as problem drinking, drug use, sexual intercourse, and deviant behaviors (Jessor, 1987; Jessor and Jessor, 1977). Alcohol use is one behavioral aspect of a syndrome of problem behavior engagement associated with negative distal outcomes (Jessor, 1987; Jessor and Jessor, 1977), such as academic failure, unintended pregnancy, sexually-transmitted infections, and delinquency. While many United States studies support problem behavior theory (Jessor, 1987; Jessor and Jessor, 1977), only a few studies that we are aware of have investigated alcohol use and problem behavior engagement among adolescent Mexicans (Juarez et al., 1998; Rojas-Guiot et al., 1999). More research is needed to examine this important relationship in Mexican adolescents.

The present study sought to define differing levels of alcohol use problem severity among a school-based sample of adolescents by incorporating measures on alcohol use frequency and DSM-IV symptoms associated with use (APA, 2000). Additionally, we sought to examine whether levels of alcohol use problem severity were associated with problem behavior engagement, specifically marijuana use, sexual intercourse, and having been arrested/having trouble with the law and demographic characteristics, specifically age and gender. We hypothesized that higher levels of alcohol use and alcohol problems would be associated with greater problem behavior engagement, older age, and male gender.

Materials and Methods

Subjects and Procedure

In the spring of 2000, 1,238 students at one middle school (grades 7–9) and one high school (grades 10–12) in the northern border city of Monclova, Mexico (in the state of Coahuila) were administered the Spanish version of the International Longitudinal Survey of Adolescent Health (ILSAH) (Latimer et al., 2004a; Latimer et al., 2004b). The ILSAH is a multi-wave confidential survey designed to assess risk and protective factors associated with a range of health behavior outcomes in adolescence, including drug use, sexual behavior, psychiatric problems, and school achievement (Latimer et al., 2004a; Latimer et al., 2004b). Less than 1% of the sample ($N=9$) were excluded from the analyses because they endorsed the use of a fictitious drug item or had an inconsistent pattern of responses throughout the survey. Inconsistent response patterns were identified by conducting response consistency checks in which item frequencies were compared and cross-tabulated for related items. The survey response rate was 93%. The final sample included 1,229 youths with a mean age of 15.1 years (standard deviation=1.7); 595 (48.4%) middle school students and 634 (51.6%) high school students, 659 (53.6%) females and 570 (46.4%) males (see Table 2). The students reported their ethnicity as: Hispanic ($N=1078$, 87.7%), White ($N=27$, 2.2%), Native American ($N=54$, 4.4%), and other ($N=70$, 5.7%). The procedures for this study have been described in more detail elsewhere (Latimer et al., 2004b).

In brief, Monclova was randomly selected from a compiled list of the five largest cities in Coahuila. One middle school and one high school were randomly chosen from a compiled list of the five largest school systems in Monclova. Passive parental consent was obtained and assent forms were signed by all students who participated in the study. All teachers received a three-hour didactic session on how to administer the survey. Teacher training was conducted one week before the survey administration day. Printed instructions were given to teachers with verbatim statements to read to students. On the survey administration day, the project director and project coordinator were on site and circulated between classrooms to address any problems or questions that came up. The survey and study procedures were reviewed and approved by the University of Minnesota Review Board, the Superintendent of each school, and an ad hoc review board (including the principal, teachers, and parents) formed at each school. The procedures of the study were also in accordance with the ethical standards of the Declaration of Helsinki, as revised in 1983 (Declaration of Helsinki, 1983).

Measures

The items in this survey were adapted mainly from the Personal Experience Inventory (PEI; Winters and Henly, 1989) and the Adolescent Diagnostic Interview (ADI; Winters and Henly, 1993).

