High-intensity drinking and nonmedical use of prescription drugs: Results from a national survey of 12th grade students

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Abstract

Background—Nearly 10% of U.S. 12th graders report high-intensity drinking (10+ or 15+ drinks in a row), but the extent to which these drinkers also engage in nonmedical use of prescription drugs (NMUPD) is largely unknown. This study examined the associations between different thresholds of past two-week high-intensity drinking and past-month NMUPD among U.S. 12th graders.

Methods—The sample consisted of eleven nationally representative cross-sections of 12th graders in the Monitoring the Future study (2005–2015) who answered questions on past two-week drinking behaviors and past-month nonmedical use of prescription opioids, sedative, stimulants, and tranquilizers (N = 26,502 respondents).

Results—High-intensity drinking during the past two-weeks was associated with an increased risk of past-month NMUPD. The odds of NMUPD were four times larger among 12th graders who indicated drinking 15 or more drinks on at least one occasion (AOR = 4.43, 95% CI = 3.18, 5.01) relative to those who had 0 to 4 drinks during the past two-weeks, after adjusting for relevant covariates. These associations were similar across different classes of prescription drugs and

tended to be stronger among non-white respondents. A sub-analysis revealed simultaneous co-ingestion of alcohol and NMUPD was more prevalent among high-intensity drinkers.

Conclusions—More than 1 in every 4 U.S 12th graders who engage in high-intensity drinking (15+ drinks in a row) also report NMUPD. Given the greater likelihood of simultaneous co-ingestion of alcohol and prescription drugs among high-intensity drinkers, adolescent substance use interventions need to address the risks associated with mixing alcohol and prescription drugs.

Keywords

High-intensity drinking; binge drinking; heavy drinking; Nonmedical use; prescription drugs; adolescents; substance use; epidemiology

1.0 Introduction

High-intensity drinking is a major public health concern among adolescents and young adults due to the heightened risk of experiencing adverse consequences such as blackouts, traffic accidents, or alcohol-related overdoses (Hingson and White, 2013; Jackson, 2008; Read et al., 2008; SAMHSA, 2013a). High-intensity drinking is defined as consuming at least twice the level as the standard cutoff for binge drinking (i.e., 10+ drinks or higher; Patrick et al., 2013; Patrick, 2016). Among 12th graders in the U.S., roughly 10% have indicated consuming 10 or more drinks and roughly 6% have indicated consuming 15 or more drinks in a row (Patrick et al., 2013).

Although recent trends show that alcohol use, standard binge drinking, and 10+ high-intensity drinking have declined among high school seniors over that past several years, trends in 15+ high-intensity drinking have not significantly declined over the past decade (Miech et al., 2016; Patrick et al., 2013). Problematically, alcohol-related overdoses among young adults (i.e., age 18 to 24) have increased in recent years with a 76% rise in hospitalization rates for combined alcohol and drug overdoses between 1999 and 2008 (White et al., 2011). In particular, many of these hospitalizations among adolescents and young adults involve nonmedical use of prescription drugs (NMUPD), and frequently involve simultaneous co-ingestion of alcohol and NMUPD (SAMHSA, 2004a; 2004b; 2012; 2013b, 2014).

Studies of adolescents and young adults have found that alcohol use and NMUPD are highly correlated (Inciardi et al., 2004; Barrett and Pihl, 2002; Barrett et al., 2005; Egan et al., 2013; Garnier et al., 2009; McCabe et al., 2004; 2006; 2007a; 2012; 2015; Schepis et al., 2016). In fact, more than half of nonmedical users of prescription opioids, sedatives/anxiolytics and stimulants co-ingested these drugs with alcohol and had a higher likelihood to screen positive for substance-related problems than nonmedical users who do not engage in simultaneous co-ingestion with alcohol (McCabe et al., 2006). Furthermore, a national study of 12th grade students in the U.S. found that among past-year nonmedical prescription opioid users, approximately 70% indicated simultaneous co-ingestion of another substance, with a little more than half indicating simultaneous co-ingestion with alcohol (McCabe et al., 2012). The findings from these studies are troubling given that simultaneous co-ingestion of prescription drugs and alcohol are linked to lower blood alcohol concentrations required

for fatal overdoses, increases the risk for liver and heart damage, and increases the risk of impaired driving and traffic accidents (Jones et al., 2011; Dassanayake et al., 2011).

Despite the clear link between alcohol and NMUPD, and the major acute consequences (e.g., fatal overdoses) and chronic risks (e.g., substance use disorders) associated with mixing these substances, no research to date has examined how NMUPD is associated with high-intensity drinking among adolescents. Based on this gap in the literature and the current need to increase our knowledge of the potential risks associated with high-intensity drinking (Patrick, 2016), the main objective of this study is to assess different thresholds of high-intensity drinking (i.e., 10 to 14 drinks, and 15+ drinks) and determine how these thresholds are associated with past-month NMUPD (i.e., opioids, sedative, stimulants, and tranquilizers) and past-year co-ingestion of alcohol and NMUPD, and whether these associations vary by sex and race.

2.0 Methods

2.1 Study design

The present study uses eleven cross-sections (2005–2015) of the Monitoring the Future (MTF; Miech et al., 2016) study. Based on a three-stage sampling procedure, MTF has surveyed nationally representative samples of approximately 15,000 U.S. high school seniors each year since 1975, with response rates ranging from 79% to 85% between 2005 and 2015. The project design and sampling methods are described in greater detail elsewhere (Miech et al., 2016).

2.2 Sample

Measures of high-intensity drinking were added to one of six questionnaire forms in 2005; data for the current analysis included 12th graders who were randomly assigned to complete this form. The analytic sample included 26,502 (weighted n=26,499) 12th graders, 48.4% boys (51.6% girls; see Table 1). The racial/ethnic distribution was 10.9% Black, 13.6% Hispanic, 55.7% White, and 19.9% other race.

Finally, it should be noted that a sub-analysis of the MTF data using the samples from 2005 and 2006 were used to assess high-intensity drinking and simultaneous co-ingestion of alcohol and prescription drugs (n = 5062; weighted). Questions on high-intensity drinking and simultaneous co-ingestion of alcohol and prescription drugs appeared on only one of six forms in 2005 and 2006, thus limiting the sample size. The analytic sample for this sub-analysis was similar to the sample that extends to 2015.

