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Alcohol Involvement as a Function of Co-Occurring Alcohol Use Disorders and Major Depressive Episode: Evidence from the National Epidemiologic Survey on Alcohol and Related Conditions

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Abstract

Background—Co-occurring alcohol use disorder and major depression (C-ALDP) is a major public health problem. Yet, the available evidence is mixed regarding the implications of C-ALDP for alcohol involvement. The purpose of this research was to examine the associations between past 12-month co-occurring AUDs (abuse and dependence) and major depressive episode (MDE) and alcohol involvement in a representative community sample.

Design—The National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) is a national household survey of 43,083 adults ages 18 and older. For the NESARC, the target population is the civilian noninstitutionalized population, 18 years of age and older, living in the United States and the District of Columbia.

Methods—All NESARC interviews were conducted with the Alcohol Use Disorder and Associated Disabilities Interview Schedule – DSM IV Version (AUDADIS-IV; Grant et al., 2003).

Results—Prevalence of past 12-month co-occurring AUD (abuse or dependence) and MDE was 1.2%, corresponding to about 2.4 million adults ages 18 and older. Among males with alcohol dependence, comorbid MDE was associated with a greater number of days drinking at home alone. Among females and males with alcohol abuse and dependence, comorbid MDE was associated with higher prevalence of drinking to enhance depressed mood. Comorbid MDE was also associated with lower levels of some drinking behaviors among those with alcohol abuse.

Conclusions—Co-occurring AUDs and MDE are associated with specific dimensions of alcohol involvement, and this association is more consistent for alcohol dependence than abuse.

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Keywords

Comorbidity; Alcohol Use Disorders; Major Depressive Episode; Solitary Drinking; Affect Regulation

1. INTRODUCTION

Do individuals with co-occurring alcohol use disorders (AUDs) and major depression have greater alcohol involvement than those with AUD alone? Some studies using clinical samples showed that the co-occurrence of alcoholism and depression (C-ALDP) is associated with worse alcohol-related outcomes, and this relationship appears to be stronger in males than females (Pettinati et al., 1997). However, “less is known...about patterns and correlates of dual diagnosis in the general population” (Kessler, 2004, p. 730). The purpose of the present study was to examine the prevalence and alcohol-related correlates of a particular form of comorbidity, i.e., the co-occurrence of abuse and dependence (AUD) and major depressive episode (MDE).

Results from several epidemiologic studies indicated substantial co-occurrence of psychiatric and substance use disorders (SUD) (Epstein et al., 2004; Grant et al., 2004; Kandel et al., 2001; Kessler et al., 1997; Merikangas et al., 1998; Regier et al., 1990). For example, results from the 1990–1992 National Comorbidity Study (NCS) showed that 50.9% of participants with a lifetime DSM-III-R diagnosis of at least one psychiatric disorder also had a lifetime diagnosis of at least one SUD; similarly, 51.4% of participants with a lifetime SUD also had a lifetime diagnosis of at least one psychiatric disorder (Kessler et al., 1996). Among the numerous forms of comorbid mental health and substance use disorders, the co-occurrence of alcohol use disorders and depression has received considerable attention (Li et al., 2004). Below we review previous research on the prevalence of AUD and MDE, along with evidence suggesting that the co-occurrence of AUD and MDE may be more pernicious than either disorder alone.

1. AUDs and depression are among the most prevalent psychiatric disorders (Grant et al., 2004)

Recent epidemiologic studies indicated that the past 12-month prevalence rate of any AUD (including alcohol abuse and dependence) is about 8.5% of adults ages 18 and over (Grant et al., 2004), and the past 12-month prevalence rate of MDE is about 7.2% of adults ages 18 and over (Grant et al., 2004). Epidemiologic studies consistently show that AUDs are more prevalent among males than females (Zucker, 2006), although this gender difference appears to be decreasing (Grant et al., 2004; Nolen-Hoeksema, 2004). By contrast, depressive disorders are about two times more prevalent among females than males (Nolen-Hoeksema, 2001). Although gender differences in C-ALDP are not as well documented, evidence suggests that rates may be higher among females than males (Blazer et al., 1994; Davis et al., 2005).

