



# Illicit drug use among rave attendees in a nationally representative sample of US high school seniors



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## ABSTRACT

**Background:** The popularity of electronic dance music and rave parties such as dance festivals has increased in recent years. Targeted samples of party-goers suggest high rates of drug use among attendees, but few nationally representative studies have examined these associations.

**Methods:** We examined sociodemographic correlates of rave attendance and relationships between rave attendance and recent (12-month) use of various drugs in a representative sample of US high school seniors (modal age: 18) from the Monitoring the Future study (2011–2013; Weighted  $N = 7373$ ).

**Results:** One out of five students (19.8%) reported ever attending a rave, and 7.7% reported attending at least monthly. Females and highly religious students were less likely to attend raves, and Hispanics, students residing in cities, students with higher income and those who go out for fun multiple times per week were more likely to attend. Rave attendees were more likely than non-attendees to report use of an illicit drug other than marijuana (35.5% vs. 15.6%,  $p < 0.0001$ ). Attendees were more likely to report use of each of the 18 drugs assessed, and attendees were more likely to report more frequent use ( $\geq 6$  times) of each drug ( $ps < 0.0001$ ). Controlling for sociodemographic covariates, frequent attendance (monthly or more often) was associated with higher odds of use of each drug ( $ps < 0.0001$ ). Frequent attendees were at highest risk for use of “club drugs.”

**Discussion:** Findings from this study can help inform prevention and harm reduction among rave attendees at greatest risk for drug use.

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## 1. Introduction

The popularity of “electronic dance music” (EDM) and dance festivals has increased substantially in the US and worldwide in recent years (Watson, 2014). Although data from national samples suggest that drug use among adolescents in the general US population has been decreasing (Johnston et al., 2015), rave, nightclub and festival attendees are high-risk populations who may not be adequately represented in national studies. Nightclub attendees assessed through targeted samples tend to report high rates of drug use (Kelly et al., 2006; Kipke et al., 2007; Mixmag, 2013; Rogers, 2012; Van Havere et al., 2011) and rates appear to be higher than in

the general population (Lim et al., 2008). As drug-related deaths are becoming more common among dance festival attendees (Centers for Disease Control and Prevention, 2010; Ridpath et al., 2014), data is needed from nationally representative samples to determine the extent to which nightlife (or “rave”) attendees are in fact more likely to use various drugs.

“Raves” are dance parties with loud EDM, often accompanied by lights and visual effects. EDM raves gained popularity in the 1980s and have transformed into various scenes with different crowds and forms of EDM. Originally held at underground venues such as warehouses, many parties and scenes moved into more formal venues such as nightclubs, and more recently to large dance festivals, making them more “commercial” (Anderson and Kavanaugh, 2007). Many types of raves still exist today, but the EDM festival scene is of notable popularity as many have tens of thousands attend single events (Ridpath et al., 2014). Since rates of drug use tend to be high among nightlife attendees, it is important to determine which adolescents are more likely to attend these events and

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to examine which attendees are at highest risk for drug use in order to inform prevention and harm reduction.

The term “rave” has been used rather loosely in the scientific literature (Anderson and Kavanaugh, 2007); however, many studies have examined drug use among EDM enthusiasts or “clubbers” from various scenes and EDM venues (e.g., “raves,” nightclubs, circuit parties). To our knowledge, only one study compared rates of use among dance festival attendees to national rates and they found that attendees reported higher rates of use (Lim et al., 2008). Nationally representative studies of the US population in 2013 found past-year ecstasy use, for example, to be 1.5–5.3% (Johnston et al., 2014a; Substance Abuse and Mental Health Services Administration, 2014) and a study of a nationally representative sample in the UK found that 2.3% reported using ecstasy in the past year (UK Focal Point on Drugs, 2014). In comparison, in 2012, the Global Drug Survey, a large-scale Internet survey, found that US “clubbers” reported high rates of use with 61% reporting 12-month use of MDMA, 44% LSD, 41% magic mushrooms, 34% cocaine, 27% amphetamine, and 15% ketamine (Mixmag, 2013). “Club drugs” in particular tend to be highly prevalent among nightlife attendees (McCambridge et al., 2005; Rogers, 2012). The term “club drugs” typically refers to a specific subset of drugs including ecstasy (MDMA, “Molly”), gamma-hydroxybutyrate (GHB), and ketamine (“Special K”); and sometimes Rohypnol (“roofies”), LSD, powder cocaine and methamphetamine have been categorized as club drugs (Gable, 2004; Halkitis et al., 2007; Kelly et al., 2006; Maxwell, 2005). Studies conducted in US cities focusing on nightclub attendees have found that relatively large proportions of attendees had used club drugs (Kelly et al., 2006; Kipke et al., 2007; Mattison et al., 2001; Pantalone et al., 2010). Older studies of UK club attendees recruited via the Internet found that 88–97% of respondents reported lifetime ecstasy use and high rates of other illicit drugs as well (McCambridge et al., 2005; Winstock et al., 2001). While few studies have focused specifically on “raves,” the literature does suggest that drug use among nightlife attendees tends to be prevalent.