2.3 Measures

2.3.1 Past Two-Week Drinking—This was based on three questions that asked respondents to report on the number of occasions during the last two weeks they had "five or more drinks in a row," "10 or more drinks in a row," and "15 or more drinks in a row." Respondents could select from six response categories that ranged from "None" to "10 or more times." For the purposes of this study, these three questions were combined into a variable with four mutually exclusive categories to assess different thresholds of past two

week drinking: (1) 0 to 4 drinks in a row, (2) 5 to 9 drinks in a row, (3) 10 to 14 drinks in a row, and (4) 15 or more drinks in a row at least once during The past two weeks.

2.3.2 Past-Month Nonmedical Use Of Prescription Drugs (NMUPD)—This was based on four separate questions that asked respondents to report whether they used prescription opioids, sedatives, stimulants, or tranquilizers during the past 30 days on their own "without a doctor telling you to take them." For each prescription drug class, respondents were told that drugstores are not supposed to sell them without a prescription. In addition, specific examples were listed for each prescription drug class such as prescription opioids (e.g., codeine, methadone, opium, morphine, Vicodin®, Demerol®, OxyContin®, Percocet®, Percodan®, Ultram®), prescription sedatives (e.g., Ambien®), prescription stimulants (e.g., Adderall®, Dexedrine®, and Ritalin®) and prescription tranquilizers (e.g., Ativan®, Klonopin®, Librium®, Valium® and Xanax®). Respondents could select from seven response categories that ranged from "0 Occasions" to "40 or more occasions." Four binary measures were constructed from these questions that indicated whether respondents engaged in nonmedical use of opioids, sedative, stimulants, and tranquilizers during the past-month. Moreover, a general binary measure was constructed to capture any NMUPD during the past-month across the four prescription drug classes.

2.3.3 Past-Year Co-Ingestion Of Alcohol And Prescription Drugs—This was based on three separate questions measuring simultaneous co-ingestion of alcohol and prescription opioids, alcohol and prescription stimulants, and alcohol and prescription tranquilizers. Respondents were ask to report on past-year simultaneous use of alcohol and three classes of prescription drug in which "their effects overlapped". Three binary measures were constructed from these questions that indicated past-year co-ingestion of alcohol and prescription opioids, alcohol and prescription stimulants, and alcohol and prescription tranquilizers. In addition to these three measures, a general binary measure was constructed to capture any past-year co-ingestion of alcohol and prescription drugs.

2.3.4 Control Variables—Control Variables were also included in the analyses to account for potentially confounding factors that are known to be associated with NMUPD and high-intensity drinking within the MTF sample (e.g., Barret et al., 2005; Egan et al., 2013; Garnier et al., 2009; McCabe et al., 2006, 2014; Patrick et al., 2013). These variables include sex, race, skipping class, average grades in school, work status, parental education, urbanicity (e.g., does respondent live in a metropolitan statistical area [MSA]), region of the country (e.g., does respondent live in the Northeast), cohort year, early onset of substance use (i.e., drunkenness, daily cigarette use, and marijuana use before the 9th grade), and peer substance use (i.e., number of friends who get drunk, number of friends who smoke, and number of friends who smoke marijuana). Table 1 includes greater detail on these control variables.

2.4 Analysis

Descriptive statistics were used to examine prevalence of high-intensity drinking and NMUPD. Multiple logistic regression was used to examine the odds of past-month NMUPD among the four mutually exclusive thresholds of past two-week high-intensity drinking

when controlling for potentially confounding factors. The additional sub-analysis of the sample of respondents for 2005 and 2006 assessed past-year prevalence rates of simultaneous co-ingestion of alcohol and prescription drugs across the different thresholds of high-intensity drinking when control variables were included. Finally, additional analyses tested for differences by sex and race by examining interaction effects within the multiple logistic regression analyses with control variables.

STATA 14.0 was used to estimate the models outlined above (Version 14.0; StataCorp LP, College Station, Texas). All logistic regression models provide adjusted odds ratios (AOR) and 95% confidence intervals (95% CI) while controlling for confounders. All analyses used the weights provided by the MTF (public use files) to account for the probability of selection into the sample. Finally, given missing data within the MTF sample, multiple imputation was used to impute missing observations (Raghunathan et al., 2001). In particular, sequential regression imputation was used to impute missing values on all the variables used in the analyses; several separate imputations with the full MTF sample used chained multinomial, logistic, and ordered logit models in STATA's "mi impute chained" procedure (10 imputations, 5 burn-in iterations each; "augment" option was used in the presence of perfect prediction).

3.0 Results

Among all of the 12th grade respondents, 6.6% indicated past-month NMUPD; 3.5% indicated past-month nonmedical use of prescription opioids, 2.2% indicated past-month nonmedical use of prescription sedatives, 3.0% indicated past-month nonmedical use of prescription stimulants, and 2.4% indicated past-month nonmedical use of prescription tranquilizers. With respect to high-intensity drinking, the majority of respondents indicated 0 to 4 drinks on at least one occasion during the past two weeks (80.9%), 9.1% indicated 5 to 9 drinks on at least one occasion during the past two weeks, 4.7% indicated 10 to 14 drinks on at least one occasion during the past two weeks, and 5.3% indicated 15 or more drinks on at least once occasion during the past two weeks.

Table 2 shows the descriptive statistics examining past-month NMUPD by past two-week prevalence of high-intensity drinking. The results show that more than one in every four 12th graders who consumed 15 or more drinks in one sitting also indicated past-month NMUPD (27.2%). Moreover, more than one in every ten 12th graders who consumed between 5 and 9 drinks (14.6%), or between 10 to 14 drinks (18.5%), also reported past-month NMUPD. Across all thresholds of high-intensity drinking, nonmedical use of prescription opioids was the most common type of NMUPD.

Results presented in Tables 3 examine the associations between high-intensity drinking and NMUPD with control variables. The odds of engaging in any past-month NMUPD was higher among 12th graders who indicated any type of high-intensity drinking when compared to their peers who did not engage in high-intensity drinking. For instance, 12th graders who indicated drinking 15 or more drinks had higher odds of each type of past-month NMUPD when compared to 12th graders who did not engage in high-intensity drinking.