2. AUDs and depression have relatively high rates of co-occurrence

AUDs and depression co-occur at levels greater than expected by chance in clinical and epidemiological samples (Sullivan et al., 2005; Swendsen and Merikangas, 2000). Evidence from the 2001–02 NESARC showed that 13.7% of those with a past year AUD also had a past year MDE, compared to a 7.2% base rate of past year MDE (Grant et al., 2004). In addition, 16.4% of those with a past year MDE had a past year AUD, compared to an 8.5% base rate of past year AUD (Grant and Harford, 1995). Using the same data set but assessing

MDD instead of MDE, Hasin et al. (2005), found that 40.3% of those with a lifetime MDD also had a lifetime AUD.

3. AUDs, depression, and their co-occurrence impose a tremendous burden on individuals, families, and communities

As separate disorders, AUDs and depression exact a tremendous toll world-wide. The Global Burden of Disease 2000 Study conducted by the World Health Organization (WHO, 2001) found that AUDs and depression are among the leading causes of disability in the world, as measured by disability-adjusted life years (DALYs) and years of life lived with disability (YLDs) (Room et al., 2005; Ustun et al., 2004). Among those with an AUD, comorbid depression is associated with an earlier onset of alcohol dependence, higher rates of lifetime drug dependence (Schuckit et al., 1997); worse outcomes among those entering treatment for alcohol and drug problems (Hasin et al., 2002); higher relapse following AUD treatment among adolescents (Cornelius et al., 2004) and adults (Greenfield et al., 1998); greater severity of suicidality in adult psychiatric patients (Cornelius et al., 1995); and higher likelihood of suicide attempts (Conner et al., 2007; Preuss et al., 2002) and completed suicides (Conner and Duberstein, 2004).

The purpose of this research was to examine the associations between past 12-month co-occurring AUDs and major depressive episode (MDE) and alcohol involvement in a representative community sample. Conner et al. (2009, p. 128), observed that, despite good evidence linking C-ALDP with numerous adverse outcomes, data on the implications of C-ALDP for drinking outcomes are not as definitive. Affect regulation models highlight the reduction of negative affect as a motivation for alcohol and other drug use (Baker et al., 2004; Kassel et al., 2003). Accordingly, we hypothesized that C-ALDP would be associated with higher levels of alcohol involvement and drinking to enhance mood compared to AUDs and MDE alone. In addition, previous research showed that C-ALDP may have a greater impact on males than females (Kranzler et al., 1996). Based on this work, we also hypothesized that the effects of C-ALDP on alcohol involvement would be stronger among males than females.

2. Methods

We conducted secondary data analyses of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC; Grant et al., 2003), a national household survey sponsored, designed and conducted by the National Institute on Alcohol Abuse and Alcoholism (NIAAA). The NESARC is the largest and most comprehensive study of alcohol use disorders and co-occurring psychiatric disorders that has ever been conducted in the United States.

Sample Design—For the NESARC, the target population is the civilian noninstitutionalized population, 18 years of age and older, living in the United States and the District of Columbia. The target population included persons living in households and in certain noninstitutionalized group quarters (i.e., boarding and rooming houses, nontransient hotels and motels, shelters, facilities for housing workers, college quarters, and group homes). After the sample was weighted, the NESARC data were adjusted based on the 2000 Decennial Census so that they were representative of the civilian noninstitutionalized U.S. population for region, sex, age race, and ethnicity (Grant et al., 2003; Grant et al., 2004).

Response Rates and Sample Characteristics—For Wave 1 (W1) of the NESARC, face-to-face interviews were conducted with 43,093 participants using computer assisted personal interviewing (CAPI). At W1, the NESARC achieved a sampling frame response

rate of 99%, a household response rate of 89%, and a person response rate of 93%, for an overall response rate of 81% (Grant et al., 2004). Based on weighted data, the final sample was 52.1% female; with respect to age, 21.8% of the participants were 18–20 years old, 30.9% were 30–44 years old, 31.1% were 45–64 years old, and 16.2% were 65 years or older; with respect to race/ethnicity, 70.9% of the participants were White, 11.1% were Black, 11.6% were Hispanic, 4.4% were Asian or Pacific Islander; and 2.1% were Native American (Grant et al., 2004).

