



# Simultaneous alcohol and marijuana use among US high school seniors from 1976 to 2011: Trends, reasons, and situations



Yvonne M. Terry-McElrath\*, Patrick M. O'Malley, Lloyd D. Johnston

Institute for Social Research, University of Michigan, PO Box 1248, Ann Arbor, MI 48106-1248, United States

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## ABSTRACT

**Background:** Simultaneous alcohol and marijuana (SAM) use raises significant concern due to the potential for additive or interactive psychopharmacological effects. However, no nationally representative studies are available that document prevalence, trends, or related factors in US youth SAM use.

**Methods:** Nationally representative cross-sectional samples of 12th grade students surveyed in the Monitoring the Future project from 1976 to 2011 provided data on SAM use. Analyses were conducted in 2012.

**Results:** In 2011, 23% of all US high school seniors reported any SAM use. Among seniors reporting any past 12-month marijuana use, 62% reported any SAM use and 13% reported SAM use most or every time they used marijuana. SAM use consistently followed trends for past 30-day alcohol use over time. SAM use showed significant variation by psychosocial and demographic characteristics and was strongly associated with higher substance use levels, but occurred across the substance use spectrum. Certain reasons for alcohol or marijuana use (to increase effects of another drug; I'm hooked) and situations of alcohol or marijuana use (park/beach, car, party) were strongly associated with SAM use.

**Conclusions:** A sizable proportion of US high school seniors reported SAM use, and it appeared to occur frequently in social use situations that could impact both the public as well as youth drug users. SAM use appears to be a complex behavior that is incidental to general substance use patterns as well as associated with (a) specific simultaneous reasons (or expectancies), and (b) heavy substance use and perceived dependence, especially on alcohol.

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## 1. Introduction

The use of alcohol together with one or more illegal substances at the same occasion (hereafter referred to as simultaneous drug use) raises significant concern due to the potential for additive or interactive psychopharmacological effects. Available studies indicate the most common form of simultaneous drug use involves alcohol and marijuana (Collins et al., 1998; Earleywine and Newcomb, 1997; Martin et al., 1996; Midanik et al., 2007; SAMHSA, 2009). Consequences of simultaneous alcohol and marijuana (SAM) use include additive effects on a variety of cognitive, perceptual and motor functions, with clearly increased risk for behaviors such as driving (Belgrave et al., 1979; Chesher et al., 1976, 1977; Kelly et al., 2004; Lamers and Ramaekers, 2001; Ramaekers et al., 2000; Robbe, 1998). SAM use has been significantly and positively associated with social consequences, alcohol dependence and depression, binge drinking, and other health problems (Brière et al., 2011; Martin et al., 1996; Midanik et al., 2007; SAMHSA, 2009).

Little is known about why or where SAM use typically occurs. Findings are mixed as to whether SAM use is incidental to general substance use (i.e., use prevalence of alcohol and marijuana are both high enough that it may be common for both substances to be used together; Hoffman et al., 2000) or relates to specific simultaneous use expectancies over and above drug-specific expectancies (i.e., the desire for a unique high; Barnwell and Earleywine, 2006). If SAM use is a general "by-product" of heavy use of both substances, then reducing or preventing heavy use should reduce or prevent simultaneous use. However, if SAM use is not fully explained by independent levels of alcohol and marijuana use, there may be specific risk factors that could help identify individuals most at risk for SAM use and associated consequences.