Several differences were also found between different thresholds of past two week high-intensity drinking (tables not provided). In particular, 12th graders who indicated drinking 5 to 9 or 10 to 14 drinks on at least one occasion during the past two weeks had similar odds of engaging in any past-month NMUPD. This was consistent across all prescription drug classes. However, 12th graders who indicated drinking 15 or more drinks had roughly one-and-a-half times higher odds of any past-month NMUPD when compared to their peers who either drank 5 to 9 drinks (AOR = 1.59; 95% CI = 1.26, 2.02), or 10 to 14 drinks (AOR = 1.34; 95% CI = 1.02, 1.75). This difference was consistent across all drug classes except for a non-significant difference on past-month nonmedical use of prescription opioids and tranquilizers between those who had 10 to 14 and those who had 15 or more drinks.

There were no significant interaction effects between sex and high-intensity drinking with respect to past-month NMUPD (tables not provided). However, there were several statistically significant interactions by race (tables not provided). Black respondents who drank 15 or more drinks on at least one occasion during the past two weeks had higher odds of engaging in past-month nonmedical use of prescription sedatives (16.8%; AOR = 5.15, 95% CI = 1.42, 18.5) and tranquilizers (16.1%; AOR = 7.67, 95% CI = 2.10, 27.9) when compared to White respondents who consumed 15 or more drinks. Hispanic respondents who drank 15 or more drinks during the past two weeks had higher odds of engaging in past-month nonmedical use of prescription opioids (17.6%; AOR = 3.44, 95% CI = 1.53, 7.73) and sedatives (12.1%; AOR = 3.79, 95% CI = 1.47, 9.73) when compared to White respondents who consumed 15 or more drinks. Finally, 'Other Race' respondents who drank 15 or more drinks during the past two weeks had higher odds of past-month nonmedical use of prescription opioids (25.1%; AOR = 2.04, 95% CI = 1.05, 3.93), sedatives (19.7%; AOR = 2.40, 95% CI = 1.09, 5.24), and stimulants (24.8%; AOR = 1.86, 95% CI = 1.02, 3.41) when compared to their White peers who indicated drinking 15 or more drinks.

Table 4 provides the sub-analysis of simultaneous co-ingestion of alcohol and prescription drugs using data from 2005 and 2006. The results indicate that respondents who engaged in high-intensity drinking (i.e., 10 to 14 drinks and 15 or more drinks) consistently had higher odds of reporting any past-year simultaneous co-ingestion of alcohol and prescription drugs when compared to their peers who indicated drinking between 0 to 4 drinks during the past two weeks. These results were similar for simultaneous co-ingestion involving alcohol and prescription opioids, alcohol and prescription stimulants, and alcohol and prescription tranquilizers.

Several differences were also found between different thresholds of past two-week high-intensity drinking (tables not provided). Respondents who reported drinking 10 to 14 drinks (AOR = 2.23, 95% CI = 1.28, 3.88) and 15 or more drinks (AOR = 2.23, 95% CI = 1.25, 3.96) on at least one occasion had higher odds of indicating any past-year simultaneous co-ingestion of alcohol and prescription drugs when compared to respondents who indicated drinking 5 to 9 drinks on at least one occasion during the past two weeks. This pattern was similar for simultaneous co-ingestion of alcohol and prescription opioids and co-ingestion of alcohol and prescription stimulants. No significant differences in the odds of any past-year simultaneous co-ingestion of alcohol and prescription drugs were found between respondents who indicated drinking 10 to 14 drinks and 15 or more drinks during the past

two weeks (along with simultaneous co-ingestion of alcohol and opioids, and simultaneous co-ingestion of alcohol and stimulants). However, respondents who indicated drinking 15 or more drinks had higher odds of past-year simultaneous co-ingestion of alcohol and prescription tranquilizers when compared to their peers who indicated drinking 10 to 14 drinks (AOR = 2.06, 95% CI = 1.00, 4.25) on at least one occasion during the past two weeks.

Finally, the sub-analysis examining simultaneous co-ingestion of alcohol and prescription drugs also tested for interaction effects for sex and race. No interaction effects were found by sex or race. (Note that small sample sizes did not provide adequate power to estimate separate interaction effects for respondents who were Black, Hispanic, or Other race, so a dichotomous race interaction was tested).

4.0 Discussion

High-intensity drinking was associated with an increased risk of past-month NMUPD among nationally representative samples of 12th grade students in the U.S. While prior studies have found strong associations between heavy drinking and NMUPD among adolescents (Inciardi et al., 2004; Barrett et al., 2005; Egan et al., 2013; Garnier et al., 2009; McCabe et al., 2004, 2006, 2007a, 2012, 2015; Schepis et al., 2016), the present study was the first to demonstrate how different thresholds of high-intensity drinking (i.e., 10 to 14 drinks, and 15+ drinks) were associated with NMUPD. In particular, when compared to 12th graders who did not engage in binge or high-intensity drinking (i.e., who had a maximum of 0 to 4 drinks in a row) during the past two weeks, the odds of engaging in nonmedical use of prescription opioids, sedatives, stimulants, and tranquilizers were at least four times higher among 12th graders who indicated drinking 15 or more drinks on at least one occasion. Moreover, when compared to 12th graders who indicated drinking 5 to 9 drinks, or 10 to 14 drinks in a row, the odds of engaging in nonmedical use of prescription sedatives and stimulants during the past 30 days were approximately one-and-a-half times larger for those who drank 15 or more drinks on at least one occasion during the past two weeks. No differences in past-month NMUPD were detected between consuming 5 to 9 drinks and 10 to 14 drinks in a row.

While no differences in the association between high-intensity drinking and NMUPD were found between males and females, significant differences did emerge across different racial/ethnic groups with respect to these associations. The analyses found that among respondents who indicated consuming 15 or more drinks on at least one occasion during the past two weeks, respondents who identified as Black, Hispanic, or other racial/ethnic categories were at higher risk of past-month NMUPD of certain types of prescription drug classes when compared to their White peers. Several national epidemiological studies find that Whites tend to have the highest rates of alcohol consumption (including binge drinking) and alcohol use disorders (e.g., Grant et al., 2015; Miech et al., 2016; SAMHSA, 2016). However, studies have found that historically disadvantaged racial groups are the most vulnerable to negative consequences associated with alcohol consumption (Delker et al., 2016). Results from the current study corroborate that several racial groups who engaged in high-intensity drinking (15+) were more vulnerable to certain types of NMUPD when compared to their

White peers. While the current study cannot determine why these racial groups are at greater risk, it may be that social and cultural factors (i.e., racial discrimination) unique to these racial groups elevates the risk for polysubstance use among individuals engaging in these types of risky drinking behaviors (Mulia et al., 2008, 2009).

