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# Alcohol criteria endorsement and psychiatric and drug use disorders among DUI offenders: Greater severity among women and multiple offenders

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## Abstract

**Purpose—**Data from the Collaborative Study on the Genetics of Alcoholism (COGA), a high-risk family study of alcohol dependence, were used to examine differences in alcohol diagnostic criteria endorsement and psychiatric and drug use disorders by gender and by number of DUI offenses.

**Results—**Individuals with two or more DUIs exhibited greater severity of alcohol dependence than those with none or one DUI. This severity was characterized in three ways: (1) higher endorsement of alcohol diagnostic criterion items, with evidence of greater severity among women, (2) higher prevalence of co-occurring lifetime psychiatric disorders, and (3) higher rates of drug use and of dependence on cocaine, stimulants, and, for women only, marijuana and opiates.

**Conclusions—**By examining gradations of disorder within a combination of two high-risk indicators, DUI and family vulnerability, this study provides useful information for clinical research about individuals with chronic and severe alcohol problems. In addition, the observed gender differences in this high-risk sample will contribute to the literature on alcohol dependence among women at the more severe end of the dependence spectrum.

### Keywords

Driving under the influence; Alcoholism; Drug dependency; Mental disorders

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## 1. Introduction

Women represent an increasing proportion of individuals arrested for driving under the influence of alcohol (DUI). In the ten years from 1997 to 2006, arrests of men for DUI decreased 6% nationally, while arrests of women increased 29%; for women under age 18 arrests increased by 39% (Federal Bureau of Investigation, 2006). This trend, combined with evidence that the gender gap in alcohol dependence is closing (Grucza, Bucholz, Rice, & Bierut, 2008; Holdcraft & Iacono, 2002; Keyes, Grant, & Hasin, 2008), demonstrates the increasing risk for alcohol dependence and alcohol-related behaviors among women and highlights the need for research on women's alcohol problems (Smith & Weisner, 2000). Careful examination of gender differences in DUI samples can suggest areas for improved treatment for women with DUIs or, more broadly, for women with severe alcohol dependence.

During the last decade, several studies have documented the prevalence of alcohol, drug, and psychiatric disorders among women and men with DUIs and have found that DUI offenders more closely resemble a clinical than a population-based sample (Lapham et al., 2001). Female and male DUI offenders from court-referred screening (Lapham et al., 2001) and treatment programs (Laplante, Nelson, Odegaard, Labrie, & Shaffer, 2008; Lapham, C'de Baca, McMillan, & Lapidus, 2006) have high rates of alcohol and drug use disorders. In a sample of first-time DUI offenders, 85% of women and 91% of men met lifetime criteria for alcohol abuse or dependence five years after participation in a screening program for alcohol problems (Lapham et al., 2001), and co-occurring drug and psychiatric disorders were common. Of those with an alcohol use disorder, 37% of women and 42% of men also met lifetime criteria for drug abuse or dependence, and 50% of women and 33% of men met criteria for a non-substance psychiatric disorder (Lapham et al., 2001).

Women are less likely than men to be repeat DUI offenders (C'de Baca, et al., 2001; Lapham, Skipper, Hunt, & Chang, 2000; Lapham, Skipper, & Simpson, 1997; Wells-Parker, Pang, Anderson, McMillen, & Miller, 1991), making it difficult to obtain samples with sufficient numbers of women to examine gender differences in recidivists. One of the first studies to do so selected consecutive female referrals to a screening program for first-time DUI offenders, frequency matched males to females by date of referral to obtain similar numbers of male and female offenders, and examined predictors of re-arrest within 5 years, including drug use, alcohol problems in a parent or spouse, physical or sexual abuse, treatment referral and completion, and scores on an alcohol screen (Lapham, Skipper, Hunt, & Chang, 2000). The only gender-specific predictor of re-arrest within five years was age; men, but not women, who were younger at the initial screening were more likely to re-offend (Lapham et al., 2000). Similarly, while there is sharp evidence for differences in the course of alcohol abuse and dependence in community samples (Dawson, Grant, & Ruan, 2005; Edens, Glowinski, Grazier, & Bucholz, 2008; Harford, Grant, Yi, & Chen, 2005), studies using treatment or high-risk samples do not find many such differences (Schuckit, Anthenelli, Bucholz, Hesselbrock, & Tipp, 1995; Schuckit, Daeppen, Tipp, Hesselbrock, & Bucholz, 1998). These two sets of findings suggest that, once a severity threshold for alcohol use disorder is reached, gender plays an insubstantial role.

More recent studies, however, have found evidence of greater severity of alcohol dependence and psychiatric comorbidity among female than male repeat DUI offenders. While female first-time offenders have lower rates of alcohol dependence than males (Lapham et al., 2001), higher rates of dependence have been found among female than male recidivists (Lapham et al., 2006; Laplante et al., 2008). In a treatment program to reduce DUI recidivism, more women (72%) than men (50%) met lifetime criteria for alcohol dependence and non-substance psychiatric disorders (80% versus 65%), both significant gender differences (Lapham et al., 2006). In addition, 69% of women and 71% of men had abused or been dependent on at least

one illicit drug (Lapham et al., 2006). A recent study of repeat DUI offenders who selected a treatment program in lieu of incarceration found a greater prevalence of alcohol dependence and non-substance psychiatric lifetime comorbidity among women than men (Laplante et al., 2008). The high rates of disorder among individuals with histories of one or more DUIs suggest that samples selected for histories of DUI are well suited to provide information on alcohol use disorders at the severe end of the alcohol use spectrum. Further, evidence for greater severity among women than men in this population suggests that women who commit DUIs may be particularly severely affected.

Arrests for DUI are a rare occurrence. Only 1% of the driving public reports being arrested for DUI, and more than twice as many males as females are arrested (National Highway Traffic Safety Administration, 2003). Recruiting participants from court-referred DUI treatment settings is thus an efficient method of obtaining sufficient sample sizes for study. However, women are under-represented in DUI samples due to their lower arrest rates relative to men (National Highway Traffic Safety Administration, 2003; Federal Bureau of Investigation, 2006), and fewer women than men are referred by the courts to treatment after a first DUI arrest (Lapham et al., 2000). Furthermore, under-reporting of alcohol symptoms is common in such settings due to concerns about legal complications (Lapham et al., 2004). Individuals with histories of DUI who were not recruited from mandated screening or treatment might be more likely provide accurate symptom estimates than court-referred samples. A population-based sample large enough to capture a sufficient number of DUI offenders for analysis would provide the least biased estimates. The National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) is one large study that has good data on alcohol and drug use and psychiatric disorders. Surprisingly, although it contains questions about drinking and driving (Chou et al., 2006), it does not include an item about DUI arrest. An alternate sampling strategy is to use data from samples at high risk for alcohol dependence, which would likely have elevated rates of DUI relative to population-based samples, but which are not recruited from mandated treatment settings. The Collaborative Study on the Genetics of Alcoholism (COGA) is one such high-risk study. We used COGA data, in which 29% of men and 8% of women reported at least one DUI arrest, to examine gender differences in alcohol criteria endorsement, lifetime prevalence of non-substance psychiatric disorders, and illicit drug use and dependence for individuals who reported none, one, two, or three or more DUIs. We anticipated that examining gradations of disorder within a combination of two high-risk indicators, DUI and family vulnerability, might provide useful information for clinical research about individuals with chronic and severe alcohol problems. In addition, any gender differences found in this high-risk sample were expected to contribute to the literature on alcohol dependence among women at the more severe end of the alcohol dependence spectrum.