Personal Experience Inventory—The PEI is a self-report questionnaire in which respondents report on the onset, nature, degree, frequency, and duration of alcohol and other drug use and on risk factors associated with substance abuse (Winters and Henly, 1989;

Winters et al., 1997). It is used mainly in adolescent populations 12–18 years old and is administered via paper and pencil format. The PEI has been widely used in United States school and clinic settings and has shown good psychometric properties (Winters and Henly, 1989; Winters et al., 2001). The PEI has shown good internal consistency measures, good test-retest reliability, and good validity in adolescent US school samples, clinic samples, and juvenile justice samples (Winters and Henly, 1989; Winters et al., 2001). One study reported that the average coefficient alpha across three samples of youths (drug clinic, school, and juvenile detention) for the PEI's Personal Involvement Scale (29 items) was .97 (Winters et al., 2001).

Adolescent Diagnostic Interview—The ADI systematically assesses substance use disorders in 12- to 18-year-olds and items are based on the diagnostic criteria of the Diagnostic and Statistical Manual of Mental Disorders, III-R (Winters and Henly, 1993). The ADI helps professionals identify adolescents with substance abuse problems who are in need of treatment, referral, or additional assessment. The ADI has been widely used in US drug treatment settings and has shown good psychometric properties (Winters and Henly, 1993; Winters et al., 2001). The ADI has shown good inter-rater agreement ($\kappa = .66-.96$) and test-retest reliability (.53–.79) in adolescent clinical samples (Winters et al., 2001). It has also show good validity (Winters and Henly, 1993; Winters et al., 2001). For this survey, the ADI was adapted for paper and pencil self-administration.

Spanish Language Translation—The current version of the survey was forward and backward translated into Spanish (Latimer et al., 2004b). First, the bilingual forward translation team translated the English language versions into Spanish. Next, the bilingual backward translation team translated that Spanish language version back into English. Using the versions provided by each translation team, the bilingual project coordinator then developed a Spanish language version of the survey. The Spanish version of the survey was then pilot tested in a group of students in northern Mexico and a group of Mexican-American students in the United States. Some minor modifications were made to some items following the pilot test results.

Alcohol Use Frequency—Alcohol use frequency items were taken from the Personal Experience Inventory (Winters and Henly, 1989). Participants responded to one item inquiring about their frequency of alcohol use in their lifetime (“How many times have you had ALCOHOL (including BEER, WINE, and LIQUOR) to drink during your lifetime?”) and to one item asking about their frequency of alcohol use in the past 12 months (“How many times have you had ALCOHOL (including BEER, WINE, and LIQUOR) to drink during the last 12 months?”) by selecting from seven response choices, ranging from never to 40-or-more times. For this analysis, lifetime and past year alcohol use were dichotomized into never used versus any use.

Alcohol Abuse and Dependence Symptoms—Alcohol Abuse and Dependence symptom items were taken from the Adolescent Diagnostic Interview (Winters and Henly, 1993). Participants responded to 20 items asking about the frequency of problems related to alcohol use that they experienced in the past year. Eleven items asked about DSM-IV alcohol Abuse symptoms (representing all four Abuse criteria) and nine items asked about DSM-IV alcohol Dependence symptoms (representing six out of seven Dependence criteria; no item addressed tolerance) (APA, 2000). An example Abuse item is “Have you skipped school because of alcohol use?”. An example Dependence item is “Have you kept using alcohol even though you were told you had a serious medical problem that could get worse with alcohol use?” Response options were never, one time, or two or more times. For this analysis, all symptoms were dichotomized into never versus one or more times.

Marijuana Use Frequency—One survey item derived from the Personal Experience Inventory asked about their frequency of marijuana use in their lifetime, “How many times have you used MARIJUANA (weed, grass, pot, joint) or HASHISH (hash, hash oil) during your lifetime?” (Winters and Henly, 1989). There were seven response choices, ranging from never to 40-or-more times. Lifetime marijuana use was dichotomized into never used in lifetime versus any use in lifetime for the first analysis. For the subsequent analysis of lifetime marijuana users, this variable was categorized as: one or two times used vs. three or more times used.

