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Alcohol-Use Disorders and Nonmedical Use of Prescription Drugs Among U.S. College Students*

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Abstract

Objective—The purpose of this study was to examine the association between Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV), alcohol-use disorders (AUDs) and nonmedical use of prescription drugs (NMPD) among U.S. college students. A secondary aim of this study was to identify individual-level and college-level characteristics associated with the co-occurrence of AUDs and NMPD.

Method—Data were collected from self-administered mail surveys, sent to a random sample of approximately 14,000 college students from a nationally representative sample of 119 U.S. colleges and universities.

Results—Among U.S. college students, those with AUDs represented approximately 75% of nonmedical users of prescription drugs. Multivariate logistic regression analyses indicated that college students with past-year DSM-IV alcohol abuse only (adjusted odds ratio [AOR] = 4.46, 95% confidence interval [CI] = 3.59-5.55) and students with past-year DSM-IV alcohol dependence (AOR = 9.17, 95% CI = 7.05-11.93) had significantly increased odds of NMPD in the past year compared with students without AUDs. The co-occurrence of AUDs and NMPD was more likely among college students who were male, white, earned lower grade point averages, and attended co-ed colleges and institutions located in Southern or Northeastern U.S. regions.

Conclusions—The findings provide evidence that NMPD is more prevalent among those college students with AUDs, especially individuals with past-year DSM-IV alcohol dependence. The assessment and treatment of AUDs among college students should account for other forms of drug use such as NMPD.

YOUNG ADULTS 18-25 YEARS OF AGE in the United States report the highest prevalence rates of heavy episodic drinking; Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV; American Psychiatric Association, 1994), alcohol-use disorders (AUDs); and nonmedical use of prescription drugs (NMPD), as well as co-occurrence of AUD and NMPD compared with all other age groups (e.g., Grant et al., 2004; Johnston et al., 2005; McCabe et al., 2006a; Substance Abuse and Mental Health Services Administration, 2005). Among young adults, college students report higher rates of heavy episodic drinking, DSM-IV AUDs and some types of NMPD than their same-age peers not attending college (e.g., Dawson et al., 2004; Johnston et al., 2005; Slutske, 2005). Surprisingly, not much work has

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focused on the co-occurrence of AUD and NMPD among U.S. college students, despite the fact that adverse consequences are associated with the co-ingestion of alcohol and prescription drugs (e.g., McCabe et al., 2006b; Petrillo and Cantlupe, 2005). Where past research has examined the relationship between alcohol use and nonmedical use of selected prescription drugs among U.S. college students, the present study extends previous findings to examine patterns and risk factors associated with AUD diagnosis and nonmedical use of four classes of prescription drugs. An improved understanding regarding the co-occurrence of AUD and NMPD among U.S. college students is needed to guide evidence-based assessment, prevention, and treatment efforts. The primary objectives of this brief report were the following: (1) to examine the association between past-year AUD and NMPD among U.S. college students and (2) to identify the individual-level and college-level characteristics associated with the co-occurrence of AUD and NMPD.

Method

This brief report draws upon data collected via the College Alcohol Study (CAS) from 119 4-year U.S. colleges and universities in 1999. The overall response rate for the CAS was 59%. Individual sampling weights were calculated for the sampled students who responded to the survey, and these weights effectively built in the response rates at each college; this was done in an effort to offset the amount of nonresponse that was taking place in certain demographic groups at each college. The sample included all respondents among the 119 colleges in 1999 with data permitting for calculation of the AUD diagnosis ($N = 13,933$). The mean age of the sample was 21 years, and 47% were women. Approximately 47% of students earned a grade point average of B or lower. Approximately 76% of students were white, 7% were black, 9% were Asian, and 8% were from other racial categories. The CAS sample accurately represents a national cross-section of students enrolled at 4-year colleges in the U.S. (National Center for Education Statistics, 1999,2003). Additional information regarding sampling procedures, research design, and inclusion criteria for the CAS are described in more detail elsewhere (e.g., Knight et al., 2002; Wechsler et al., 1994,1998,2000,2002).