## 2. Methods

### 2.1. Study and sample

The Collaborative Study on the Genetics of Alcoholism (COGA) is a family study of alcohol dependence which includes 6 subject recruitment centers across the United States (Farmington, CT; Brooklyn, NY; Indianapolis; IN, St. Louis, MO; Iowa City, IA; and San Diego, CA). Probands were recruited from treatment settings and were required to meet criteria for DSM-III-R (American Psychiatric Association, 1987) alcohol dependence and Feighner definite alcoholism (Feighner et al., 1972). Probands were also required to have at least two first-degree relatives living in one of the COGA catchment areas who were available for the study. All first-degree relatives of probands were sought for interview during the initial phase of the study. Siblings of probands are the focus of the current study. The institutional review board at each site approved the protocol, and written informed consent was obtained from all subjects.

Additional details about the study have been published elsewhere (Bucholz et al., 1996; Culverhouse et al., 2005; Nurnberger et al., 2004; Reich, 1996; Schuckit et al., 1998).

The sample used in this analysis comprised 1289 male and 1425 female siblings of probands who participated in the COGA protocol during the first or second phase of data collection, which occurred approximately 5 years apart. The mean age (SD) at the first interview was 36.0 (9.1) and at the second interview was 41.3 (8.8). Fifty-one percent of the sample participated in both phases, 41% in Phase 1 only, and 8% in Phase 2 only. Individuals were coded as positive for an alcohol-related behavior, including DUI arrest, if they reported it in either the Phase 1 or Phase 2 interview, and for a psychiatric or drug use disorder if they met criteria at either interview. Individuals who participated in Phase 2 endorsed more alcohol criteria than those who participated in Phase 1 only. Our analysis was adjusted for this difference in severity as described below in statistical methods.

## 2.2. Assessment

All subjects participated in an interview developed specifically for COGA, the Semi-Structured Assessment for the Genetics of Alcoholism (SSAGA; Bucholz et al., 1994; Bucholz et al., 1995; Hesselbrock, Easton, Bucholz, Schuckit, & Hesselbrock, 1999). The SSAGA is a comprehensive psychiatric interview that was designed to accommodate several diagnostic systems, including DSM-III-R (American Psychiatric Association, 1987), DSM-IV (American Psychiatric Association, 1994), ICD-10 (World Health Organization, 1993), and Feighner alcohol diagnostic criteria (Feighner et al., 1972). It includes assessments for alcohol and drug use and dependence, major depression, panic disorder, posttraumatic stress disorder, conduct disorder, and antisocial personality disorder. Because DSM-IV criteria were not yet published at the time of the first stage of data collection, and because we combined data from phases 1 and 2 for this analysis, we based our dichotomous alcohol dependence, psychiatric disorder, and drug dependence variables on DSM-III-R criteria. For alcohol diagnostic criteria (Table 2), we utilized DSM-III-R and Feighner criteria. All demographic data were based on the most recent interview, with 59% of participants having data from Stage 2 and 41% having data from Stage 1 only.

The DUI variable was based on the question “Have you ever been arrested for drunk driving?” which was asked during the alcohol section of the interview. Respondents also reported their age at first DUI arrest and the number of times they had been arrested for DUI. More men than women reported one (M: 14%, F: 5%), two (M: 6%, F: 2%), and three or more DUIs (M: 8%, F: 1%). Of the 1248 individuals for whom we had DUI information from both stages, 92% were consistent in their DUI reports, 6% reported a first DUI between stages, and 2% reported a DUI at Stage 1 but not at Stage 2 (kappa=.82, 95% CI=.78–.85). Because this was a cross-sectional analysis based on lifetime reports, we did not correct for the 2% who were inconsistent in their reports.

## 2.3. Statistical methods

Our dependent variable was a 4-level variable comprising individuals reporting none, one (1), two (2), and three or more (3+) DUIs. We chose this categorization based on the higher observed rates of alcohol dependence, drug use and psychiatric disorders among repeat offenders (Lapham et al., 2006) than first-time offenders (Lapham et al., 2001). Associations of demographic, alcohol, drug, and psychiatric variables with DUI status were tested using multinomial logistic regression, with the no DUI category as the reference group. All regressions included control variables for gender (since women [7.9%] were less likely than men [28.8%, $p<.01$] to report DUIs) and for stage participation, since individuals who participated in Stage 2 endorsed a greater number of alcohol dependence criteria items than individuals who participated only in Stage 1 (M[sd]=6.9 [6.9] vs. 4.6 [5.6], $p<.01$). When cell

sizes for the 2 and 3+ DUI categories were too small to permit analysis the categories were combined to form a 2+ DUI category. Interactions of gender with each variable were tested. When there was a trend for a gender interaction ($p \leq .10$), results were reparameterized using an equivalent model (i.e., same number of parameters) and were reported separately by gender to enable direct comparison of risk ratios for males and females. Differences between the 1, 2, and 3+ DUI groups were determined using post-hoc Wald tests, the results of which are reported in tables. We used a *p*-value of .05 for all tests of significance except for interaction terms, as noted above. All regressions were corrected for familial clustering using the Huber–White robust variance estimator in the Stata statistical program (Stata Corporation, 2004).

## 3. Results

### 3.1. DUI, demographic, and alcohol use characteristics

Demographic and alcohol use characteristics of the sample are presented in Table 1 for individuals with none, 1, 2, and 3+ DUIs. The majority of individuals with no DUIs were women, and increasingly small proportions of the 1 (29%), 2 (23%), and 3+ DUI categories (12%) were female. Individuals with 3+ DUIs, compared to those with 1 or 2, had less education and a lower family income. Individuals with 2 or 3+ DUIs, compared to those with 1 only, were more likely to have obtained a general equivalency diploma (GED) and less likely to be currently employed.