Sexual Intercourse—Items asking about sexual behavior were derived from the Personal Experience Inventory (Winters and Henly, 1989). One item, asked participants if they had ever had sexual intercourse in their lifetime (“Have you ever had sexual intercourse (‘gone all the way’)?”; yes or no). One-hundred-eighty-three youths (14.9%) had missing values on lifetime sexual intercourse. Many studies on adolescents have used lifetime or ever had sexual intercourse as an outcome (Jessor and Jessor, 1977; Kim, 2010; Latimer et al., 2008; Mancha et al., 2010; Palen et al., 2009). For the subsequent analysis of those reporting lifetime sexual intercourse, three additional items were used. The item regarding sexual debut (“How old were you the first time you did it (had intercourse)?”) was dichotomized into sexual debut at 15 years or younger vs. 16 years or older. The item on number of sexual partners (“How many people have you had sexual intercourse with during your lifetime?”) was dichotomized into one vs. two or more persons. Another item asked students about their recent use of condoms (“The last time you had sexual intercourse, did you or your partner use a condom?”; Yes or No).

Arrested/Trouble with the Law—Another item, derived from the Personal Experience Inventory, asked respondents: “Have you been arrested or had any trouble with the law in the past 12 months?”; yes or no (Winters and Henly, 1989). Eighty-two youths (6.7%) had missing values on this variable.

Alcohol Use Problem Severity Categories—In order to categorize youths into groups based on their severity of alcohol use and alcohol problems we used a similar methodology as in two other published papers (Latimer et al., 2008; Mancha et al., 2010); this is the third paper in a sequence of investigations into alcohol use problem severity and problem behaviors in three countries (the USA, Puerto Rico, and now Mexico). Our goal here was to create homogenous groups of youths in terms of severity of alcohol use and alcohol problems. Youths were categorized into their highest severity category possible. We used the ADI (DSM-IV symptoms of Alcohol Abuse and Dependence) and the PEI (frequency of lifetime and past year alcohol use) to create the groups.

In order to create the most homogeneous groups, we began our categorization by using the gold standard, the DSM-IV. Youths were initially grouped accordingly: Dependence (three or more Dependence criteria), Abuse (one or more Abuse items and did not report three or more Dependence criteria), and no diagnosis. The category of “no diagnosis” was quite heterogeneous, including youths who have endorsed Dependence criteria symptoms, those who have never taken a drink, and those who had used alcohol (in various levels). This study, along with the other two studies in the sequence (Latimer et al., 2008; Mancha et al., 2010) sought to extend the DSM categorizations to include youths at varying levels of alcohol use frequency and alcohol problems. Since there is not a DSM-IV category for those reporting only one or two Dependence criteria, we created a category for those endorsing one or two Dependence criteria. Other researchers have created such an “extra” category so as not to exclude “diagnostic orphans” (Pollock and Martin, 1999). Since we had one Abuse category including those reporting between one and four Abuse symptoms and there were

already two categories for Dependence – namely one or two Dependence criteria and three or more Dependence criteria we decided to divide the Abuse category into similar groups distinguished by symptom number: one or two Abuse symptoms and three or more Abuse symptoms. We then consolidated the Abuse and Dependence symptom categories together; those reporting one or two alcohol Abuse symptoms were combined with those reporting one or two alcohol Dependence criteria and those reporting three or more alcohol Abuse symptoms were combined with those reporting three or more alcohol Dependence criteria. These final decisions were based on research suggesting that the number of symptoms may be more important for adolescents compared to the type of symptom endorsed (Abuse vs. Dependence) (Harrison et al., 1998; Hasin et al., 2003; Latimer et al., 2008; Mancha et al., 2010; Martin and Winters, 1998; Winters et al., 2001). In addition, these decisions are consistent with some revisions to the DSM; DSM-V is scheduled to be released in 2013 and has eliminated the distinction between Abuse and Dependence symptoms (including a diagnosis of Abuse and Dependence) and will now include severity specifiers based on the number of criteria endorsed (American Psychiatric Association).