The measures in the 20-page 1999 CAS survey assessed demographic characteristics and personal behaviors, including NMPD and items corresponding to DSM-IV diagnostic criteria for alcohol abuse and dependence. The 1999 CAS was selected because it contained adequate measures to assess AUD and NMPD in a large nationally representative sample of U.S. college students.

DSM-IV AUDs were measured with items adapted from the Semi-Structured Assessment for the Genetics of Alcoholism, which was designed to assess self-report of 12-month DSM-IV diagnosis of alcohol abuse or dependence (e.g., Bucholz et al., 1994; Hesselbrock et al., 1999). Consistent with previous research, a diagnosis of past-year alcohol abuse required the absence of a dependence diagnosis and at least one positive response to four abuse criteria, and a past-year alcohol dependence diagnosis was defined as a positive response to at least three of the seven dependence criteria (see Knight et al., 2002).

NMPD was measured using the following item: "How often, if ever, have you used any of the drugs listed below? Do not include anything you used under a doctor's orders." Each of the following classes of prescription medications were listed separately in the survey: (1) opiate-type drugs (controlled substances like codeine, Demerol, Percodan); (2) tranquilizers (prescription-type drugs like Valium, Librium); (3) barbiturates (prescription-type sleeping pills like Quaaludes, downs, or yellow-jackets); and (4) amphetamines (prescription-type stimulants like speed, uppers, ups). The response scale ranged from 1 (never used) to 4 (used in the past 30 days).

Co-occurrence of AUD and NMPD was measured using binary indicator variables, where respondents meeting criteria for an AUD diagnosis (either abuse *or* dependence) in the past 12 months and using one of four classes of prescription drugs nonmedically in the past 12 months were assigned a 1, and all other respondents were assigned a 0. Five binary indicators of co-occurrence were computed: one indicator each for NMPD of a given prescription drug class (opioids, stimulants, tranquilizers, or sedatives) and an AUD diagnosis in the past 12 months, and a single indicator for *any* NMPD and an AUD diagnosis in the past 12 months.

All statistical analyses were conducted using the SAS/STAT statistical software package (Version 9.1.3), which has a suite of procedures available for the analysis of complex sample survey data (SAS Institute, Cary, NC). In the present analyses, the sampling weights described earlier were used to compute weighted estimates of statistics describing the population of interest (U.S. college students), and Taylor Series Linearization (e.g., Rust, 1985) was used to estimate robust standard errors of all statistical estimates that reflected the clustered design of the 1999 CAS sample (where colleges were the primary sampling units). Bivariate associations between past-year DSM-IV AUD diagnoses (no diagnosis, abuse, and dependence) and nonmedical use of each of the four classes of prescription drugs (in addition to *any* nonmedical use) were tested. Multivariate logistic regression analyses were performed to estimate the relationships of AUD diagnosis with the probability of nonmedical use of each class of prescription drugs, adjusting for student-level and college-level covariates. Additional multivariate analyses were performed to estimate the effects of student- and college-level covariates on the probability of co-occurrence of AUD and NMPD.

Results

Figure 1 illustrates the prevalence of past-year NMPD as a function of past-year DSM-IV AUD diagnosis. A clear pattern emerged, indicating that the prevalence of past-year NMPD was highest among those individuals who reported AUDs. Alcohol-dependent individuals reported the highest past-year prevalence rate of any NMPD (26.02%, SE = 2.04), followed by those individuals who met the criteria for alcohol abuse only (13.61%, SE = 0.87), and individuals who had not met the criteria for an AUD diagnosis (3.34%, SE = 0.28) ($\chi^2 = 571.42$, 2 df, $p < .001$). Although individuals with AUDs constituted less than 40% of the population, those with AUDs were estimated to represent approximately 75% of nonmedical users of prescription drugs.