Rates of lifetime alcohol dependence were higher and age at regular drinking and at onset of alcohol dependence was lower in each successive DUI category. Men with 3+ DUIs had an earlier age at first DUI than men with fewer DUIs; this was not true of women. The number of DUIs among men with 3+ DUIs was higher than among similar women (M[sd]=men: 4.5 [2.6]; women: 3.4 [0.8], $p<.001$). The number of alcohol dependence criteria endorsed increased in each successive DUI category for men whereas for women the number endorsed was similar in the 2 and 3+ DUI categories.

### 3.2. Alcohol symptom endorsement

Women with DUIs endorsed several indicators of behavioral and physiological dependence more frequently than men (Table 2). Women with 2 or 3+ DUIs, compared to women with none, were more likely than similar men to report getting drunk contrary to promises, wanting to quit, unsuccessful attempts to stop drinking, spending lots of time drinking or recovering from drinking, and drinking when on medications. Women with 1, 2, and 3+ DUIs also reported more marital and family problems due to drinking and drinking despite psychological problems than women with no DUIs, compared to similar men. Women with just 1 DUI reported more work or school problems and continuing to drink despite illness or health problems than women with none, compared to men. Regarding physiological criteria, women with 2 or 3+ DUIs were more likely to report withdrawal than men, and women with 1 DUI reported more alcohol-related seizures than men. Each of the gender differences was due to a greater divergence of women with DUIs from women with none, compared to men. Only one item, drinking to relieve seizures, failed to differentiate individuals with 2 or 3+ DUIs from those with 1. Several items (e.g., work problems, tolerance) differentiated men with 2 or 3+ DUIs from men with 1 only but did not differentiate similar women, although a pattern of greater endorsement among women with multiple DUIs was apparent.

### 3.3. Psychiatric disorders

The lifetime prevalence of psychiatric disorders by DUI category is presented in Table 3. Rates of lifetime disorder were high across all DUI categories, compared with national prevalence surveys (Kessler et al., 2005;Kessler et al.,1994), and only a few differences between categories were observed. Men with 3+ DUIs were more likely to meet criteria for any disorder than men

with 1 or 2 DUIs; among women this difference was not statistically significant. Rates of lifetime depression were higher among women with 2 or 3+ DUIs than women with 1 DUI only. Men with 3+ DUIs had higher rates of conduct and antisocial personality disorders than men with 1 or 2 DUIs. The most striking gender difference was for antisocial personality disorder, where women with 1 or 2 DUIs diverged more markedly from women with none than did similar men. Of the 1559 individuals who were assessed for posttraumatic stress disorder (PTSD; assessed at Phase 2 interview only), 43% endorsed a PTSD-qualifying event (men: 47%, women: 39%). Rates of event endorsement and PTSD were similar across all DUI categories.

### 3.4. Drug use and dependence

Rates of drug use and dependence by DUI category are presented in Table 4. Individuals with 2 or 3+ DUIs had higher sedative, opiate and “other” drug use and tried a greater number of drugs than those with 1 DUI. Gender differences in drug use were due to lower female than male use.

Women were more likely to become dependent on marijuana and opiates than men, given use of these drugs at least 11 times. Rates of drug dependence did not differ among DUI categories with the exception of marijuana dependence, which was higher among women with 2 or 3+ DUIs.

## 4. Discussion

Women with DUIs in this high risk sample evidenced greater physiological and behavioral dependence on alcohol than men with DUIs, and may thus represent a particularly severe alcohol dependence phenotype. Women with multiple DUIs were more likely to report wanting to quit and unsuccessful attempts to quit drinking than men. Thus, despite a desire to quit, women with multiple DUIs had less success with quitting drinking than men. Combined with evidence that fewer women than men are referred to treatment after a first DUI offense (Lapham et al., 2000), that treatment may not be as effective for female as male offenders, and that women are less likely to complete treatment (Maxwell & Freeman, 2007), this highlights an opportunity to improve treatment for women with DUIs. Examination of gender differences in alcohol criteria endorsement can potentially improve treatment for women in mandated DUI programs and, more broadly, for women at the severe end of the alcohol dependence spectrum.

Previous work found greater prevalence of alcohol abuse and dependence among male then female first-time DUI offenders (Lapham et al., 2001) but higher rates of alcohol dependence among female than male recidivists (Lapham et al., 2006; Laplante et al., 2008). In the current study, inspection of individual alcohol criteria revealed evidence of greater severity among female offenders, including those with just one DUI. Female DUI offenders were more likely than males to drink despite negative consequences such as marital, health and emotional problems. Continued use in the context of negative life consequences may be associated with behavioral under control, a trait which might be over-represented among women with DUIs. In a survey of drivers from the general population, women expressed more social and moral inhibitions against drinking and driving than did men (Marelich, Berger, & McKenna, 2000), which suggests that women who do drive after drinking are not similarly constrained. Behavioral under control might also be associated with the high endorsement of alcohol withdrawal by women with DUIs, since it shares some genetic risk with alcohol dependence (Slutske et al., 2002), and a related concept, novelty-seeking, is associated with greater familial risk for alcohol dependence (Grucza et al., 2006). While there is evidence that individuals with histories of DUI or drinking and driving display more impulsivity, risk-taking, sensation-seeking, and aggressive behavior than individuals without such histories (Donovan, 1993; Wilson, 1992), those studies included only small samples of women and did not examine

gender differences. Our examination of individual alcohol criteria highlights gender differences among DUI offenders which have not previously emerged.

Our findings stand in contrast to an earlier study of gender differences in alcohol criteria endorsement among alcohol-dependent COGA participants (Schuckit et al., 1998). While the current study found that women with DUIs endorsed items indicating greater severity more frequently than similar men, the previous study found just the opposite among all alcohol dependent individuals. For example, Schuckit et al. (1998) found that more men than women reported periods of time dominated by drinking, but the current study found that women with multiple DUIs were more likely to report this than men. The same pattern was true for unsuccessful attempts to quit and for items about negative consequences of drinking, such as problems with family or friends. Regarding measures of physiological dependence, the current study found that women with multiple DUIs were more likely to report tolerance to alcohol, withdrawal, and alcohol-related seizures, whereas men endorsed these items more frequently in the earlier study (Schuckit et al., 1998). These differences indicate that even in a high-risk sample such as COGA, women with histories of DUI represent a severe alcohol dependence phenotype.