2.1. Measures

Demographic and background variables assessed in the NESARC included sex, age, race/ethnicity, marital status, highest year of school completed, and total household income in the past 1 year.

AUDADIS-IV—All NESARC interviews were conducted with the National Institute on Alcohol Abuse and Alcoholism Alcohol Use Disorder and Associated Disabilities Interview Schedule – DSM IV Version (AUDADIS-IV) (Grant et al., 2003). The AUDADIS-IV is a structured diagnostic interview with modules that assess DSM-IV alcohol use disorders, mood and anxiety disorders, drug and nicotine use disorders, personality and conduct disorders, pathological gambling, and family history of alcoholism, and major depression. Numerous psychometric studies have documented the reliability and validity of the AUDADIS-IV (Grant et al., 2003).

Past 12 Month DSM-IV Alcohol Use Disorder (AUD)—Consistent with DSM-IV criteria (American Psychiatric Association, 1994), a diagnosis of *past 12 month DSM-IV alcohol abuse* required participants to meet at least one of four criteria for alcohol abuse in the year preceding the interview, without meeting criteria for alcohol dependence. The past year prevalence of DSM-IV alcohol abuse in W1 of the NESARC was 4.6% (Grant et al., 2004). A diagnosis of *past 12 month DSM-IV alcohol dependence* required participants to meet at least three of seven alcohol dependence criteria in the year preceding the interview. The past year prevalence of DSM-IV alcohol dependence in W1 of the NESARC was 3.8% (Grant et al., 2004).

Past 12 Month DSM-IV Major Depressive Episode (MDE)—Consistent with DSM-IV criteria (American Psychiatric Association, 1994), a diagnosis of past 12 month major depressive episode (MDE) required participants to meet at least five of nine criteria for at least 2 weeks (at least one of which must be depressed mood or anhedonia). Following Grant et al. (2004), we used DSM-IV diagnosis of primary MDE, which excludes substance-induced MDE and MDE due to medical conditions or bereavement. The past 12-month prevalence of MDE was 7.2% (Grant et al., 2004).

Past 12 Month Co-Occurrence of AUD and MDE (C-ALDP) was constructed from the past year AUD and MDE variables. This categorical variable was coded 1=No past year AUD/No past year MDE; 2=Yes past year MDE/No past year AUD; 3=No past year MDE/Yes past year alcohol abuse (AB); 4=Yes past year MDE/Yes past year AB; 5=No past year MDE/Yes past year alcohol dependence (AD); and 6=Yes past year MDE/Yes past year AD.

Past 12-Month Alcohol Involvement—Eight items assessed the frequency of various forms of alcohol involvement in the past 12 months, including 1) number of drinking days, 2) number of days drank enough to feel intoxicated or drunk, 3) number of days drank at home alone, 4) number of days drank before 3pm on any day of the week, 5) number of days drank at two or more separate times during the same day, 6) number of days drove a car or other motor vehicle after having 3 or more drinks, 7) number of days drank after midnight

on any day of the week, and 8) number of days drank in public places. Two items assessed quantity of alcohol consumption in the past 12 months: 1) usual number of drinks per drinking day, and 2) largest number of drinks in a single day. One variable assessed average daily volume of ethanol intake, and one item assessed the use of alcohol to enhance mood.