Next, we looked at those who reported no (Abuse or Dependence) symptoms. Even this group was quite heterogeneous, including non-users and frequent users. Since the study's goal was to examine specific levels of alcohol use (and alcohol problems), we decided to categorize the group who reported no symptoms into three rationally defined categories: no lifetime alcohol use, lifetime alcohol use but none in the past year, and used alcohol in the past year. The decision of how to categorize these groups was based on the distribution of the data and on what made the most sense epidemiologically (creating the most homogenous groups). (Initially, the past year alcohol use category was categorized into those who used alcohol one to nine times in the past year and those who used alcohol ten or more times in the past year, however the sample size was low [N=27] in the group reporting using alcohol ten or more times in the past year.)

The result was five mutually exclusive and approximately homogenous categories: no lifetime alcohol use, lifetime alcohol use but none in the past year, past year alcohol use, one or two alcohol Abuse or Dependence symptoms, and three or more alcohol Abuse or Dependence symptoms (see Table 1). This categorization was consistent with creating homogenous groups of youths, in terms of the frequency of alcohol use and the number of abuse/dependence symptoms reported within groups.

The groups were mutually exclusive in that individuals were only included in one group. Youths were categorized into their highest severity category possible. Although individuals in higher severity groups may report a “lower” severity activity (for example individuals in the three or more alcohol Abuse or Dependence symptoms reported lifetime and past year alcohol use and potentially one or two alcohol Abuse or Dependence symptoms, they were categorized into their highest alcohol use severity category possible.

Statistical Analyses

We examined the association between the five alcohol use problem severity categories and problem behavior engagement, specifically lifetime marijuana use, lifetime sexual intercourse, and past year arrested/law trouble, and demographic characteristics, specifically age and gender, by conducting multiple 2 X 2 chi-square and two-sided Fisher's exact test comparisons using Stata version 10 (StataCorp, 2007). Fisher's exact tests were employed when the chi-square comparison had at least one expected cell frequency of less than five (Rosner, 2000). For age, multiple two-sample t-tests for unpaired data were conducted to determine if mean age differed by alcohol category. Based on tests of the equality of variances, we assumed equal or unequal variances where appropriate. Each of the five alcohol problem severity categories was compared on their endorsement of problem

behaviors and demographic characteristics. For example, category 1 (no lifetime alcohol use) and category 2 (lifetime alcohol use but none in the past year) were compared to each other with respect to their endorsement of lifetime marijuana use. The alpha level was set at 0.05.

In addition, to further examine those reporting engagement in problem behaviors we also displayed the cross-tabulation of the alcohol use problem severity groups with frequency of lifetime marijuana use (one or two vs. three or more times), among those reporting lifetime marijuana use and the alcohol use problem severity groups with age of sexual debut (15 years of age or younger vs. 16 years of age or older), number of sexual partners (one vs. two or more), and condom used during the last sexual intercourse (no vs. yes), among those reporting lifetime sexual intercourse.

Results

Alcohol Use Problem Severity Groups—The alcohol use problem severity groups were: no lifetime alcohol use (N=489; 39.8%), lifetime alcohol use but none in the past year (N=221; 18.0%), past year alcohol use (N=329; 26.8%), one or two alcohol Abuse or Dependence symptoms (N=129; 10.5%), and three or more alcohol Abuse or Dependence symptoms (N=61; 5.0%; see Table 1).

Age and Alcohol Use Problem Severity Groups—Results showed that mean age was significantly different for each category of alcohol use problem severity (see Table 2). Mean age increased with each increase in alcohol problem severity group.

Gender and Alcohol Use Problem Severity Groups—The group reporting three or more Abuse or Dependence symptoms had significantly more males (85.2%) compared to all other alcohol categories (see Table 2). The group reporting one or two Abuse or Dependence symptoms had significantly more males (54.3%) compared to all other lower severity groups. The prevalence of male gender increased with each increase in alcohol problem severity group.