The multivariate results reinforce the bivariate findings, in that DSM-IV AUD diagnosis was significantly associated with NMPD after statistically adjusting for the effects of gender, race, age, grade point average, living arrangement, social fraternity/sorority membership, geographical region, co-ed status, and admission criteria. The odds of any NMPD were estimated to be four times greater among those with past-year alcohol abuse only, compared with those without a past-year AUD diagnosis (adjusted odds ratio [AOR] = 4.46, 95% confidence interval [CI] = 3.59-5.55, $p < .001$). Further, the odds of any NMPD were more than nine times greater among past-year alcohol-dependent individuals compared with those without a past-year AUD diagnosis (AOR = 9.17, 95% CI = 7.05-11.93, $p < .001$). The significant association between AUD and NMPD was present across all four classes of prescription drugs. Multivariate logistic regression analyses also indicated that the odds of any NMPD were more than two times greater among past-year alcohol-dependent individuals compared with past-year alcohol abusers only (AOR = 2.06, 95% CI = 1.68-2.52, $p < .001$). The elevated risk of NMPD among past-year alcohol-dependent individuals compared with those with past-year alcohol abuse only was present across all four classes of prescription drugs.

The multivariate logistic regression analyses also indicated that several individual-level and college-level characteristics were significantly associated with the co-occurrence of past-year

AUD and NMPD. College men were significantly more likely than women to report the co-occurrence of past-year AUD and any NMPD (AOR = 1.38, 95% CI = 1.19-1.61, $p < .001$). In addition, black (AOR = 0.17, 95% CI = 0.07-0.38, $p < .001$) and Asian (AOR = 0.27, 95% CI = 0.16-0.44, $p < .001$) students had much lower odds than white students of reporting co-occurrence of past-year AUD and any NMPD. Students with a grade point average of B or below had greater odds of reporting co-occurrence of past-year AUD and any NMPD than those with a B+ or above (AOR = 1.60, 95% CI = 1.33-1.91, $p < .001$). In terms of college-level characteristics, students attending colleges located in the Northeastern (AOR = 1.85, 95% CI = 1.35-2.53, $p < .001$) and Southern (AOR = 1.6, 95% CI = 1.21-2.20, $p < .01$) regions of the U.S. were more likely to report the co-occurrence of AUD and any NMPD than students attending colleges located in the Midwest. Finally, students attending women's-only colleges were less likely than students attending co-ed colleges to report the co-occurrence of past-year AUD and any NMPD (AOR = 0.27, 95% CI = 0.15-0.51, $p < .001$). Overall, results were similar when considering the correlates associated with co-occurrence of past-year AUD and NMPD across the four different classes of prescription drugs.

Discussion

The present investigation provides new information regarding the patterns associated with AUD and NMPD among U.S. college students. More than one in every four college students (26%) with past-year DSM-IV alcohol dependence also reported NMPD in the past year. The odds of reporting any NMPD were nine times higher among DSM-IV alcohol-dependent individuals compared with those without a past-year DSM-IV AUD diagnosis. Further, the odds of reporting any NMPD were more than two times higher among DSM-IV alcohol-dependent individuals compared with those with past-year DSM-IV abuse only. The present investigation also provides new information regarding individual-level and college-level characteristics associated with co-occurrence of AUD and NMPD (e.g., male, white, grade point average of B or lower, co-ed colleges, and institutions located in Southern or Northeastern U.S. regions). Indeed, results were remarkably consistent when considering the outcomes indicating co-occurrence of past-year AUD and nonmedical use of the four specific classes of prescription drugs. These individual-level and college-level factors should be considered in designing substance abuse prevention efforts and evaluating such efforts over time.

A recent study found that the majority of past-year collegiate nonmedical users of prescription drugs reported simultaneous use of alcohol and prescription drugs (McCabe et al., 2006b). Based on the adverse consequences, future preventative efforts should educate individuals regarding the dangerous drug interactions associated with co-ingestion of alcohol and prescription drugs (e.g., Barrett and Pihl, 2002; Cone et al., 2003, 2004; Watson et al., 2004). Although the data in the present study were collected in 1999, there is little reason to believe that the co-occurrence of AUD and NMPD has decreased between 1999 and 2005 among college students because heavy drinking and NMPD have held steady or increased across this period (Johnston et al., 2005).