3. Results

3.1. Analysis Plan

In order to examine the main and interactive effects of past 12-month C-ALDP and sex on alcohol involvement, we used the framework outlined in Jaccard (1998; Jaccard and Guilamo-Ramos, 2002). Past 12-month C-ALDP was designated as the *focal independent variable* and sex was designated as the *first-order moderator variable*. We conducted a series of weighted design-based multiple linear and multiple logistic regression analyses to assess the effects of past 12-month C-ALDP and sex on continuous and binary alcohol-related outcomes, respectively. For alcohol-related response variables that took the form of counts, we estimated a series of weighted design-based generalized linear models with a log link and a Poisson sampling model (Long, 1997). The REGRESS, LOGISTIC, and LOGLINK procedures in SUDAAN were used to estimate conditional marginal means for C-ALDP and sex (controlling for covariates). Main effects, simple main effects, and interaction contrasts were tested with single degree-of-freedom contrasts (Jaccard, 1998). As described by Jaccard and Turrisi (2003), simple main effects analyses examine the association between a focal independent variable and a dependent variable at a given level of a moderator variable. Interaction contrasts compare the effects of a focal independent variable on the dependent variable at different levels of the moderator variable. All analyses statistically controlled for age, race/ethnicity, past 12-months personal income, level of education, marital status, urbanicity, geographic region, past 12-months anxiety disorder (Schuckit et al., 1997); past 12-months tobacco dependence (Daeppen et al., 2000); past 12-months drug use disorder (Regier et al., 1990); and any lifetime personality disorder (Hasin et al., 2007).

Because the NESARC used a complex sample design, estimation procedures that assume simple random sampling cannot be used (West, 2008). Accordingly, all parameters, 95% confidence intervals (CIs) and standard errors were estimated using SUDAAN v. 10.0 (Research Triangle Institute, 2008), a statistical software program that uses Taylor series linearization to adjust for complex survey sample design effects. A modified Bonferroni correction (Holland and Copenhagen, 1987) to maintain the alpha at .05 was applied to the following families: 1) main effects, 2) simple main effects, and 3) interaction contrasts (Jaccard, 1998).

3.2. Prevalence and Demographic Correlates of Past 12-Month C-ALDP

The prevalence of past 12-month comorbid alcohol abuse and MDE was 0.4%, and the prevalence of past 12-month comorbid alcohol dependence and MDE was 0.8%. The overall prevalence of past 12-month C-ALDP was 1.2%, representing approximately 2.4 million adults ages 18 and over. Bivariate associations between demographic variables and C-ALDP showed that the prevalence of C-ALDP was virtually identical for females and males. C-ALDP was more prevalent among the 18–29 age group and decreased with age. Race/ethnicity was also significantly associated with C-ALDP, with a pattern of results indicating that prevalence of C-ALDP, and AUD with no MDE, were highest among American Indians and b) lowest among Asians.

3.3. Past 12-Month Alcohol Involvement as a Function of AUD-MDE

Estimated marginal means for each dependent variable by C-ALDP and sex are presented in Table 1. Results for the eight measures of drinking frequency indicated main effects of sex and C-ALDP. Males showed significantly higher frequency of all forms of alcohol involvement compared to females. Simple main effects contrasts showed that, among males with alcohol dependence, MDE was associated with higher frequency of drinking across all eight measures. However, this contrast was statistically significant for only one measure: males in the Yes MDE/Yes AD group reporting significantly more days drinking at home alone in the past 12 months than males in the No MDE/Yes AD group, $c = 33.2, p < .01$ (see Figure 1). In line with these results, simple main effects analyses showed that the odds of drinking to enhance mood (DEM) were higher for a) the Yes MDE/Yes AB group compared to the No MDE/Yes AB group, and b) the Yes MDE/Yes AD group compared to the No MDE/Yes AD group. As seen in Table 1, the effects of C-ALDP did not differ by sex. None of the interaction contrasts were statistically significant.

Contrary to predictions, results from simple main effects analyses of the contrast between the Yes MDE/Yes AB group and the Yes MDE/Yes AB group showed that, among females with alcohol abuse, MDE was associated with significantly lower frequency of drinking at home alone. In addition, results from simple main effects analyses also showed that, among males with alcohol abuse, MDE was associated with significantly lower quantity of drinking (i.e., average drinks per drinking day and average daily volume of ethanol intake). None of the interaction contrasts were statistically significant.