Lifetime Marijuana Use and Alcohol Use Problem Severity Groups—The group reporting three or more alcohol Abuse or Dependence symptoms had a significantly different prevalence of lifetime marijuana use compared to all other categories of alcohol problem severity (see Table 2). The group reporting one or two alcohol Abuse or Dependence symptoms had a significantly different prevalence of lifetime marijuana use compared to all other lower categories of alcohol problem severity. In addition, the group reporting no lifetime alcohol use (0.8%) and the group reporting past year alcohol use (4.3%) had significantly different prevalence of lifetime marijuana use. The prevalence of lifetime marijuana use increased with each increase in alcohol problem severity group.

Lifetime Sexual Intercourse and Alcohol Use Problem Severity Groups—The group reporting three or more alcohol Abuse or Dependence symptoms had a significantly different prevalence of lifetime sexual intercourse (40.4%) compared to all other categories of alcohol problem severity (see Table 2). The groups reporting one or two alcohol Abuse or Dependence symptoms (16.5%) and past year alcohol use (12.2%) did not differ with respect to their prevalence of lifetime sexual intercourse, but both did significantly differ compared to the groups reporting no lifetime alcohol use (2.4%) and lifetime alcohol use but none in the past year (4.2%). The prevalence of lifetime sexual intercourse increased with each increase in alcohol problem severity group.

Past Year Arrest/Law Trouble and Alcohol Use Problem Severity Groups—The group reporting three or more alcohol Abuse or Dependence symptoms had a significantly different prevalence of past year arrest/law trouble (35.8%) compared to all other categories of alcohol problem severity (see Table 2). The group reporting one or two alcohol Abuse or Dependence symptoms had a significantly different prevalence of past year arrest/law trouble (8.9%) compared to all other lower categories of alcohol problem severity. In addition, the group reporting no lifetime alcohol use (0.8%) and the group reporting past year alcohol use (3.5%) had a significantly different prevalence of past year arrest/law trouble. The prevalence of past year arrest/law trouble increased with each increase in alcohol problem severity group.

Frequency of Marijuana Use Among Lifetime Marijuana Users—Among those reporting lifetime marijuana use, 32 (56.1%) reported using marijuana three or more times in their lifetime (see Table 3). The no lifetime alcohol use group had the lowest percentage (25.0%; N=1) of using marijuana three or more times in their lifetime compared to the other groups.

Age of Sexual Debut Among Those Reporting Lifetime Sexual Intercourse—Among those reporting lifetime sexual intercourse, 40 (48.8%) reported that they first had sexual intercourse at age 15 or younger (see Table 3). The following groups had comparatively higher percentages of reporting that they first had sex at age 15 or younger: past year alcohol use (51.6%; N=16), one or two alcohol Abuse or Dependence symptoms (60.0%; N=9), and three or more alcohol Abuse or Dependence symptoms (55.0%; N=11).

Number of Sex Partners Among Those Reporting Lifetime Sexual Intercourse—Among those reporting lifetime sexual intercourse, 35 (43.7%) reported that they had two or more sexual partners (see Table 3). The no lifetime alcohol use group had the lowest percentage (14.3%; N=1) of reporting that they had two or more sexual partners compared to the other groups.

Condom Use Among Those Reporting Lifetime Sexual Intercourse—Among those reporting lifetime sexual intercourse, 47 (56.6%) reported that they had did not use a condom the last time they had sex (see Table 3). All groups had relatively high rates of non-condom use for the last sexual intercourse, with the exception of the group reporting lifetime alcohol use but none in the past year (with 2 [25.0%] reporting that they did not use a condom).

Discussion

This study presents an alcohol use problem severity taxonomy for Mexican adolescents based on self-reported alcohol use frequency and symptoms of DSM-IV alcohol Abuse and Dependence and examines its association to other problem behaviors and demographic characteristics. This study reports that Mexican adolescents engage in a range of alcohol use and experience a range of problems associated with that use. This study and others suggest that more substance abuse prevention interventions are needed in Mexican border communities because of the high alcohol usage among adolescents.