Adult SAM use may be especially related to negative emotional states and social contexts (Pakula et al., 2009). SAM use has been shown to vary by gender (Collins et al., 1998; Hoffman et al., 2000; Martin et al., 1992; Midanik et al., 2007; Pakula et al., 2009; SAMHSA, 2009), sensation seeking (Martin et al., 1992) and low educational attainment (Midanik et al., 2007). Results have been mixed for differences by race/ethnicity (Collins et al., 1998; Hoffman et al., 2000; Midanik et al., 2007; Norton and Colliver, 1988; SAMHSA, 2009). Available studies on youth SAM use are

\* Corresponding author. Tel.: +1 734 647 9142; fax: +1 734 936 0043.  
E-mail address: [yterry@umich.edu](mailto:yterry@umich.edu) (Y.M. Terry-McElrath).

limited. In the 1982 National Household Survey on Drug Abuse, 7% of youth aged 12–17 reported at least occasional past 30-day SAM use (Norton and Colliver, 1988). In the National Surveys on Drug Use and Health of 2006 and 2007, 14% of 12–17 year olds reported past-month simultaneous illicit drug or alcohol use (SAM use specifically was not reported, but marijuana was the illicit drug most frequently used with alcohol (SAMHSA, 2009)). Past 6-month SAM use prevalence rates among New York 7th–12th graders for the years 1983, 1990, and 1994 were reported to be 25%, 12% and 21%, respectively (Hoffman et al., 2000). SAM use among Quebec high school students from disadvantaged areas averaged 30% from 2004 to 2008 (Brière et al., 2011). An additional study used 1990 data from the RAND Adolescent Panel Study of West Coast youth to report past 12-month SAM use prevalence rates of 28% (Collins et al., 1998). To our knowledge, no studies using nationally representative data have been published presenting youth SAM use trends over time, or that provide detailed information on the reasons, locations, and situations for substance use reported by adolescents who also report SAM use.

The current study used nationally representative data from US high school seniors to examine the following questions: (1) What percentage report SAM use, and has this percentage remained stable from 1976 to 2011? (2) How does SAM use associate with use frequency of both marijuana and alcohol? (3) What psychosocial and demographic characteristics are associated with SAM use? (4) What reasons for and situations of alcohol and marijuana use are frequently reported by students who also report frequent SAM use? (5) Do the answers to the above research questions support the conceptualization of SAM use as being incidental to general substance use or indicate specific correlates (in particular, simultaneous use reasons/expectancies)?

## 2. Methods

### 2.1. Sample

The analyses utilized data from nationally representative cross-sectional samples of 12th grade students in the coterminous US collected through the Monitoring the Future (MTF) study (detailed information on design and procedures can be found in Bachman et al. (2011) and Johnston et al. (2012)). Yearly sample selection included approximately 15,000 high school seniors from about 130 schools. In order to reduce respondent burden but still obtain a wide variety of measures, six different questionnaire forms were used in the full MTF study (randomly distributed within classroom); items on SAM use were included on only one form. Surveys were administered in classrooms by University of Michigan personnel; students self-completed questionnaires, usually during a normal class period. Student response rates averaged 83% for 12th graders from 1976 to 2011. Absenteeism was the primary reason for missing data; less than 1% of students were estimated to refuse participation. Appropriate consent was used, and the University of Michigan Behavioral Sciences Institutional Review Board approved the study.

### 2.2. Measures

**2.2.1. Past 12-month substance use.** For alcohol, marijuana and hashish, students self-reported past 12-month use as 0 occasions, 1–2, 3–5, 6–9, 10–19, 20–39, 40 or more occasions (coded in analysis as 0, 1.5, 4, 7.5, 15, 30, 40); dichotomous any/none use measures also were created (responses for marijuana and hashish were combined into a single measure, hereafter referred to as marijuana). An additional dichotomy for any past 12-month use of illicit drugs other than marijuana (IOTM) was also created (including LSD, other psychedelics, cocaine, heroin, and any of the following not under doctor's orders: amphetamines, tranquilizers, barbiturates, and narcotics other than heroin).

**2.2.2. Simultaneous use.** Students who reported any past 12-month marijuana use were asked: "How many of the times when you used marijuana or hashish during the last year did you use it along with alcohol—that is, so that their effects overlapped?" Responses included not at all (1), a few of the times, some of the times, most of the time, every time (5). SAM use was coded in two ways: any simultaneous use (0,1); simultaneous use most or every time (0,1).