Rates of lifetime drug use and dependence among repeat offenders in this sample were higher than the rates in other samples of repeat DUI offenders (Lapham et al., 2006; Laplante et al., 2008). The differences in prevalence rates between our study and those of previous DUI studies may result from our sample selection of families at high risk for alcohol dependence, which may also have correlated high risks for drug dependence (Kendler, Prescott, Myers, & Neale, 2003). The individuals recruited from treatment programs for DUI offenders in earlier studies may have had fewer or more varied familial vulnerabilities to substance use disorders. Differences in rates of drug use may also be due to reporting differences. Because individuals in earlier studies were recruited from treatment settings where they'd been referred due to DUI legal problems, they may have been reluctant to report drug use for fear it might add to their existing legal troubles. By contrast, the DUI variable in this study was based on self report rather than arrest records, and individuals may have been more willing to accurately report drug use.

This study's finding that more women than men developed dependence on marijuana and opiates is at odds with findings from other DUI samples (Lapham et al., 2001), including one study reporting no gender differences in rates of drug dependence (Laplante et al., 2008), and a study reporting higher rates of hallucinogen dependence among males than females (Lapham et al., 2006). Because those studies did not condition drug dependence on drug use as we did in our analysis, we tested gender differences in our data a second time without conditioning on use and the gender differences remained significant. It is possible that women were more susceptible than men to the numbing effects of marijuana and opiates, given their higher endorsement of continuing to drink despite health and psychological problems.

Overall, rates of psychiatric comorbidity in this sample were higher than in other studies of DUI offenders (Lapham et al., 2006; Lapham et al., 2001; Laplante et al., 2008), and were consistently high across all DUI categories. Women and men differed in the lifetime prevalence of MDD, CD, and ASPD. In the case of externalizing disorders, it is noteworthy that while men with three or more DUIs had significantly higher rates than men with one or two DUIs, this was not true of women. This suggests that women who commit even a single DUI offense deviate more from women who do not than do men, consistent with a hypothesis of greater behavioral undercontrol among women with DUIs.

This study cannot be interpreted as being representative of all individuals with DUIs or with alcohol dependence, as the study protocol was designed to inform genetic studies and required

a certain family size and loading for alcohol diagnoses. The measure for DUI, unlike many studies of DUI populations, is based on self report rather than official documentation. The study also relies on retrospective recall of symptoms for alcohol dependence, psychiatric disorders, and drug use disorders. Nonetheless, it contributes to our understanding of the relationship between DUIs and severe alcohol dependence, and in particular highlights several interesting areas for study among women with DUIs. For example, gender differences in endorsement of behavioral alcohol criteria may indicate areas amenable to psychosocial intervention which may improve treatment outcomes and lower risks for initial or multiple DUIs among women with severe alcohol problems. The gender difference in withdrawal endorsement may indicate areas ripe for gender-specific pharmacological research. In future studies with this population we will examine in detail the time course of alcohol use, psychiatric and drug use disorders in relation to the timing of arrests for DUI.

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COGA

COLLABORATIVE STUDY ON THE GENETICS OF ALCOHOLISM

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The Collaborative Study on the Genetics of Alcoholism (COGA) is comprised of 4 scientific Co-Principal Investigators: B. Porjesz (who is also the Administrative PI), V. Hesselbrock, H. Edenberg, L. Bierut; they have expertise in different but complementary areas. COGA includes nine different centers where data collection, analysis, and storage take place.

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## References


American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-III-R). 3. Washington, DC: American Psychiatric Association; 1987. revised

American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-IV). 4. Washington, DC: American Psychiatric Association; 1994.

Bucholz KK, Cadoret R, Cloninger CR, Dinwiddie SH, Hesselbrock VM, Nurnberger JI Jr, et al. A new, semi-structured psychiatric interview for use in genetic linkage studies: A report on the reliability of the SSAGA. Journal of Studies on Alcohol and Drugs 1994;55(2):149–158.

Bucholz KK, Heath AC, Reich T, Hesselbrock VM, Kramer JR, Nurnberger JI Jr, et al. Can we subtype alcoholism? A latent class analysis of data from relatives of alcoholics in a multicenter family study of alcoholism. Alcoholism: Clinical and Experimental Research 1996;20(8):1462–1471.

Bucholz KK, Hesselbrock VM, Shayka JJ, Nurnberger JI Jr, Schuckit MA, Schmidt I, et al. Reliability of individual diagnostic criterion items for psychoactive substance dependence and the impact on diagnosis. Journal of Studies on Alcohol and Drugs 1995;56(5):500–505.

C'de Baca J, Miller WR, Lapham S. A multiple risk factor approach for predicting DWI recidivism. Journal of Substance Abuse Treatment 2001;21(4):207–215. [PubMed: 11777670]

Chou SP, Dawson DA, Stinson FS, Huang B, Pickering RP, Zhou Y, et al. The prevalence of drinking and driving in the United States, 2001–2002: Results from the national epidemiological survey on alcohol and related conditions. Drug and Alcohol Dependence 2006;83(2):137–146. [PubMed: 16364565]

Culverhouse R, Bucholz KK, Crowe RR, Hesselbrock V, Nurnberger JI Jr, Porjesz B, et al. Long-term stability of alcohol and other substance dependence diagnoses and habitual smoking: An evaluation after 5 years. Archives of General Psychiatry 2005;62(7):753–760. [PubMed: 15997016]

Dawson DA, Grant BF, Ruan WJ. The association between stress and drinking: Modifying effects of gender and vulnerability. Alcohol and Alcoholism 2005;40(5):453–460. [PubMed: 15972275]

Donovan JE. Young adult drinking-driving: Behavioral and psychosocial correlates. Journal of Studies on Alcohol and Drugs 1993;54(5):600–613.

Edens EL, Glowinski AL, Grazier KL, Bucholz KK. The 14-year course of alcoholism in a community sample: Do men and women differ? Drug and Alcohol Dependence 2008;93(1–2):1–11. [PubMed: 17935914]

Federal Bureau of Investigation. Table 33: Ten-year arrest trends by sex 1997–2006. Uniform Crime Reporting Program. 2006. Retrieved January 12, 2009 from http://www.fbi.gov/ucr/cius2006/data/table_33.html

Feighner JP, Robins E, Guze SB, Woodruff RA Jr, Winokur G, Munoz R. Diagnostic criteria for use in psychiatric research. Archives of General Psychiatry 1972;26(1):57–63. [PubMed: 5009428]

Grucza RA, Bucholz KK, Rice JP, Bierut LJ. Secular trends in the lifetime prevalence of alcohol dependence in the United States: A re-evaluation. Alcoholism: Clinical and Experimental Research 2008;32(5):763–770.

Grucza RA, Robert Cloninger C, Bucholz KK, Constantino JN, Schuckit MI, Dick DM, et al. Novelty seeking as a moderator of familial risk for alcohol dependence. Alcoholism: Clinical and Experimental Research 2006;30(7):1176–1183.