The sub-analysis examining past-year simultaneous co-ingestion of alcohol and prescription drugs yielded similar results. In particular, high-intensity drinking (i.e., 10 to 14 drinks and 15+ drinks) was associated with the highest rates of past-year simultaneous co-ingestion of alcohol and prescription drugs. About one-quarter (24%) of adolescents who consumed 15 or more drinks also reported simultaneous co-ingestion of alcohol and prescription drugs during the past year. Given these findings, the 15+ threshold appears to be a critical indicator of drinking that substantially increases the likelihood of engaging in any type of NMUPD, especially among non-Whites. This is alarming given that 1 out of 4 (27.8%) high-intensity drinkers who consumed 15 or more drinks co-ingested prescription opioids, sedatives, stimulants, or tranquilizers. The combination of high-intensity drinking and co-ingestion undoubtedly increases the risk for negative consequences including impaired driving and alcohol or drug-related overdoses (Jones et al., 2011; Dassanayake et al., 2011; SAMHSA, 2004a; 2004b; 2012; 2013b; 2014).

Many adolescents underestimate the perceived harmfulness associated with heavy drinking and NMUPD (Meich et al., 2016) and may not fully understand the dangerous interactions from simultaneously co-ingesting alcohol and NMUPD based on the high rate. For example, mixing prescription stimulants and alcohol can override the protective mechanism of passing out when drinking and approaching dangerous blood-alcohol concentrations which can lead to life-threatening consequences (SAMHSA, 2006). In addition, there is evidence that alcohol increases the subjective effects (e.g., drug liking and euphoria) of prescription opioids, which may partially explain why alcohol and prescription opioids are often simultaneously co-ingested (Zacny and Gutierrez, 2011). Notably, central nervous system depressants (e.g., prescription opioids, sedatives and tranquilizers) are much more toxic and associated with more severe consequences when they are taken with other drugs that depress the central nervous system, such as alcohol, as compared to when they are taken alone (Cone et al., 2004; McCabe et al., 2006; SAMHSA, 2014).

The present study has several limitations that should be addressed. First, the study was cross-sectional and measures of simultaneous co-ingestion of alcohol and prescription drugs were only available for two survey years and did not specifically assess simultaneous high-intensity drinking and NMUPD. Future longitudinal studies should include measures that assess polysubstance use involving more than two substances, dose of NMUPD, and order of substance use involved during simultaneous co-ingestion of prescription drugs and high-intensity drinking. Second, there are some important subgroups of the U.S. youth population, such as students who were home-schooled, dropped out of school, or were absent on the day of data collection, who are not included. Third, the number of racial minorities were too small to examine potential racial interactions in simultaneous co-ingestion of alcohol and NMUPD between individual racial minority groups and future research should consider such racial interactions with larger samples based on the present study. Finally, all measures were based on self-reports. While prior work has found that

measures in the MTF study are reliable and valid, studies on youth suggest that misclassification and under-reporting of sensitive behaviors such as high-intensity drinking and NMUPD can occur (e.g., Harrison and Hughes, 1997; Johnston and O'Malley, 1985; Johnston et al., 2016; Miech et al., 2016; Morral et al., 2003; O'Malley et al., 1983), and there are particularly challenges with assessing high-intensity drinking that should be considered in future research (Patrick et al., 2016; White, 2017).

Taking into consideration the results from this study, interventions may need to target certain subgroups regarding the potential risks of co-ingesting alcohol and prescription drugs. For example, given that males have been found to be more likely to receive diverted medication from their peers (McCabe and Boyd, 2005; McCabe et al., 2007b), interventions may want to focus on minimizing peer-to-peer diversion in social contexts that are favorable to excessive drinking. We found that most adolescents who reported each type of past-month NMUPD also engaged in binge drinking or high-intensity drinking in the past two weeks. Prevention efforts must take into account the evidence indicating that each type of NMUPD is largely associated with other high-risk health behaviors rather than solely self-treatment with minimal health risks. Moreover, interventions may target certain social groups (i.e., athletes) within secondary school settings whose members are known to be more likely to engage in both high-intensity drinking and NMUPD (Veliz et al., 2013a; 2013b; 2016). Information regarding the risks associated with mixing alcohol with prescription medications (e.g., fatal overdoses) could occur during yearly physicals or discussed in team meetings by coaches. Accordingly, an increased effort within secondary schools to provide information regarding the hazards of mixing alcohol and prescription drugs may be able to reduce alcohol and drug-related overdoses among adolescents.

Acknowledgments

References

Barrett SP, Darredeau C, Bordy LE, Pihl RO. Characteristics of methylphenidate misuse in a university student sample. Can J Psychiatry. 2005; 50:457–461. [PubMed: 16127963]

Barrett SP, Pihl RO. Oral methylphenidate-alcohol co-abuse. J Clin Psychopharmacol. 2002; 22:633–634. [PubMed: 12454570]

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 Anal Toxicol. 2004; 28:217–225. [PubMed: 15189671]

Dassanayake T, Michie P, Carter G, Jones A. Effect of benzodiazepines, antidepressants and opioids on driving: a systematic review and meta-analysis of epidemiological and experimental evidence. Drug Saf. 2011; 34:125–156. [PubMed: 21247221]

Delker E, Brown Q, Hasin DS. Alcohol consumption in demographic subpopulations. Alcohol Res. 2016; 38:7–15. [PubMed: 27159807]

Egan KL, Reboussin BA, Blocker JN, Wolfson M, Sutfin EL. Simultaneous use of non-medical ADHD prescription stimulants and alcohol among undergraduate students. Drug Alcohol Depend. 2013; 131:71–77. [PubMed: 23274057]

Garnier LM, Arria AM, Caldeira KM, Vincent KB, O'Grady KE, Wish ED. Nonmedical prescription analgesic use and concurrent alcohol consumption among college students. Am J Drug Alcohol Abuse. 2009; 35:334–338. [PubMed: 20180661]

Grant BF, Goldstein RB, Saha TD, Chou SP, Jung J, Zhang H, Pickering RP, Ruan WJ, Smith SM, Huang B, Hasin DS. Epidemiology of DSM-5 alcohol use disorder: results from the National Epidemiologic Survey on Alcohol and Related Conditions III. JAMA Psychiatry. 2015; 72:757–766. [PubMed: 26039070]

Harrison L, Hughes A. The validity of self-reported drug use: Improving the accuracy of survey estimates. NIDA Res Monogr. 1997; 167:1–16.