**2.2.3. Reasons for and situations of substance use.** Reasons for and situations of alcohol and marijuana use were asked only of students reporting past 12-month use of the specified substance. Respondents were asked, "What have been the most

important reasons for your using [substance]?" (See Table 1 for reason list.) Respondents were instructed to mark all that applied. For situations of use, respondents were asked: "When you used [substance] during the last year, how often did you use it in each of the following situations?" (See Table 1 for situation list.) Responses included not at all (1), a few of the times, some of the times, most of the time, every time (5). Situations were coded as continuous (1–5) and most/every time dichotomies. All reasons and situations focused on a single substance and did not refer to SAM use.

**2.2.4. Psychosocial and demographic control variables.** Self-reported gender, race/ethnicity, number of parents in the home, parental education, college plans, grades, evenings out during the week for recreation, truancy, and religious commitment were included in all multivariate models, as were measures of population density, region, and year. Race/ethnicity was coded as African American, Hispanic, White, or other. Parental education was utilized as a proxy for family socioeconomic status and was coded on an 11-point scale representing student-reported average parental educational attainment for father and mother (missing data for one parent allowed). College plans was a dichotomy indicating plans to probably or definitely graduate from a four-year college program. Grades were self-reported average grades in high school ranging from D (1) to A (9). Number of evenings out per week for fun and recreation was coded on a 6-point scale from less than one (0.5) to six or seven (6.5). Truancy was a mean of the frequency of skipping classes or whole days of school during the past 4 weeks. Religious commitment was a mean of two items assessing the importance of religion (ranging from not important to very important) and frequency of attendance at religious services (ranging from never to about once a week or more). Beginning in 1997, religious commitment items were not asked of students in California schools due to state regulations; all California students were assigned missing data on this measure and treated as a separate category. Population density was coded as large Metropolitan Statistical Area (MSA), other MSA, and non-MSA. For multivariate models, year was coded into individual dummy variables.

### 2.3. Data analysis

Survey commands in SAS 9.2 were used for all analyses to account for the complex MTF survey sampling design. All analyses included weights to adjust for differential probability of selection. Examination of SAM use trends was conducted using surveylogistic models with centered and quadratic year terms (without other control measures). Relationships between substance use frequency and SAM use were conducted with bivariate surveylogistic models with SAM use most/every time regressed on a single continuous substance use frequency measure per model. Surveylogistic models examining psychosocial and demographic characteristics associated with SAM use were conducted in three steps: (1) with each characteristic alone; (2) with all characteristics simultaneously other than substance use frequency; (3) simultaneously with all characteristics including substance use frequency. (Measures of both tolerance and variance inflation showed no indications of significant collinearity resulting from inclusion of substance use frequency in models.) Surveylogistic models examining reasons for and situations of using alcohol and marijuana and their associations with SAM use first simultaneously included all appropriate reasons or situations, and were then repeated including psychosocial and demographic controls and substance use frequency.

## 3. Results

A total of 103,129 unweighted cases were available from 1976 to 2011 from the questionnaire form with SAM use. Five percent of cases had missing data on past 12-month marijuana use; of the remaining 98,007 cases, 38% (37,566) reported any use of marijuana in the past year. SAM use was asked only of respondents indicating any past-year marijuana use; 36,107 respondents provided data (96% of past-year users). An additional 1257 cases with conflicting data on alcohol use and SAM use were removed leaving 34,850 cases for analyses.

### 3.1. SAM use prevalence and trends

Table 1 shows that among seniors reporting any past 12-month marijuana use, 70% reported any SAM use and 18% reported SAM use most/every time from 1976 to 2011. While not the focus of the current study, the respective percentages for all US high school seniors were 26% for any SAM use and 7% for SAM use most/every time. Fig. 1 presents prevalence trends for SAM use and past 30-day alcohol and marijuana use; SAM use trends generally followed those for past 30-day alcohol use. (After aggregating the data to the year level ( $N = 36$ ), Pearson correlations were .803

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