4. Discussion

The purpose of this research was to examine levels of past 12-month alcohol involvement as a function of C-ALDP in a representative community sample. Compared to each individual disorder, past 12-month C-ALDP had a relatively low prevalence. However, at the national level the prevalence of co-occurring AUDs and MDE (1.1%) translates into approximately 2.4 million adults ages 18 and older. Results from the NSDUH showed a similar but slightly higher prevalence rate of past year major depressive episode (MDE) and AUD (1.2%, approximately 2.7 million adults ages 18 and over) (OAS, 2007). The slightly higher rate obtained by the NSDUH is likely due to the fact that, unlike NESARC, the NSDUH did not exclude participants with MDE caused by medical illness, bereavement, or substance use disorder.

4.1. Alcohol Dependence and MDE

We originally hypothesized that C-ALDP would be associated with higher levels of alcohol involvement compared to AUD and MDE alone, and that these associations would be stronger among males than females. This hypothesis received only partial support. Specifically, we found that 1) among males with past 12-month alcohol dependence, MDE was associated with a greater number of drinking days at home alone; and 2) among females and males with past 12-month alcohol abuse and dependence, MDE was associated with higher odds of drinking to enhance mood. Some previous research has documented higher levels of alcohol involvement among those with C-ALDP compared to those with AUD alone (Hanna and Grant, 1997), and some evidence showed that the effects of C-ALDP are stronger for males than females (Pettinati et al., 1997). However, to our knowledge this is the first study to show more frequent solitary drinking days and higher odds of drinking to enhance mood among those with comorbid AUDs and MDE.

Other studies found no differences in alcohol involvement between those with AUDs alone and those with C-ALDP (Davidson and Blackburn, 1998; Schuckit, 1985). Also, previous

research found that C-ALDP is associated with some but not other drinking measures. For example, Rounsaville et al. (1987) followed a sample of 266 hospitalized participants with AUDs one year after discharge and found no significant differences between males with and without MDD on number of drinking days. Our findings concur with those from other studies showing that C-ALDP is differentially associated with drinking outcomes. Results also suggest that if in fact those with C-ALDP consume alcohol to reduce or regulate negative affect, this may translate into a pattern of solitary, sustained heavy drinking.

Results are also consistent with previous research on solitary drinking. For example, Christiansen et al. (2002), found that college students who reported at least one heavy-drinking episode in the past 3 months and at least one lifetime episode of drinking alone had higher levels of depressive symptoms compared to heavy drinkers who never drank alone and non-heavy drinkers. Participants who reported drinking alone also showed higher levels of alcohol involvement, more alcohol-related problems, higher levels of alcohol expectancies, and lower levels of readiness to change their drinking. Gonzalez et al. (2009), studied a sample of college students with a history of at least passive suicidal ideation. They also found that solitary heavy drinkers reported higher levels of alcohol involvement and alcohol-related problems. Further, suicidal ideation (but not depressive symptoms) predicted a higher number of solitary drinking episodes. In an interesting longitudinal study, Tucker et al. (2006), found that solitary drinking in Grade 8 was concurrently associated with several negative academic and social outcomes. Also, solitary drinking in Grade 8 was associated with a) higher odds of alcohol and drug problems and b) lower odds of graduating college 9 years later at age 23 (Bourgault and Demers, 1997). To our knowledge, ours is the first study to show higher levels of solitary drinking as a function of comorbid alcohol dependence and MDE among males. Although this pattern also fits with a negative affect regulation model of alcohol involvement, results from previous work suggest a more complex model. For example, Mohr et al. (2001), used a daily process design and found that participants consumed more alcohol alone on days with more negative social interactions. Using the same sample, Armeli et al. (2003), examined the within-day associations between morning mood, daily negative events, daily alcohol use, and evening mood. They found that, consistent with a stress-response dampening hypothesis, the negative effects of daily stress on some evening moods became weaker as a function of daily drinking. However, the buffering effects of daily drinking were largely limited to drinking with others. For nervous mood, Armeli et al. found that the effect of daily stress on evening nervousness actually *increased* in magnitude as a function of daily drinking, but only in the case of drinking alone. Drawing on the Attention-Allocation Model (AAM) (Steele and Josephs, 1988; Steele et al., 1986), Armeli et al., suggested that drinking alone (i.e., without the distraction of social interaction) worsens the effects of daily stress. Paradoxically, although solitary drinking is associated with drinking to regulate negative affect (Cooper, 1994), it may intensify the effects of external stressors. One reason may be that solitary drinking allows for rumination about external stressors, and rumination has been shown to exacerbate both depression and alcohol use (Nolen-Hoeksema et al., 2007).