Hingson RW, White A. Trends in extreme binge drinking among US high school seniors. JAMA Pediatr. 2013; 167:996–998. [PubMed: 24042186]

Inciardi JA, Surratt HL, Martin SS, Gealt R. Prevalence of narcotic analgesic abuse among students: Individual or poly-drug abuse? Arch Pediatr Adolesc Med. 2004; 158:498–499.

Jackson KM. Heavy episodic drinking: Determining the predictive utility of five or more drinks. Psychol Addict Behav. 2008; 22:68–77. [PubMed: 18298232]

Johnston LD, O'Malley PM. Issues of validity and population coverage in student surveys of drug use. NIDA Res Monogr. 1985; 57:31–54. [PubMed: 3929114]

Johnston, LD., O'Malley, PM., Miech, RA., Bachman, JG., Schulenberg, JE. Monitoring the future national survey results on drug use: 1975–2015: Overview, key findings on adolescent drug use. University of Michigan Institute for Social Research; Ann Arbor, MI: 2016.

Jones AW, Kugelberg FC, Holmgren A, Ahlner J. Drug poisoning deaths in Sweden show a predominance of ethanol in mono-intoxications, adverse drug-alcohol interactions and poly-drug use. Forensic Sci Int. 2011; 206:43–51. [PubMed: 20630671]

Jones CM, Paulozzi LJ, Mack KA. Alcohol involvement in opioid pain reliever and benzodiazepine drug abuse-related emergency department visits and drug-related deaths—United States, 2010. MMWR. 2014; 63:881–885. [PubMed: 25299603]

McCabe SE, Boyd CJ. Sources of prescription drugs for illicit use. Addict Behav. 2005; 30:1342–1350. [PubMed: 16022931]

McCabe SE, Boyd CJ, Teter CJ. Subtypes of nonmedical prescription drug misuse. Drug Alcohol Depend. 2009; 102:63–70. [PubMed: 19278795]

McCabe SE, Cranford JA. Motivational subtypes of nonmedical use of prescription medications: Results from a national study. J Adolesc Health. 2012; 51:445–452. [PubMed: 23084165]

McCabe SE, Cranford JA, Boyd CJ, Teter CJ. Motives, diversion and routes of administration associated with nonmedical use of prescription opioids. Addict Behav. 2007b; 32:562–75. [PubMed: 16843611]

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. 2006; 67:529–537. [PubMed: 16736072]

McCabe SE, Schulenberg JE, O'Malley PM, Patrick ME, Kloska D. Non-medical use of prescription opioids during the transition to adulthood: A multi-cohort national longitudinal study. Addiction. 2014; 109:102–110. [PubMed: 24025114]

McCabe SE, Teter CJ, Boyd CJ. The use, misuse and diversion of prescription stimulants among middle and high school students. Subst Use Misuse. 2004; 39:1095–1117. [PubMed: 15387205]

McCabe SE, West BT, Schepis TS, Teter CJ. Simultaneous co-ingestion of prescription stimulants, alcohol and other drugs: a multi-cohort national study of US adolescents. Hum Psychopharmacol. 2015; 30:42–51. [PubMed: 25370816]

McCabe SE, West BT, Teter CJ, Boyd CJ. Co-ingestion of prescription opioids and other drugs among high school seniors: Results from a national study. Drug Alcohol Depend. 2012; 126:65–70. [PubMed: 22609061]

McCabe SE, West BT, Wechsler H. Alcohol-use disorders and nonmedical use of prescription drugs among U.S. college students. J Stud Alcohol. 2007a; 68:543–547.

Miech, RA., Johnston, LD., O'Malley, PM., Bachman, JG., Schulenberg, JE. Monitoring the Future National Survey Results on Drug Use, 1975–2015. Volume I: Secondary school students. University of Michigan Institute for Social Research; Ann Arbor, MI: 2016.

Morral AR, McCaffrey DF, Chien S. Measurement of adolescent drug use. J Psychoactive Drugs. 2003; 35:301–309. [PubMed: 14621128]

Mulia N, Ye Y, Greenfield TK, Zemore SE. Disparities in alcohol-related problems among White, Black, and Hispanic Americans. Alcohol Clin Exp Res. 2009; 33:654–662. [PubMed: 19183131]

Mulia N, Ye Y, Zemore SE, Greenfield TK. Social disadvantage, stress, and alcohol use among Black, Hispanic, and White Americans: Findings from the 2005 U.S. national alcohol survey. J Stud Alcohol Drugs. 2008; 69:824–833. [PubMed: 18925340]

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]

Patrick ME. A call for research on high-intensity alcohol use. Alcohol Clin Exp Res. 2016; 40:256–259. [PubMed: 26842244]

Patrick ME, Schulenberg JE, Martz ME, Maggs JL, O'Malley PM, Johnston LD. Extreme binge drinking among 12th-grade students in the United States. JAMA Pediatr. 2013; 167:1019–1025. [PubMed: 24042318]

Patrick ME, Terry-McElrath YM, Kloska DD, Schulenberg JE. High-intensity drinking among young adults in the United States: Prevalence, frequency, and developmental change. Alcohol Clin Exp Res. 2016; 40:1905–1912. [PubMed: 27488575]

Read JP, Beattie M, Chamberlain R, Merrill JE. Beyond the "binge" threshold: Heavy drinking patterns and their association with alcohol involvement indices in college students. Addict Behav. 2008; 33:225–234. [PubMed: 17997047]

Raghunathan TE, Lepkowski JM, Van Hoewyk J, Solenberger P. A multivariate technique for multiply imputing missing values using a sequence of regression models. Surv Methodol. 2001; 27:85–95.

Substance Abuse and Mental Health Services Administration. Benzodiazepines in Drug Abuse-Related Emergency Department Visits: 1995–2002. Department of Health and Human Services; Rockville, MD: 2004a. The DAWN Report.

Substance Abuse and Mental Health Services Administration. Oxycodone, Hydrocodone, and Polydrug Use, 2002. Department of Health and Human Services; Rockville, MD: 2004b. The DAWN Report.

