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## 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 0–4 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.

## 1. 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 18–24) 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., 2008). 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,b, 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-

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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., 10–14 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. 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) 0–4 drinks in a row, (2) 5–9 drinks in a row, (3) 10–14 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 asked 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%

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