There were some important strengths and limitations that should be considered when weighing the implications of the findings. The CAS includes clinically relevant substance abuse measures which build on previous college-based research. Furthermore, data were from a large nationally representative sample, which allowed for an in-depth examination of several characteristics associated with co-occurrence of AUD and NMPD. Although the CAS is subject to the limitations of self-report surveys, similar approaches have been widely used and are considered generally valid in examining substance use when certain conditions of confidentiality are met (e.g., Harrison and Hughes, 1997; Johnston and O'Malley, 1985; O'Malley et al., 1983). The present study also did not measure the frequency or quantity of NMPD, and future research is needed to examine different behavioral patterns associated with

NMPD. Limitations also included the absence of characteristics that might be associated with NMPD (e.g., sensation-seeking), because such information was not collected. Although the prevalence rates of NMPD in this study are comparable to rates found in other national surveys of young adults and college students (Johnston et al., 2005; McCabe et al., 2006a; Substance Abuse and Mental Health Services Administration, 2005), the prevalence of NMPD may have been underestimated because the 1999 CAS did not specifically list some commonly abused prescription drugs. Furthermore, the present study used a modified version of the Semi-Structured Assessment for the Genetics of Alcoholism, which may have overestimated the prevalence of DSM-IV alcohol abuse and underestimated the prevalence of DSM-IV alcohol dependence (see Dawson et al., 2004; Grant et al., 2004). Finally, because these data were cross-sectional, inferences about causality cannot be made, and we could not assess whether certain factors preceded AUD and NMPD.

This study provides new evidence that NMPD is significantly higher as a function of AUD diagnosis severity among U.S. college students. Based on the relatively high rates of NMPD among college students with DSM-IV AUDs, health professionals are encouraged to collect comprehensive drug use histories when working with college students with AUDs.

References

- American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders (DSM-IV). Washington, DC: 1994.
- Barrett SP, Pihl RO. Oral methylphenidate-alcohol co-abuse. *J. Clin. Psychopharmacol* 2002;22:633–634. [PubMed: 12454570]
- Bucholz KK, Cadoret R, Cloninger CR, Dinwiddie SH, Hesselbrock VM, Nurnberger JI Jr. Reich T, Schmidt I, Schuckit MA. A new, semi-structured psychiatric interview for use in genetic linkage studies: A report on the reliability of the SSAGA. *J. Stud. Alcohol* 1994;55:149–158. [PubMed: 8189735]
- Cone EJ, Fant RV, Rohay JM, Caplan YH, Ballina M, Reder RF, Haddox JD. Oxycodone involvement in drug abuse deaths: II. Evidence for toxic multiple drug-drug interactions. *J. Analyt. Toxicol* 2004;28:217–225. [PubMed: 15189671]
- Cone EJ, Fant RV, Rohay JM, Caplan YH, Ballina M, Reder RF, Spyker D, Haddox JD. Oxycodone involvement in drug abuse deaths: A DAWN-based classification scheme applied to an oxycodone postmortem database containing over 1000 cases. *J. Analyt. Toxicol* 2003;27:57–67. [PubMed: 12669998]
- Dawson DA, Grant BF, Stinson FS, Chou PS. Another look at heavy episodic drinking and alcohol use disorders among college and noncollege youth. *J. Stud. Alcohol* 2004;65:477–488. [PubMed: 15378804]
- Grant BF, Dawson DA, Stinson FS, Chou SP, Dufour MC, Pickering RP. The 12-month prevalence and trends in DSM-IV alcohol abuse and dependence: United States, 1991–1992 and 2001–2002. *Drug Alcohol Depend* 2004;74:223–234. [PubMed: 15194200]
- Harrison, L.; Hughes, A., editors. The Validity of Self-Reported Drug Use: Improving the Accuracy of Survey Estimates. Government Printing Office; Washington: 1997. NIDA Research Monograph No. 167, NIH Publication 97-4147
- Hesselbrock M, Easton C, Bucholz KK, Schuckit M, Hesselbrock V. A validity study of the SSAGA: A comparison with the SCAN. *Addiction* 1999;94:1361–1370. [PubMed: 10615721]
- Johnston, LD.; O'Malley, PM. Issues of validity and population coverage in student surveys of drug use. In: Rouse, BA.; Kozel, NJ.; Richards, LG., editors. Self-Report Methods of Estimating Drug Use: Meeting Current Challenges to Validity. Government Printing Office; Washington: 1985. p. 31–54. NIDA Research Monograph No. 57, DHHS Publication No. (ADM) 85-1402
- Johnston, LD.; O'Malley, PM.; Bachman, JG.; Schulenberg, JE. Monitoring the Future National Survey Results on Drug Use, 1975–2004. 2. National Institute on Drug Abuse; Bethesda, MD: 2005. NIH Publication No. 05-5728