Substance Abuse and Mental Health Services Administration. Emergency Department Visits Involving ADHD Stimulant Medications. Department of Health and Human Services; Rockville, MD: 2006. The DAWN Report.

Substance Abuse and Mental Health Services Administration. Drug Misuse or Abuse-Related Emergency Department Visits Involving Nonmedical Use of Pharmacuticals Vary by Gender among Older Adolescents, 2010. Department of Health and Human Services; Rockville, MD: 2012. The DAWN Report.

Substance Abuse and Mental Health Services Administration. Results from the 2012 National Survey on Drug Use and Health: Detailed tables (Tables 2.77B and 2.79B). 2013a. Retrieved from http://www.samhsa.gov/data/NSDUH/2012SummNatFindDetTables/DetTabs/NSDUH-DetTabsTOC2012.htm

Substance Abuse and Mental Health Services Administration. Drug Abuse Warning Network, 2011: National Estimates of Drug-Related Emergency Department Visits. Rockville, MD: 2013b. HHS Publication No. (SMA) 13-4760, DAWN Series D-39

Substance Abuse and Mental Health Services Administration. Substance Abuse and Mental Health Services Administration. The DAWN Report: Benzodiazepines in Combination with Opioid Pain Relievers or Alcohol: Greater Risk of More Serious ED Visit Outcomes. Substance Abuse and Mental Health Services Administration; Rockville, MD: 2014.

Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality, 2016. National Survey on Drug Use and Health: Detailed Tables. Substance Abuse and Mental Health Services Administration; Rockville, MD: 2015.

Schepis TS, West BT, Teter CJ, McCabe SE. Prevalence and correlates of co-ingestion of prescription tranquilizers and other psychoactive substances by U.S. high school seniors: Results from a national survey. Addict Behav. 2016; 52:8–12. [PubMed: 26334560]

Terry-McElrath YM, O'Malley PM, Johnston LD. Reasons for drug use among American youth by consumption level, gender, and race-ethnicity: 1976–2005. J Drug Issues. 2009; 39:677–714. [PubMed: 20628558]

Veliz P, Boyd CJ, McCabe SE. Playing through pain: sports participation and nonmedical use of opioid medications among adolescents. Am J Public Health. 2013a; 103:e28–e30.

Veliz P, Boyd CJ, McCabe SE. Adolescent athletic participation and nonmedical Adderall use: An exploratory analysis of a performance-enhancing drug. J Stud Alcohol Drugs. 2013b; 74:714–719. [PubMed: 23948530]

Veliz P, McCabe SE, Boyd CJ. Extreme binge drinking among adolescent athletes: A cause for concern? Am J Addiction. 2016; 25:37–40.

White AM. Commentary on Patrick and colleagues: High-intensity drinking among young adults in the United States: Prevalence, frequency, and developmental change. Alcohol Clin Exp Res. 2017; 41:270–274. [PubMed: 28102543]

White AM, Hingson RW, Pan IJ, Yi HY. Hospitalizations for alcohol and drug overdoses in young adults ages 18–24 in the United States, 1999–2008: results from the nationwide inpatient sample. J Stud Alcohol Drugs. 2011; 72:774–786. [PubMed: 21906505]

White AM, Kraus CL, Swartzwelder HS. Many college freshmen drink at levels far beyond the binge threshold. Alcohol Clin Exp Res. 2006; 30:1006–1010. [PubMed: 16737459]

Zacny JP, Gutierrez S. Subjective, psychomotor, and physiological effects of oxycodone alone and in combination with ethanol in healthy volunteers. Psychopharmacology. 2011; 218:471–481. [PubMed: 21603891]

Highlights

- High-intensity drinking was associated with an increased risk of nonmedical use of prescription drugs (NMUPD).

- Co-ingestion of alcohol and NMUPD was more prevalent among high-intensity drinkers.

- These findings were similar across different classes of prescription drugs.

Table 1

Sample characteristics (weighted estimates are provided n = 26,502)

	(n = 26,502) Multiple Imputation (10 imputations)		(n = 17,234) Full sample (listwise deletion)		
	%	SE	%	SE	% Missing
High intensity drinking (past two weeks)					
0 to 4 drinks in a row (ref.)	80.9%	0.003	82.2%	0.003	
5 to 9 drinks in a row	9.1%	0.002	9.2%	0.003	
10 to 14 drinks in a row	4.7%	0.002	4.5%	0.002	6.10%
15 or more drinks in a row	5.3%	0.002	4.1%	0.002	
Nonmedical Prescription Drug Use (past month)					
Any Nonmedical Prescription Drug Use	6.6%	0.002	5.8%	0.002	12.4%
Nonmedical Opioid Use	3.5%	0.002	3.0%	0.002	9.80%
Nonmedical Sedative Use	2.2%	0.001	1.8%	0.001	8.20%
Nonmedical Stimulant Use	3.0%	0.001	2.4%	0.001	7.60%
Nonmedical Tranquilizer Use	2.4%	0.001	1.7%	0.001	8.80%
Control Variables					
Male (ref.)	48.4%	0.004	46.6%	0.004	9.2%
Female	51.6%	0.004	53.4%	0.004	
White (ref.)	55.7%	0.004	64.7%	0.004	
Black	10.9%	0.002	9.4%	0.003	0.00%
Hispanic	13.6%	0.002	12.8%	0.003	
Other race	19.9%	0.003	13.1%	0.003	
Both parents do not have a college degree (ref.)	50.1%	0.004	47.0%	0.004	8.8%
At least one parent has a college degree	49.9%	0.004	53.0%	0.004	
2005–06 (ref.)	19.1%	0.003	19.8%	0.003	
2007–08	18.8%	0.003	19.0%	0.003	
2009–10	18.5%	0.003	18.3%	0.003	0.00%
2011–12	18.3%	0.003	18.5%	0.003	
2013–14	16.6%	0.003	16.1%	0.003	
2015	8.7%	0.002	8.3%	0.003	
Lives in the North East (ref.)	18.4%	0.003	17.1%	0.003	0.00%
Lives in the Midwest	23.3%	0.003	25.2%	0.004	