4.2. Alcohol Abuse and MDE

Contrary to predictions, we did not observe greater alcohol involvement among those with alcohol abuse and MDE. In fact, among females with alcohol abuse, MDE was associated with lower frequency of drinking at home alone; among males with alcohol abuse, MDE was associated with lower quantity of daily consumption. Some previous work has documented inverse associations between depressive symptoms and alcohol involvement (Schutte et al., 1995; Windle and Miller, 1990). Males may be more likely to withdraw socially when depressed, which might result in lower consumption (Schutte et al., 1995). However, it is not clear why this pattern was not observed for alcohol dependence. Other

results from the NESARC (Grant et al., 2007) and from the NLAES (Hasin and Paykin, 1999) have raised questions about the construct validity of the DSM-IV diagnosis of alcohol abuse. Thus, the current results showing reduced alcohol involvement among those with abuse and MDE should be viewed with caution.

4.3. Limitations

This study had several limitations. DSM-IV diagnoses were based on information from structured interviews conducted by lay interviewers, rather than clinical assessment (Schuckit, 2006). Also, the current study was based on cross-sectional data, and we are not able to discern the temporal order of the associations between C-ALDP and alcohol involvement. Thus, we cannot, for example, rule out the possibility that drinking alone predicted comorbid alcohol dependence and MDE (Helzer et al., 2006). However, as noted earlier, the NESARC included DSM-IV diagnosis of primary MDE excluding substance-induced MDE and MDE due to medical conditions or bereavement, making it less likely that MDE was induced by the more frequent solitary drinking that we observed (Hasin and Grant, 2002; Schuckit, 2006).

Another limitation is that even using a past 12-month time frame, we cannot state that AUD and MDE were occurring at the same time. It is possible, for example, that some percentage of cases may have experienced past 12-month AUD and MDE that were separated by several months (e.g., an episode of AUD lasting 2 months, followed by an 8 month period of no AUD or MDE, followed by an episode of MDE lasting 2 months). Use of a shorter time frame (e.g., past 30 days) would better address this question (Blazer et al., 1994; Regier et al., 1988).

Hasin et al. (2007), showed that the association between past 12-month alcohol dependence and MDD became nonsignificant when sociodemographic and other psychiatric disorders were controlled. We found this same pattern when examining the associations between past 12-month alcohol dependence and MDE, supporting Hasin et al.'s assertion that the relationship between alcohol dependence and depression is due to factors common to both disorders. Although we have focused on C-ALDP, it is clear that other psychiatric disorders have a strong influence on the associations between AUDs and depression.

On a related note, we reported on associations between C-ALDP and alcohol involvement after statistically controlling for several demographic and clinical variables. The inclusion of additional predictors can potentially reduce statistical power (Cohen et al., 2003). Accordingly, we tested all models with and without the inclusion of the demographic and clinical covariates. There were no substantive differences between the two sets of results. Finally, some of the nonsignificant effects we observed deserve comment. Among males with alcohol dependence, MDE was associated with more days of drink driving and drinking twice in the same day. Although nonsignificant, these findings highlight the public health implications of comorbid alcohol dependence and MDE.

4.4. Summary and Conclusions

Using a nationally representative sample, we found that 1) among females and males with past 12-month alcohol abuse and dependence, MDE was associated with higher odds of drinking to enhance mood; and 2) among males with past 12-month alcohol dependence, MDE was associated with a greater number of drinking days at home alone. These results may help us understand why previous research on C-ALDP and alcohol involvement has yielded mixed findings, i.e., C-ALDP appears to be related to a specific pattern of alcohol involvement that differs by sex. Findings also indicated that C-ALDP is associated with solitary drinking, identified in previous research as a correlate of several adverse outcomes.