This study is one of a few studies that examines the relationship between alcohol use, alcohol problems, and other problem behaviors among Mexican adolescents (Juarez et al., 1998; Rojas-Guiot et al., 1999). Overall, we found that youths endorsing higher levels of alcohol use and more symptoms of alcohol Abuse or Dependence had greater endorsement of lifetime marijuana use, lifetime sexual intercourse, and past year arrest/law trouble. These results are consistent with studies showing that alcohol use is associated with illicit

substance use, sexual behavior, and deviant behavior (Donovan et al., 1999; Jessor, 1987; Jessor and Jessor, 1977). The results showed an approximate “dose-response effect”; with higher alcohol use and more symptoms being associated with greater problem behavior engagement. It should be noted that the group reporting three or more alcohol Abuse or Dependence symptoms had significantly higher rates of lifetime marijuana use, lifetime sexual intercourse, and past year arrest/law trouble compared to all the other categories.

A similar pattern was found for the demographic characteristics. Mean age increased with higher severity alcohol categories. This is consistent with research showing an increased risk of developing an alcohol use disorder among older youths and young adults (Palmer et al., 2009). In addition, with respect to gender the categories were more evenly distributed, however males constituted 85.2% of the highest severity group (those reporting three or more alcohol Abuse or Dependence symptoms), which was significantly higher than all other categories.

The frequency of marijuana use and sexual risk behavior results (shown in Table 3) are somewhat more nuanced. The “dose-response effect” pattern seen in the previous analyses is less clear or absent. Because the base prevalences of problem behavior engagement were very low in this sample, closer examination of those reporting problem behaviors was limited. However, results are presented to elucidate the profile of problem behavior engagement among the alcohol groups in this population. It should also be noted that this survey did not include data on the number or types of arrest or trouble with the law the youths experienced.

The public health significance of distinguishing between youths at the low and high end of alcohol use problem severity is supported by the results. The findings suggest that knowing about variations in adolescent alcohol experimentation may be instrumental in gauging the degree to which youths may also be engaging in a range of behaviors that place them at risk for more severe risk behaviors and a progression to more serious forms of alcohol and drug use (Grant et al., 2006). Such information is crucial to targeting youths for selected and indicated prevention programs; these programs may need to address youths’ engagement in other risk behaviors to be effective. The study results are also important for the creation of adaptive prevention and treatment interventions that assign different dosages or program components to individuals based on certain characteristics, called tailoring variables (Collins et al., 2004). A youth experiencing several problems with alcohol use may need a more intense intervention than a youth experiencing only one alcohol problem.

While the National Survey on Addictions (Secretaria de Salud, 2004) found that 25% of Mexican adolescents had used alcohol in the past year, the present study found that 42% of adolescents had used alcohol in the past year. One possible explanation for these differences in the prevalence rates is that the National Survey on Addictions is a country-wide probability sample, while this study sample was from only two schools in one northern border community in Mexico. Research has shown border communities to have higher rates of substance use (Felix-Ortiz et al., 2001; Medina-Mora et al., 1996).

This study had some limitations. The present method of categorizing youths into groups may be limited in that comparing it to other studies which utilize the DSM-IV or other methods may be difficult. Also, we did not examine the frequency of alcohol use within groups of youths who reported symptoms of alcohol Abuse or Dependence. Future research could consider a model in which outcome variables are regressed on a) number of symptoms and b) frequency of use, along with age and sex, enabling one to determine the degree to which these two characteristics provide redundant and independent predictive information about the outcomes. Another limitation is that our sample was from one city in northern Mexico