- Knight JR, Wechsler H, Kuo M, Seibring M, Weitzman ER, Schuckit MA. Alcohol abuse and dependence among U.S. college students. *J. Stud. Alcohol* 2002;63:263–270. [PubMed: 12086126]
- McCabe SE, Cranford JA, Boyd CJ. The relationship between past-year drinking behaviors and nonmedical use of prescription drugs: Prevalence of co-occurrence in a national sample. *Drug Alcohol Depend* 2006a;84:281–288. [PubMed: 16621337]
- McCabe SE, Cranford JA, Morales M, Young A. Simultaneous and concurrent poly-drug use of alcohol and prescription drugs: Prevalence, correlates and consequences. *J. Stud. Alcohol* 2006b;67:529–537. [PubMed: 16736072]
- National Center for Education Statistics. Fall Enrollment in Postsecondary Institutions. Department of Education; Washington, DC: 1999. 1997. NCES 99-162 available at: <http://nces.ed.gov/pubs2000/2000160.pdf>
- National Center for Education Statistics. Enrollment in Postsecondary Institutions. Department of Education; Washington, DC: 2003. Fall 2001 and Financial Statistics, Fiscal Year 2001, NCES 2004-155 available at: <http://nces.ed.gov/pubs2004/2004155.pdf>
- O'Malley PM, Bachman JG, Johnston LD. Reliability and consistency in self-reports of drug use. *Int. J. Addict* 1983;18:805–824. [PubMed: 6605313]
- Petrillo, L.; Cantlupe, J. Painkiller linked to 3 local deaths. *San Diego Union Tribune*; Feb 19. 2005 available at: www.signonsandiego.com/uniontrib/20050219/news_7m19drug.html
- Rust K. Variance estimation for complex estimators in sample surveys. *J. Offic. Stat* 1985;1:381–397.
- Slutske WS. Alcohol use disorders among U.S. college students and their non-college attending peers. *Arch. Gen. Psychiat* 2005;62:321–327. [PubMed: 15753245]
- Substance Abuse and Mental Health Services Administration (Office of Applied Studies). National Survey on Drug Use & Health: Detailed Tables. Department of Health and Human Services; Rockville, MD: 2005. 2004 available at: <http://www.oas.samhsa.gov/nsduh/2k4nsduh/2k4tabs/toc.htm>
- Watson WA, Litovitz TL, Klein-Schwartz W, Rodgers GC Jr. Youniss J, Reid N, Rouse WG, Rembert RS, Borys D. 2003 Annual Report of the American Association of Poison Control Centers Toxic Exposure Surveillance System. *Amer. J. Emer. Med* 2004;22:335–404.
- Wechsler H, Davenport A, Dowdall G, Moeykens B, Castillo S. Health and behavioral consequences of binge drinking in college: A national survey of students at 140 campuses. *JAMA* 1994;272:1672–1677. [PubMed: 7966895]
- Wechsler H, Dowdall GW, Maenner G, Gledhill-Hoyt J, Lee H. Changes in binge drinking and related problems among American college students between 1993 and 1997. *J. Amer. Coll. Hlth* 1998;47:57–68.
- Wechsler H, Lee JE, Kuo M, Lee H. College binge drinking in the 1990s: A continuing problem. Results of the Harvard School of Public Health 1999 College Alcohol Study. *J. Amer. Coll. Hlth* 2000;48:199–210.
- Wechsler H, Lee JE, Kuo M, Seibring M, Nelson TF, Lee H. Trends in college binge drinking during a period of increased prevention efforts: Finding from 4 Harvard School of Public Health College Alcohol Study surveys: 1993–2001. *J. Amer. Coll. Hlth* 2002;50:203–217.

FIGURE 1.

Unadjusted prevalence estimates (in percentage) of past-year nonmedical use of prescription drugs by past-year Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV), alcohol-use diagnosis. Rx = prescription. Error bars represent ± 1 SE.