Results suggest that therapeutic efforts aimed at C-ALDP might benefit by focusing on reasons for drinking and reductions in solitary drinking.

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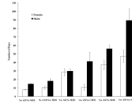


Figure 1.
Number of Days Drank At Home Alone by Past 12 Month Alcohol Use Disorders, Major Depressive Episode, and their Co-Occurrence

Alcohol Involvement as a Function of Co-Occurring Past Year Alcohol Use Disorder and Major Depressive Episode and Sex

Table 1

	1. No. of drinking days in past year		2. No. of days intoxicated/past year		3. No. of days drank home alone/past year		4. No. of days drank 2+ times in same day	
	Females	Males	Females	Males	Females	Males	Females	Males
No AUD/No MDE	54.4	81.8	4.1	6.8	7.9	14.7	1.7	4.1
No AUD/Yes MDE	46.7	72.1	4.0	6.3	10.4	18.2	1.9	3.1
Yes Abuse/No MDE	121.4	147.9	11.0	15.2	28.4	29.7	5.9	9.7
Yes Abuse/Yes MDE	101.0	123.5	7.1	21.4	10.7	41.1	3.6	13.7
Yes Dependence/No MDE	169.6	207.3	28.6	44.6	37.3	56.1	12.7	23.5
Yes Dependence/Yes MDE	159.9	215.7	24.0	51.5	47.4	89.3	15.8	41.8

	5. No. of days drank before 3pm		6. No. of days drank after midnight		7. No. of days drink driving		8. No. of days drank in public places	
	Females	Males	Females	Males	Females	Males	Females	Males
No AUD/No MDE	3.1	7.1	4.2	6.5	1.7	3.1	11.0	14.3
No AUD/Yes MDE	3.6	8.1	6.3	4.5	1.9	2.7	11.7	13.1
Yes Abuse/No MDE	9.9	20.7	10.8	19.8	10.2	21.3	30.9	38.4
Yes Abuse/Yes MDE	8.1	15.3	11.1	15.7	4.5	13.9	24.0	32.9
Yes Dependence/No MDE	20.0	37.3	24.3	31.2	19.8	29.4	43.1	50.1
Yes Dependence/Yes MDE	20.0	48.2	20.7	32.2	12.8	42.5	31.4	50.5

	9. Avg. drinks per day/past year		10. Max drinks in 1 day/past year		11. Avg. daily volume consumed		12. Drank to enhance mood	
	Females	Males	Females	Males	Females	Males	Females	Males
No AUD/No MDE	1.8	2.5	2.7	4.4	0.2	0.5	0.01	0.02
No AUD/Yes MDE	1.8	2.4	2.7	4.1	0.2	0.4	0.04	0.07
Yes Abuse/No MDE	3.0	4.1	5.2	8.4	0.7	1.1	0.07	0.06
Yes Abuse/Yes MDE	2.7	3.3	4.8	8.0	0.6	0.8	0.17	0.26
Yes Dependence/No MDE	3.9	5.2	7.3	11.4	1.3	2.0	0.31	0.33
Yes Dependence/Yes MDE	3.5	5.0	6.5	11.6	1.2	2.0	0.55	0.52

Note. For all count variables, cell means are conditional marginal means estimated from weighted design-based multiple Poisson regression analysis. For “avg. daily volume consumed,” cell means are conditional marginal means estimated from weighted design-based multiple linear regression analysis. For “drank to enhance mood,” cell means are conditional prevalence estimates from weighted design-

based multiple logistic regression analysis. Adjacent cells within the same column that are shaded with bold text indicate that the means for “No MDE” and “Yes MDE” groups were statistically significantly different based on simple main effects contrasts. All analyses controlled for current age, race/ethnicity, education level, personal income, marital status, urbanicity, geographic region, and other psychiatric disorders (any drug use disorder, any nicotine dependence, any anxiety disorder, and any personality disorder). AUD=Past 12 months DSM-IV Alcohol Use Disorder (abuse and/or dependence). MDE=Past 12 months DSM-IV Major Depressive Episode.