	(n = 26,502) Multiple Imputation (10 imputations)		(n = 17,234) Full sample (listwise deletion)		
High intensity drinking (past two weeks)	%	SE	%	SE	% Missing
Lives in the South	36.3%	0.003	34.6%	0.004	
Lives in the West	21.9%	0.003	23.1%	0.004	
Lives in a Non-MSA (ref.)	20.9%	0.003	21.5%	0.004	
Lives in a other MSA	48.5%	0.004	49.5%	0.004	0.00%
Lives in a Large MSA	30.6%	0.003	29.1%	0.004	
Did not skip class during the past month (ref.)	68.5%	0.004	70.4%	0.004	13.3%
Skipped class during the past month	31.5%	0.004	29.6%	0.004	
Average grade is a B- or higher (ref.)	83.2%	0.003	85.4%	0.003	11.2%
Average grade is a C+ or lower	16.8%	0.003	14.6%	0.003	
Does not work (ref.)	37.6%	0.004	36.2%	0.004	12.70%
Works 1 to 20 hours during a typical week	41.6%	0.004	44.0%	0.004	
Works 21 or more hours during a typical week	20.8%	0.004	19.8%	0.004	
Indicated first time being drunk during the 9th grade or later/never drunk (ref.)	89.1%	0.002	90.2%	0.003	16.40%
Indicated first time being drunk before the 9th grade	10.9%	0.002	9.8%	0.003	
Indicated first daily cigarette use during the 9th grade or later/never smoked (ref.)	95.7%	0.002	96.5%	0.002	11.1%
Indicated first daily cigarette use before the 9th grade	4.3%	0.002	3.5%	0.002	
Indicated first marijuana use during the 9th grade or later/never smoked marijuana (ref.)	88.8%	0.002	90.5%	0.003	10.90%
Indicated first marijuana use before the 9th grade	11.2%	0.002	9.5%	0.003	
Number of friends who get drunk at least once a week (none, a few, some) (ref.)	80.2%	0.003	81.5%	0.003	8.30%
Number of friends who get drunk at least once a week (Most, All)	19.8%	0.003	18.5%	0.003	
Number of friends who smoke cigarettes (none, a few, some) (ref.)	86.7%	0.003	87.9%	0.003	8.10%
Number of friends who smoke cigarettes (Most, All)	13.3%	0.003	12.1%	0.003	
Number of friends who smoke marijuana (none, a few, some) (ref.)	75.7%	0.003	77.7%	0.004	8.10%
Number of friends who smoke marijuana (Most, All)	24.3%	0.003	22.3%	0.004	

% = percent; SE = standard error; ref. = reference group in the multiple logistic regression analysis

Table 2

High intensity drinking and nonmedical prescription drug use during the past month (2005 to 2015)

High intensity drinking (past two weeks)	Any Nonmedical Prescription Drug Use (past 30 days)		Nonmedical Opioid Use (past 30 days)		Nonmedical Sedative Use (past 30 days)		Nonmedical Stimulant Use (past 30 days)		Nonmedical Tranquilizer Use (past 30 days)	
	%	OR 95% CI	%	OR 95% CI	%	OR 95% CI	%	OR 95% CI	%	OR 95% CI
0 to 4 drinks in a row	3.7%		1.7%		1.2%		1.4%		1.0%	
5 to 9 drinks in a row	14.6%	4.43***(3.76, 5.21)	7.6%	4.86***(3.86, 6.12)	3.9%	3.42***(2.47, 4.72)	6.6%	5.18***(4.05, 6.62)	5.2%	5.37***(4.04, 7.14)
10 to 14 drinks in a row	18.5%	5.89***(4.84, 7.18)	11.3%	7.56***(5.82, 9.82)	5.8%	5.07***(3.50, 7.33)	9.2%	7.34***(5.59, 9.62)	7.8%	8.32***(6.09, 11.3)
15+ drinks in a row	27.2%	9.68***(8.06, 11.6)	18.0%	12.9***(10.3, 16.2)	11.6%	10.8***(8.24, 14.2)	16.9%	14.9***(11.8, 18.7)	13.7%	15.5***(12.0, 20.0)

p<.05*, p<.01**, p<.001***

Table 3

High intensity drinking and nonmedical prescription drug use during the past 30 days (2005 to 2015)