Harford TC, Grant BF, Yi HY, Chen CM. Patterns of DSM-IV alcohol abuse and dependence criteria among adolescents and adults: Results from the 2001 National Household Survey on Drug Abuse. Alcoholism: Clinical and Experimental Research 2005;29(5):810–828.

Hesselbrock M, Easton C, Bucholz KK, Schuckit M, Hesselbrock V. A validity study of the SSAGA—A comparison with the SCAN. Addiction 1999;94(9):1361–1370. [PubMed: 10615721]

Holdcraft LC, Iacono WG. Cohort effects on gender differences in alcohol dependence. Addiction 2002;97(8):1025–1036. [PubMed: 12144605]

Kendler KS, Prescott CA, Myers J, Neale MC. The structure of genetic and environmental risk factors for common psychiatric and substance use disorders in men and women. Archives of General Psychiatry 2003;60(9):929–937. [PubMed: 12963675]

Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE. Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. Archives of General Psychiatry 2005;62(6):593–602. [PubMed: 15939837]

Kessler RC, McGonagle KA, Zhao S, Nelson CB, Hughes M, Eshleman S, et al. Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States. *Results from the National Comorbidity Survey*. Archives of General Psychiatry 1994;51(1):8–19. [PubMed: 8279933]

Keyes KM, Grant BF, Hasin DS. Evidence for a closing gender gap in alcohol use, abuse, and dependence in the United States population. Drug Alcohol Depend 2008;93(1–2):21–29. [PubMed: 17980512]

Lapham SC, C'de Baca J, McMillan G, Hunt WC. Accuracy of alcohol diagnosis among DWI offenders referred for screening. Drug and Alcohol Dependence 2004;76(2):135–141. [PubMed: 15488337]

Lapham SC, C'de Baca J, McMillan GP, Lapidus J. Psychiatric disorders in a sample of repeat impaired-driving offenders. Journal of Studies on Alcohol and Drugs 2006;67(5):707–713.

Lapham SC, Skipper BJ, Hunt WC, Chang I. Do risk factors for re-arrest differ for female and male drunk-driving offenders? Alcoholism: Clinical and Experimental Research 2000;24(11):1647–1655.

Lapham SC, Skipper BJ, Simpson GL. A prospective study of the utility of standardized instruments in predicting recidivism among first DWI offenders. Journal of Studies on Alcohol and Drugs 1997;58 (5):524–530.

Lapham SC, Smith E, C'de Baca J, Chang I, Skipper BJ, Baum G, et al. Prevalence of psychiatric disorders among persons convicted of driving while impaired. Archives of General Psychiatry 2001;58(10): 943–949. [PubMed: 11576032]

Laplante DA, Nelson SE, Odegaard SS, Labrie RA, Shaffer HJ. Substance and psychiatric disorders among men and women repeat driving under the influence offenders who accept a treatment-sentencing option. Journal of Studies on Alcohol and Drugs 2008;69(2):209–217. [PubMed: 18299761]

Marelich WD, Berger DE, McKenna RB. Gender differences in the control of alcohol-impaired driving in California. Journal of Studies on Alcohol and Drugs 2000;61(3):396–401.

Maxwell JC, Freeman J. Gender differences in DUI offenders in treatment in Texas. Traffic Injury Prevention 2007;8(4):353–360. [PubMed: 17994488]

National Highway Traffic Safety Administration. 2001 National Survey of Drinking and Driving, Volume III: Findings Report. Washington, DC: National Highway Traffic Safety Administration; 2003 [Accessed online 11/11/2008]. at http://www.nhtsa.dot.gov/staticfiles/DOT/NHTSA/Traffic%20Injury%20Control/Articles/Associated%20Files/DD2001v3.pdf

Nurnberger JI Jr, Wiegand R, Bucholz K, O'Connor S, Meyer ET, Reich T, et al. A family study of alcohol dependence: Coaggregation of multiple disorders in relatives of alcohol-dependent probands. Archives of General Psychiatry 2004;61(12):1246–1256. [PubMed: 15583116]

Reich T. A genomic survey of alcohol dependence and related phenotypes: Results from the Collaborative Study on the Genetics of Alcoholism (COGA). Alcoholism: Clinical and Experimental Research 1996;20(8 Suppl):133A–137A.

Schuckit MA, Anthenelli RM, Bucholz KK, Hesselbrock VM, Tipp J. The time course of development of alcohol-related problems in men and women. Journal of Studies on Alcohol and Drugs 1995;56 (2):218–225.

Schuckit MA, Daeppen JB, Tipp JE, Hesselbrock M, Bucholz KK. The clinical course of alcohol-related problems in alcohol dependent and nonalcohol dependent drinking women and men. Journal of Studies on Alcohol and Drugs 1998;59(5):581–590.

Slutske WS, Heath AC, Madden PA, Bucholz KK, Statham DJ, Martin NG. Personality and the genetic risk for alcohol dependence. Journal of Abnormal Psychology 2002;111(1):124–133. [PubMed: 11871377]

Smith WB, Weisner C. Women and alcohol problems: A critical analysis of the literature and unanswered questions. Alcoholism: Clinical and Experimental Research 2000;24(8):1320–1321.

Stata Corporation. Stata Statistical Software: Release 8.0. College Station, TX: Stata Corporation; 2004.

Wells-Parker E, Pang MG, Anderson BJ, McMillen DL, Miller DI. Female DUI offenders: A comparison to male counterparts and an examination of the effects of intervention on women's recidivism rates. Journal of Studies on Alcohol and Drugs 1991;52(2):142–147.

World Health Organization. The ICD-10 classification of mental and behavioural disorders: Diagnostic criteria for research. Geneva: World Health Organization; 1993.

Wilson RJ. Convicted impaired drivers and high-risk drivers: How similar are they? Journal of Studies on Alcohol and Drugs 1992;53(4):335–344.