and may not be generalizable to all youths in Mexico. Our sample was also school-based and did not include adolescents who dropped out or skipped school, who are known to be at greater risk for substance use disorders and other problem behaviors (Swaim et al., 1997). The prevalence of school drop out in Mexico is 45% (Economic Commission for Latin America and the Caribbean, 2002), suggesting that including drop outs could significantly change the results (Swaim et al., 1997). In addition, the wide developmental range of youths in our sample (between 12 and 19 years of age) is fully acknowledged. The decision to stratify the sample was rejected because for youths aged 12–15 years old the prevalence of alcohol use, alcohol problems, and problem behaviors were too low and would have had to be omitted from the current analysis. Similarly, this study found low prevalences of reported problem behaviors and low sample sizes in some cells, for example only four youths reporting no lifetime alcohol use reported past year arrest/law trouble. A larger sample size would allow us to have more confidence in these results and further examine these relationships. However, these low prevalence estimates regarding problem behavior engagement may reflect a slightly lower risk profile for Mexican youths in this school setting. The study is also limited in that the lifetime sexual intercourse analyses had 14.9% missing data while the past year arrest analyses had 6.7% missing data. Further, given the cross-sectional analyses performed, we cannot infer causality, nor did we have the ability to examine the stability of group membership over time or make across-time predictions of problem behaviors by group membership. Future research should examine how alcohol use and problems associated with use change over time and if the association between different levels of alcohol use and problem behaviors remain consistent throughout adolescence and continue into adulthood. Additionally, as with studies of this kind, we relied solely on students' self-report of alcohol use and risk behaviors. However, extant research has supported the validity of adolescent self-report (O'Malley et al., 2000) and the present study incorporated both valid scales and response consistency checks in an effort to eliminate invalid responses.

These limitations are, however, offset by several strengths. This study is unique compared to others investigating adolescent alcohol use in Mexico (Felix-Ortiz et al., 2001; Medina-Mora et al., 1995; Rojas-Guiot et al., 1999) because it incorporated measures of alcohol Abuse and Dependence symptoms. It is also unique compared to studies that adhered precisely to DSM criteria (Medina-Mora et al., 2005; Tapia-Conyer et al., 1990) because it distinguished between levels of high alcohol problem severity, based on the number of symptoms endorsed, rather than distinguishing between Abuse and Dependence. The DSM-V, which is scheduled to be released in 2013, include similar changes, such as the elimination of the Abuse and Dependence distinction and the inclusion of severity specifiers based on the number of symptoms endorsed (American Psychiatric Association). In addition, this study also investigates an association that has not been well studied in this population. Furthermore, this study also provides estimates that are crucial to estimating resources needed for indicated alcohol and drug prevention interventions and treatment. Specifically, while studies suggest that between 2% and 6% of the adult population in Mexico meets criteria for alcohol Dependence (Medina-Mora et al., 2005; Tapia-Conyer et al., 1990), the present study suggests that about 5.0% of Mexican students experience three or more symptoms of alcohol Abuse or Dependence. The present study also suggests that about 15.5% of Mexican students experience one or more symptoms of alcohol Abuse or Dependence.

In conclusion, this study examined alcohol use, alcohol problems, and problem behaviors in Mexican students. This study highlights the need for more alcohol use prevention and treatment programs for Mexican adolescents, especially programs that address engagement in other problem behaviors.

Acknowledgments

The research and preparation of this manuscript were supported by National Institute on Drug Abuse grants DA00254 and DA007292 and National Institute of Mental Health grants MH19545 and MH14592. The authors wish to thank Mary Mitchell for her critical review of the manuscript.

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Table 1

Categories of alcohol use problem severity among 1229 Mexican students.