	Any Nonmedical Prescription Drug Use (past 30 days)	Nonmedical Opioid Use (past 30 days)	Nonmedical Sedative Use (past 30 days)	Nonmedical Stimulant Use (past 30 days)	Nonmedical Tranquilizer Use (past 30 days)
	AOR 95% CI	AOR 95% CI	AOR 95% CI	AOR 95% CI	AOR 95% CI
High intensity drinking (past two weeks)					
5 to 9 drinks in a row	2.50***(2.07, 3.00)	2.47***(1.92, 3.20)	1.91***(1.31, 2.77)	2.83***(2.16, 3.71)	2.73***(1.98, 3.77)
10 to 14 drinks in a row	3.99***(2.36, 3.77)	3.31***(2.41, 4.55)	2.68***(1.79, 4.01)	3.57***(2.59, 4.93)	4.06**(2.77, 5.96)
15+ drinks in a row	4.43***(3.18, 5.01)	4.28***(3.19, 5.76)	4.42***(3.05, 6.40)	5.84***(4.41, 7.73)	5.58***(3.92, 7.96)
Control Variables					
Female	1.35***(1.17, 1.56)	1.19 (.986, 1.44)	1.61***(1.28, 2.01)	1.36** (1.11, 1.66)	1.47***(1.16, 1.86)
Black	.480***(.352, .654)	.629* (.416, .951)	.721 (.432, 1.20)	.495** (.302, .812)	.451* (.257, .793)
Hispanic	.549***(.432, .698)	.543***(.383, .770)	.652 (.422, 1.00)	.711 (.493, 1.02)	.884 (.576, 1.35)
Other race	.964 (.816, 1.14)	1.14 (.888, 1.46)	1.35* (1.01, 1.80)	1.18 (.934, 1.50)	1.55** (1.17, 2.07)
At least one parent has a college degree	1.08 (.944, 1.24)	1.02 (.851, 1.22)	1.18 (.932, 1.51)	1.13 (.934, 1.37)	1.18 (.939, 1.48)
2007–08	1.10 (.910, 1.34)	1.18 (.905, 1.54)	.924 (.672, 1.27)	.946 (.708, 1.26)	1.11 (.802, 1.55)
2009–10	.985 (.799, 1.21)	1.08 (.796, 1.46)	.830 (.591, 1.16)	.911 (.676, 1.22)	1.25 (.871, 1.80)
2011–12	1.01 (.822, 1.25)	.871 (.655, 1.15)	.745 (.513, 1.08)	1.01 (.755, 1.35)	1.15 (.784, 1.68)
2013–14	.977 (.786, 1.21)	.816 (.600, 1.11)	.713 (.501, 1.01)	1.14 (.845, 1.53)	1.24 (.867, 1.80)
2015	.833 (.626, 1.10)	.782 (.509, 1.20)	.741 (.460, 1.19)	.932 (.629, 1.38)	.719 (.422, 1.22)
Lives in the Midwest	1.49***(1.23, 1.80)	1.59***(1.21, 2.09)	1.32 (.927, 1.89)	1.10 (.853, 1.43)	1.11 (.796, 1.55)
Lives in the South	1.46***(1.22, 1.76)	1.27 (.943, 1.70)	1.73***(1.27, 2.37)	1.07 (.831, 1.38)	1.75***(1.28, 2.40)
Lives in the West	1.41***(1.15, 1.73)	1.55** (1.14, 2.12)	1.39 (.977, 2.00)	.964 (.723, 1.28)	.968 (.663, 1.41)
Lives in a other MSA	1.32* (1.11, 1.57)	1.10 (.865, 1.40)	1.25 (.942, 1.66)	1.41** (1.10, 1.81)	1.43* (1.07, 1.89)
Lives in a Large MSA	1.13 (.936, 1.37)	.955 (.722, 1.26)	.990 (.714, 1.37)	1.30 (.981, 1.73)	1.36 (.992, 1.87)
Skipped class during the past month	1.67***(1.45, 1.93)	1.83***(1.50, 2.24)	1.45** (1.14, 1.85)	1.71***(1.37, 2.12)	1.90***(1.45, 2.48)
Average grade is a C+ or lower	1.06 (.908, 1.24)	.982 (.789, 1.22)	1.11 (.844, 1.47)	1.17 (.869, 1.59)	1.15 (.861, 1.56)
Works 1 to 20 hours during a typical week	.998 (.851, 1.17)	1.23 (.974, 1.55)	.967 (.728, 1.28)	.998 (.773, 1.28)	1.09 (.826, 1.44)
Works 21 or more hours during a typical week	1.08 (.911, 1.29)	1.25 (.954, 1.63)	.866 (.636, 1.18)	1.27 (.903, 1.80)	.993 (.741, 1.33)
Indicated first time being drunk before the 9th grade	1.58***(1.29, 1.93)	1.66**(1.26, 2.19)	1.61** (1.13, 2.30)	1.28 (.973, 1.70)	1.26 (.894, 1.78)
Indicated daily cigarette use before the 9th grade	1.19 (.924, 1.54)	1.30 (.953, 1.78)	2.03***(1.41, 2.91)	1.52 ** (1.13, 2.04)	1.61** (1.13, 2.29)

High intensity drinking (past two weeks)	**Any Nonmedical Prescription Drug Use (past 30 days)**	**Nonmedical Opioid Use (past 30 days)**	**Nonmedical Sedative Use (past 30 days)**	**Nonmedical Stimulant Use (past 30 days)**	**Nonmedical Tranquilizer Use (past 30 days)**
	AOR 95% CI	**AOR 95% CI**	**AOR 95% CI**	**AOR 95% CI**	**AOR 95% CI**
Indicated first marijuana use before the 9th grade	1.71***(1.40, 2.10)	1.76***(1.39, 2.24)	1.54** (1.13, 2.10)	1.51** (1.15, 1.98)	2.03***(1.50, 2.75)
Number of friends who get drunk at least once a week (Most, All)	1.19* (1.02, 1.40)	1.12 (.905, 1.40)	1.10 (.838, 1.46)	1.27* (1.01, 1.60)	.951 (.730, 1.23)
Number of friends who smoke cigarettes (Most, All)	1.85***(1.56, 2.20)	1.79***(1.38, 2.31)	1.48** (1.11, 1.98)	1.77***(1.39, 2.26)	2.14***(1.61, 2.86)
Number of friends who smoke marijuana (Most, All)	2.20***(1.89, 2.56)	2.68***(2.18, 3.30)	2.27***(1.76, 2.93)	2.13***(1.67, 2.73)	2.77***(2.09, 3.65)

$p < .05$*, $p < .01$**, $p < .001$***

Table 4

High intensity drinking and past-year coingestion of alcohol and prescription drugs (all respondents; n = 5062) (2005 to 2006)

High intensity drinking (past two weeks)	Coingestion of alcohol and any prescription drug (5.6%)		Coingestion of alcohol and prescription opioids (3.1%)		Coingestion of alcohol and prescription stimulants (2.9%)		Coingestion of alcohol and prescription tranquilizers (2.3%)	
	%	AOR 95% CI	%	AOR 95% CI	%	AOR 95% CI	%	AOR 95% CI
0 to 4 drinks in a row (77.8%)	2.6%		1.4%		1.2%		0.9%	
5 to 9 drinks in a row (10.5%)	9.6%	1.74* (1.08, 2.79)	5.3%	1.76 (.947, 3.28)	4.4%	1.61 (.859, 3.03)	4.7%	2.53** (1.25, 5.15)
10 to 14 drinks in a row (5.3%)	19.7%	3.88*** (2.33, 6.45)	11.8%	3.77*** (1.99, 7.12)	11.2%	4.78*** (2.39, 9.55)	6.1%	2.90** (1.41, 5.95)
15 or more drinks in a row (6.4%)	23.5%	3.87*** (2.27, 6.61)	12.9%	3.69*** (1.87, 7.31)	13.9%	4.87*** (2.48, 9.54)	12.3%	5.96***(2.86, 12.4)

p<.05*, p<.01**, p<.001***

All models control for the race, parental education, cohort year, region, urbanicity, truancy, average grade, hours of paid work per week, early onset of drunkenness, early onset of daily cigarette use, early onset of marijuana use, number of friends who get drunk, number of friends who smoke cigarettes, and number of friends who smoke marijuana; refer to table 3 regarding how they were included in the logistic regression models (estimates not provided, but are available upon request). Multiple imputation (m = 10) was used to impute missing data. It should be noted that the percent of missing data on the coingestion items ranged from 7.0% (coingestion of alcohol and stimulants) to 9.1% (coingestion of alcohol and opioids).