**Table 1**

Demographic and alcohol use characteristics by DUI status

| | Number of DUIs | | | | | |
|---|---|---|---|---|---|---|
| | 0 (*n*=2230) | 1 (*n*=261) | 2 (*n*=102) | 3+ (*n*=121) | | |
| | % | % | % | % | Wald $X^2_{df}$ | *p*-value |
| Demographics | | | | | | |
| Male, % | 41.2 | 70.9[A] | 77.4[A] | 88.4[B] | $13.1_2$ | .0014 |
| Age, M (sd) | 39.0 (9.6) | 40.5 (8.7)[A] | 39.7 (9.1)[A] | 40.4 (8.2)[A] | $0.4_2$ | .7899 |
| Ethnicity, % | | | | | | |
| European American[R] | 70.4 | 78.9 | 86.3 | 82.6 | | |
| African American | 20.6 | 13.4[A] | 7.8[A] | 9.1[A] | $4.3_2$ | .1174 |
| Other | 9.0 | 7.7[A] | 5.9[A] | 8.3[A] | $0.8_2$ | .6653 |
| Marital status | | | | | | |
| Married[R] | 53.7 | 49.4 | 42.2 | 37.2 | | |
| Sep/Divorced/Widowed[1] | 21.3 | 27.6[A] | 30.4[A] | 32.2[A] | $3.8_2$ | .1456 |
| Never Married | 25.0 | 23.0[A] | 27.4[A] | 30.6[A] | $3.9_2$ | .1449 |
| Education | | | | | | |
| Less than high school | 12.6 | 15.7[A] | 12.7[A] | 15.7[A] | $3.2_2$ | .2031 |
| High school | 27.2 | 29.1[A] | 30.4[A] | 38.8[B] | $10.6_2$ | .0049 |
| GED | 7.6 | 10.0[A] | 18.6[B] | 20.7[B] | $12.7_2$ | .0018 |
| College or grad school[R] | 52.5 | 45.2 | 38.2 | 24.8 | | |
| Family Income | | | | | | |
| <20 K | 21.8 | 22.3[A] | 28.4[A] | 42.1[B] | $15.5_2$ | .0004 |
| 20–49 K | 39.1 | 43.8[A] | 37.2[A] | 37.2[A] | $3.0_2$ | .2204 |
| ≥50 K [R] | 39.1 | 33.8 | 34.3 | 20.7 | | |
| Currently employed | 76.0 | 79.2[A] | 71.6[B] | 69.4[B] | $6.0_2$ | .0509 |
| Alcohol and DUI-related variables | | | | | | |
| Alcohol dependence (lifetime) | | | | | $5.0_{(A,B)1}$ | .0255 |
| | 42.1 | 78.9[A] | 89.2[B] | 97.5[C] | $5.1_{(B,C)1}$ | .0232 |

| | Number of DUIs | | | | | |
|---|---|---|---|---|---|---|
| | 0 (*n*=2230) | 1 (*n*=261) | 2 (*n*=102) | 3+ (*n*=121) | | |
| | % | % | % | % | Wald $X^2_{df}$ | *p*-value |
| Age regular drinking, M (sd) | | | | | $4.2_{(A,B)1}$ | .0395 |
| | 18.7 (5.0) | 17.8 (4.2)$^A$ | 16.8 (3.8)$^B$ | 15.6 (3.6)$^C$ | $5.9_{(B,C)1}$ | .0154 |
| Age onset alcohol dependence, M (sd) | 22.8 (7.3) | 22.9 (7.1)$^A$ | 21.6 (6.4)$^A$ | 19.9 (6.3)$^B$ | $9.4_2$ | .0093 |
| Age recency alcohol dependence, M (sd) | 31.4 (8.9) | 35.3 (9.2$^A$ | 34.7 (9.1)$^A$ | 36.2 (8.3)$^A$ | $1.4_2$ | .4912 |
| Age first DUI | | | | | | |
| Male | na | 28.4 (8.2) | 25.5 (6.9)$^A$ | 22.2 (5.5)$^B$ | $9.8_1$ | .0017 |
| Female | na | 28.2 (7.8) | 26.6 (6.9)$^A$ | 26.5 (9.2)$^A$ | $0.0_1$ | .9388 |
| Total number of alcohol criteria endorsed[2] | | | | | | |
| Male | 5.6 (5.8) | 9.4 (6.2)$^A$ | 12.5 (6.7)$^B$ | 16.7 (5.8)$^C$ | $14.9_{(A,B)1}$ | .0001 |
| | | | | | $19.1_{(B,C)1}$ | .0000 |
| Female | 4.0 (5.2) | 9.5 (6.8)$^A$ | 14.2 (7.2)$^B$ | 16.6 (4.6)$^B$ | $25.5_2$ | .0000 |

Note: Tests for significance performed with multinomial logistic regression using the no-DUI category as the reference group and the robust variance estimator to correct for clustering of family data. Data presented separately by gender when interaction or trend ($p \leq .10$) within one or more DUI categories. All regressions adjusted for gender and phase participation. Same superscripts (A,B,C) indicate no statistically significant difference between DUI categories; different superscripts indicate statistically significant differences based on Wald chi-square tests.

*R* reference group;

[1] widowed prevalence <2%;

[2] sum of 29 alcohol diagnostic criteria in Table 2;

na = not applicable.

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**Table 2**

Alcohol diagnostic symptoms by DUI status

| | Number of DUIs | | | | | |
|---|---|---|---|---|---|---|
| | 0 (*n*=2230) | 1 (*n*=261) | 2 (*n*=102) | 3+ (*n*=121) | | |
| | % | % | % | % | Wald $X^2_{df}$ | *p*-value |
| A1. Larger amounts | | | | | | |
| 1. Drank more than intended | 49.3 | 75.9[A] | 89.2 [A] | 93.4[B] | $18.94_2$ | .0001 |
| 2. Got drunk when promised would not | | | | | | |
| Male | 37.6 | 60.0[A] | 73.1[B] | – | $8.75_1$ | .0031 |
| Female | 32.6 | 60.5[A] | 86.5[B] | – | $7.17_1$ | .0074 |
| A2. Desire/efforts to quit unsuccessful | | | | | | |
| 3. Wanted to cut down/stop 3+ times | | | | | | |
| Male | 48.3 | 69.2[A] | 81.7[B] | – | $7.7_1$ | .0054 |
| Female | 35.9 | 69.7[A] | 86.5[A] | – | $3.5_1$ | .0619 |
| 4. Unsuccessful efforts at stopping or cutting down | | | | | | |
| Male | 17.8 | 34.0[A] | 58.6[B] | – | $24.7_1$ | .0000 |
| Female | 14.1 | 35.5[A] | 70.3[B] | – | $11.2_1$ | .0008 |
| A3. Time spent drinking | | | | | | |
| 5. Great deal of time drinking/recovering from drinking | | | | | $4.8_{(A,B)\,1}$ | .0291 |
| Male | 10.3 | 21.1[A] | 32.9[B] | 51.4[C] | $6.3_{(B,C)\,1}$ | .0122 |
| Female | 8.7 | 23.7[A] | 52.2[B] | 64.3[B] | $11.9_2$ | .0025 |
| A4. Drinking interferes with obligations | | | | | | |
| 6. Binge drinking and neglecting responsibility | | | | | $13.5_{(A,B)1}$ | .0002 |
| | 10.4 | 24.9[A] | 45.1[B] | 69.4[C] | $12.5_{(B,C)1}$ | .0004 |
| 7. Drinking interfered with responsibilities | | | | | $8.2_{(A,B)1}$ | .0041 |
| | 19.2 | 40.2[A] | 56.9[B] | 71.9[C] | $5.0_{(B,C)1}$ | .0247 |
| 8. Car accident when drinking 3+ | 2.6 | 7.7[A] | 15.7[B] | – | $7.0_1$ | .0079 |
| 9. Serious accidents when drinking 3+ | | | | | $7.7_{(A,B)1}$ | .0056 |
| | 6.2 | 16.5[A] | 29.4[B] | 52.1[C] | $9.7_{(B,C)1}$ | .0019 |