Alcohol use problem severity	N (%)
No lifetime alcohol use	489 (39.8)
Lifetime alcohol use, none in the past year	221 (18.0)
Past year alcohol use	329 (26.8)
1–2 Abuse or Dependence symptoms	129 (10.5)
3+ Abuse or Dependence symptoms	61 (5.0)

Table 2

Comparisons between five alcohol use problem severity groups and problem behaviors and demographics among 1229 Mexican students. ^e

	Age		Gender		Lifetime Marijuana Use		Lifetime Sexual Intercourse		Past Year Arrest/Law Trouble	
	Female	Male	No	Yes	No	Yes	No	Yes	No	Yes
No lifetime alcohol use	279 (57.1)	210 (42.9) ^a	485 (99.2)	4 (0.8) ^a	414 (97.6)	10 (2.4) ^a	482 (99.2)	4 (0.8) ^a		
Lifetime alcohol use, none in the past year	126 (57.0)	95 (43.0) ^a	217 (98.2)	4 (1.8) ^{ab}	184 (95.8)	8 (4.2) ^a	167 (97.1)	5 (2.9) ^{ab}		
Past year alcohol use	186 (56.5)	143 (43.5) ^a	315 (95.7)	14 (4.3) ^b	252 (87.8)	35 (12.2) ^b	302 (96.5)	11 (3.5) ^b		
1–2 Abuse or Dependence Symptoms	59 (45.7)	70 (54.3) ^b	115 (89.1)	14 (10.9) ^c	76 (83.5)	15 (16.5) ^b	112 (91.1)	11 (8.9) ^c		
3+ Abuse or Dependence Symptoms	9 (14.8)	52 (85.2) ^c	40 (65.6)	21 (34.4) ^d	31 (59.6)	21 (40.4) ^c	34 (64.2)	19 (35.8) ^d		
Total	659 (53.6)	570 (46.4)	1172 (95.4)	57 (4.6)	957 (91.5)	89 (8.5)	1097 (95.6)	50 (4.4)		

^eThis table shows a cross-tabulation of the alcohol use problem severity groups with demographic characteristics and three problem behavior variables. Ns (%) are reported for each variable; for age means (standard deviations) are reported. Chi-square or two-sided Fisher's exact tests (when expected cell frequencies were <5) were used to compare each alcohol group on their percentage of problem behavior or gender endorsement. For age, two-sample t-tests for unpaired data were conducted (assuming equal or unequal variances where appropriate). Categories that share superscripts refer to comparisons that are not statistically different, such as categories one (0.8%^a) and two (1.8%^{ab}) for lifetime marijuana use. Categories with different superscripts refer to statistically significant differences at $p < 0.05$, such as categories one (0.8%^a) and three (4.3%^b) for lifetime marijuana use.

Comparisons between five alcohol use problem severity groups and problem behaviors among Mexican students who reported lifetime problem behavior engagement.

Table 3

	Among Those Reporting Lifetime Marijuana Use				Among Those Reporting Lifetime Sexual Intercourse			
	Frequency of Lifetime Marijuana Use		Age of Sexual Debut		# of Sex Partners		Condom Used During Last Intercourse	
	1 or 2 Times	3+ Times	≤15	16+	1	2+	No	Yes
No lifetime alcohol use	3 (75.0)	1 (25.0)	2 (25.0)	6 (75.0)	6 (85.7)	1 (14.3)	5 (71.4)	2 (28.6)
Lifetime alcohol use, none in the past year	1 (25.0)	3 (75.0)	2 (25.0)	6 (75.0)	2 (28.6)	5 (71.4)	2 (25.0)	6 (75.0)
Past year alcohol use	7 (50.0)	7 (50.0)	16 (51.6)	15 (48.4)	21 (67.7)	10 (32.3)	17 (53.1)	15 (46.9)
1-2 Abuse or Dependence Symptoms	5 (35.7)	9 (64.3)	9 (60.0)	6 (40.0)	10 (66.7)	5 (33.3)	10 (66.7)	5 (33.3)
3+ Abuse or Dependence Symptoms	9 (42.9)	12 (57.1)	11 (55.0)	9 (45.0)	6 (30.0)	14 (70.0)	13 (61.9)	8 (38.1)
Total	25 (43.9)	32 (56.1)	40 (48.8)	42 (51.2)	45 (56.3)	35 (43.7)	47 (56.6)	36 (43.4)