| | Number of DUIs | | | | | |
|---|---|---|---|---|---|---|
| | 0 (*n*=2230) | 1 (*n*=261) | 2 (*n*=102) | 3+ (*n*=121) | | |
| | % | % | % | % | Wald $X^2_{df}$ | *p*-value |
| 10. Hazardous use 3+ | 48.9 | 90.4[A] | 98.2[B] | – | $9.5_1$ | .0020 |
| 11. Drank when on medications dangerous to mix with alcohol | | | | | | |
| Male | 23.2 | 42.7[A] | 49.4[A] | 60.7[B] | $9.3_2$ | .0095 |
| Female | 18.2 | 35.5[A] | 65.2[B] | 57.1[B] | $6.9_1$ | .0311 |
| A5. Decreased social and other activities | | | | | $11.2_{(A,B)1}$ | .0008 |
| 12. Gave up activities to drink | 15.2 | 34.5[A] | 53.9[B] | 69.4[C] | $5.0_{(B,C)1}$ | .0259 |
| A6. Continued use despite negative consequences | | | | | | |
| 13. Lost friends because of drinking 3+ | | | | | $4.2_{(A,B)1}$ | .0414 |
| | 4.9 | 14.2[A] | 23.5[B] | 46.3[C] | $10.1_{(B,C)1}$ | .0015 |
| 14. Drinking caused marital problems | | | | | $10.1_{(A,B)1}$ | .0015 |
| Male | 23.4 | 43.2[A] | 63.3[B] | 85.0[C] | $11.6_{(B,C)1}$ | .0007 |
| Female | 12.3 | 39.5[A] | 78.3[B] | 64.3[B] | $11.5_2$ | .0033 |
| | | | | | $5.6_{(A,B)1}$ | .0178 |
| 15. Arrests while drinking 3+ | 2.5 | 6.5[A] | 14.7[B] | 26.4[C] | $4.0_{(B,C)1}$ | .0457 |
| 16. Family problems because of drinking 3+ | | | | | | |
| Male | 31.7 | 54.6[A] | 84.4[B] | – | $40.9_1$ | .0000 |
| Female | 20.3 | 56.6[A] | 94.6[B] | – | $12.0_1$ | .0005 |
| 17. Work/school problems because of drinking 3+ | | | | | $7.8_{(A,B)1}$ | .0051 |
| Male | 16.8 | 29.7[A] | 46.8[B] | 72.0[C] | $11.4_{(B,C)1}$ | .0007 |
| Female | 10.4 | 31.6[A] | 43.5[A] | 57.1[A] | $4.0_2$ | .1296 |
| 18. Continued to drink with serious illness | | | | | | |
| Male | 4.6 | 8.6[A] | 14.0[A] | – | $2.6_1$ | .1047 |
| Female | 4.3 | 17.1[A] | 21.6[A] | – | $0.4_1$ | .5304 |
| 19. Continued to drink despite alcohol-caused health problems | | | | | | |
| Male | 9.7 | 20.0[A] | 40.3[B] | – | $18.5_1$ | .0000 |
| Female | 7.8 | 26.3[A] | 37.8[A] | – | $1.5_1$ | .2209 |
| 20. Continued to drink despite psychological problems | | | | | | |

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| | Number of DUIs | | | | | |
|---|---|---|---|---|---|---|
| | 0 (*n*=2230) | 1 (*n*=261) | 2 (*n*=102) | 3+ (*n*=121) | | |
| | % | % | % | % | Wald $X^2_{df}$ | *p*-value |
| Male | 17.0 | 30.8$^{A}$ | 55.9$^{B}$ | – | $26.3_1$ | .0000 |
| Female | 14.1 | 42.1$^{A}$ | 78.4$^{B}$ | – | $11.6_1$ | .0007 |
| A7. Tolerance | | | | | | |
| 21. Tolerance, 50% increase | | | | | | |
| Male | 42.8 | 65.9$^{A}$ | 81.7$^{B}$ | – | $12.7_1$ | .0004 |
| Female | 31.2 | 65.8$^{A}$ | 75.7$^{A}$ | – | $1.2_1$ | .2683 |
| A8. Withdrawal symptoms | | | | | | |
| 22. 3R withdrawal syndrome | | | | | | |
| Male | 7.8 | 16.2$^{A}$ | 33.9$^{B}$ | – | $17.0_1$ | .0000 |
| Female | 5.6 | 17.1$^{A}$ | 43.2$^{B}$ | – | $8.8_1$ | .0029 |
| 23. Seizures, any | | | | | | |
| Male | 1.2 | 1.6$^{A}$ | 7.5$^{B}$ | – | $5.7_1$ | .0173 |
| Female | 0.5 | 3.9$^{A}$ | 8.1$^{A}$ | – | $0.9_1$ | .3355 |
| 24. DTs, any | 3.2 | 6.9$^{A}$ | 11.8$^{A}$ | 23.1$^{B}$ | $19.8_2$ | .0001 |
| A9. Drinking to relieve symptoms | | | | | | |
| 25. Relief drinking for withdrawal symptoms 3+ | 10.1 | 21.1$^{A}$ | 36.3$^{B}$ | 54.5$^{C}$ | $9.4_{(A,B)1}$ | .0021 |
| | | | | | $7.0_{(B,C)1}$ | .0082 |
| 26. Relief drinking for seizures | 0.4 | 1.5$^{A}$ | 2.7$^{A}$ | – | $0.4_1$ | .5257 |
| A9. Drinking to relieve symptoms | | | | | | |
| 27. Drank to relieve DTs Feighner Definite Alcoholism Criteria | 1.7 | 3.8 $^{A}$ | 14.8 $^{B}$ | – | $16.3_1$ | .0001 |
| 28. Fighting when drinking | 14.1 | 36.4$^{A}$ | 61.0$^{B}$ | – | $22.4_1$ | .0000 |
| | | | | | $8.5_{(B,C)\ 1}$ | .0147 |
| 29. Blackouts 3+ | 26.0 | 61.3$^{A}$ | 74.5$^{B}$ | 90.1$^{C}$ | $5.9_{(A,B)\ 1}$ | .0036 |

Note: Tests for significance performed with multinomial logistic regression using the no-DUI category as the reference group and the robust variance estimator to correct for clustering of family data. Data presented separately by gender when interaction or trend ($p \leq .10$) within one or more DUI categories. All regressions adjusted for gender. Superscripts (A,B,C) mark similarities and differences between categories: same superscripts indicate no statistically significant difference; different superscripts indicate statistically significant differences. Blank cells (−) indicate category merged with previous category due to small cell sizes.

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**Table 3**

Non-Substance psychiatric disorders by DUI status

| | Number of DUIs | | | | | |
|---|---|---|---|---|---|---|
| | 0 (*n*=2230) | 1 (*n*=261) | 2 (*n*=102) | 3+ (*n*=121) | | |
| | % | % | % | % | Wald $X^2_{df}$ | *p*-value |
| Any lifetime disorder | | | | | | |
| Male | 45.6 | 50.3[A] | 49.4[A] | 68.2[B] | $10.6_2$ | .0050 |
| Female | 55.3 | 59.2[A] | 78.3[A] | 85.7[A] | $5.2_2$ | .0739 |
| MDD, current [1] | 5.7 | 6.5 | 7.6 | – | $0.6_1$ | .4302 |
| MDD, lifetime | | | | | | |
| Male | 30.5 | 36.4[A] | 40.3[A] | – | $4.4_1$ | .3298 |
| Female | 50.9 | 57.9[A] | 78.4[B] | – | $0.9_1$ | .0367 |
| Panic disorder | 5.1 | 6.1[A] | 5.0[A] | – | $0.0_1$ | .9287 |
| Conduct disorder | | | | | | |
| Male | 24.9 | 30.4[A] | 35.5[A] | 48.6[B] | $9.1_2$ | .0105 |
| Female | 9.4 | 22.4[A] | 26.1[A] | 28.6[A] | $0.4_2$ | .8184 |
| ASPD | | | | | | |
| Male | 14.8 | 22.8[A] | 26.3[A] | 44.8[B] | $14.5_2$ | .0007 |
| Female | 4.7 | 18.4[A] | 26.1[A] | 28.6[A] | $1.3_2$ | .5255 |
| PTSD (conditional on qualifying trauma)[2] | 11.3 | 10.9 | 10.3 | – | $.08_1$ | .7739 |

Note: Tests for significance performed with multinomial logistic regression using the no-DUI category as the reference group and the robust variance estimator to correct for clustering of family data. Data presented separately by gender when interaction or trend ($p \leq .10$) within one or more DUI categories. All regressions adjusted for gender. Superscripts (A,B,C) mark similarities and differences between categories: same superscripts indicate no statistically significant difference; different superscripts indicate statistically significant differences. Blank cells (−) indicate category merged with previous category due to small cell sizes.

[1] current episode = within past 30 days; all other diagnoses based on lifetime experience.

[2] PTSD assessed at phase 2 only, only individuals interviewed at phase 2 included in risk set.

**Table 4**

Drug use and dependence by DUI status

| | Number of DUIs | | | | | |
|---|---|---|---|---|---|---|
| | 0 (*n*=2230) | 1 (*n*=261) | 2 (*n*=102) | 3+ (*n*=121) | | |
| | % | % | % | % | Wald $X^2_{df}$ | *p*-value |
| Drug use[1] | | | | | | |
| Any[2] | 57.9 | 74.6[A] | 83.3[B] | 87.5[B] | $8.6_2$ | .0132 |
| Marijuana | | | | | | |
| Male | 60.7 | 73.4[A] | 73.4[A] | 87.7[B] | $8.8_2$ | .0124 |
| Female | 47.5 | 65.8[A] | 82.6[A] | 42.9[A] | $5.7_2$ | .0568 |
| Cocaine | | | | | | |
| Male | 30.6 | 44.0[A] | 51.9[A] | 63.3[B] | $11.1_2$ | .0039 |
| Female | 24.9 | 36.8[A] | 52.2[A] | 28.6[A] | $2.3_2$ | .3101 |
| Stimulants | | | | | | |
| Male | 19.7 | 40.8[A] | 49.7[A] | – | $3.3_1$ | .0692 |
| Female | 18.6 | 27.6[A] | 43.2[A] | – | $2.8_1$ | .0931 |
| Sedatives | 11.7 | 17.3[A] | 38.2[B] | 34.2[B] | $20.1_2$ | .0000 |
| Opiates | 9.0 | 15.0[A] | 33.3[B] | 30.8[B] | $17.6_2$ | .0002 |
| Other drug Use[3] | 12.5 | 23.8[A] | 41.2[B] | 41.7[B] | $13.2_2$ | .0013 |
| Number drugs used ≥11 times, M(sd)[2] | 1.4 (1.7) | 2.2 (2.0)[A] | 3.2 (2.6)[B] | 3.2 (2.5)[B] | $21.7_2$ | .0000 |
| Drug Dependence, conditional on use[1] | | | | | | |
| Marijuana | | | | | | |
| Male | 48.7 | 51.8[A] | 56.3[A] | – | $0.6_1$ | .4307 |
| Female | 34.0 | 32.0[A] | 64.0[B] | – | $6.6_1$ | .0103 |
| Cocaine | 57.2 | 73.4[A] | 67.5[A] | – | $0.9_1$ | .3370 |
| Stimulants | 40.2 | 41.7[A] | 56.0[A] | 53.4[A] | $3.2_2$ | .2024 |
| Sedatives | 41.3 | 35.6[A] | 33.3[A] | 31.7[A] | $0.0_1$ | .9887 |
| Opiates | | | | | | |
| Male | 51.0 | 46.4[A] | 33.3[A] | | $1.3_2$ | .2469 |

| | Number of DUIs | | | | | |
|---|---|---|---|---|---|---|
| | 0 (*n*=2230) | 1 (*n*=261) | 2 (*n*=102) | 3+ (*n*=121) | | |
| | % | % | % | % | Wald $X^2_{df}$ | *p*-value |
| Female | 49.5 | 90.9[A] | 63.6[A] | | $1.9_2$ | .1663 |

Note: Tests for significance performed with multinomial logistic regression using the no-DUI category as the reference group and the robust variance estimator to correct for clustering of family data. Data presented separately by gender when interaction or trend ($p \leq .10$) within one or more DUI categories. All regressions adjusted for gender. Superscripts (A,B,C) mark similarities and differences between categories: same superscripts indicate no statistically significant difference; different superscripts indicate statistically significant differences. Blank cells (−) indicate category merged with previous category due to small cell sizes.

[1] Drug use on 11 or more separate occasions;

[2] includes use of marijuana, cocaine, stimulants, sedatives, opiates, PCP, hallucinogens, solvents, combo drugs, other; range 0–10.

[3] PCP, hallucinogens, solvents, combination drugs, other.