The association between drug use and raves may be related, in part, to music preference. For example, one study found that compared to those who preferred listening to other genres (e.g., rock, funk), individuals who preferred dance music were at higher risk for using illicit drugs (Van Haverd et al., 2011). Research has also found that use of certain drugs reportedly heightens or increases the sensation of the rave environment (e.g., lights, music), or facilitates socialization or a sense of “oneness” (Hunt et al., 2009a; Ramo et al., 2010). For others, participating in the rave experience may be spiritual experience (St John, 2004); however, other reasons for drug use among party attendees may be to self-medicate or “fit in” with particular social groups (Hunt et al., 2009a; Kubicek et al., 2007; Mansergh et al., 2001; Moonzwe et al., 2011).

Some studies have examined rates and correlates of club drug use in representative US samples (e.g., Palamar et al., 2014a, 2014b; Palamar and Kamboukos, 2014; Wu et al., 2006), but use among rave attendees has not been compared to use among non-attendees within the same national sample. In this analysis of a nationally representative sample of high school seniors (modal age: 18) we (1) determine sociodemographic correlates of rave attendance, (2) compare drug use between rave attendees and non-rave attendees, and (3) determine how frequency of rave attendance relates to use of various drugs. This study is needed to inform prevention and harm reduction education among a new cohort of adolescents approaching adulthood who attend or plan to attend rave events.

## 2. Methods

### 2.1. Procedure

Monitoring the Future (MTF) is a nationally representative study of US high school students. A new cohort of students is surveyed every year in approximately

130 public and private schools throughout 48 states. Using a multi-stage random sampling procedure, geographic areas were selected, then schools within areas were selected, and then classes within schools were selected. MTF surveys approximately 15,000 high school seniors every year and content is assessed through six different survey forms, which are distributed randomly. Only Form 6 asks about rave attendance (in addition to drug use and demographics). Since only a sixth of the sample was asked about rave attendance, in order to have adequate power, this analysis focused on aggregated (and weighted) data collected from the three most recent cohorts (2011–2013). MTF protocols were approved by the University of Michigan Institutional Review Board (IRB) and the authors’ IRB approved this secondary data analysis.

### 2.2. Measures

Students were asked their sex, age (defined by MTF as <18, ≥18 years) and race/ethnicity (i.e., black, white, Hispanic). Population density of students’ residences were defined as non-, small-, or large-metropolitan statistical areas (MSAs). Religiosity was assessed via two ordinal items asking about religious attendance and importance. These items were computed into a composite and divided into tertiles representing low (1.0–2.0), moderate (2.5–3.0) and high (3.5–4.0) religiosity. Students were asked which parent(s) they resided with in order to assess family composition. Answers were coded into no parents, one parent, or two parents. Students were also asked about educational attainment of each parent and a mean score for both parents (or a raw score if only one parent) was coded into tertiles representing low (1.0–3.0), medium (3.5–4.0), and high (4.5–6.0) education. Students were also asked how much money they earn during the average week from (1) a job or other work, and (2) from other sources. Responses for each of these two income items were coded into \$10 or less, \$11–50, or \$51 or more. Coding of demographic variables was based on previous MTF analyses (Palamar et al., 2014a, 2014b; Palamar and Ompad, 2014; Wallace et al., 2009).

Students were asked how often they go to raves. Answer options were: (1) never, (2) a few times a year, (3) once or twice a month, (4) at least once a week, and (5) almost every day. We dichotomized this variable into any rave attendance: yes/no. We also created a variable collapsing higher frequency attendance (monthly or more frequent) into a single category. Annual (“recent”) use of various drugs was assessed. These analyses focus on recent use of alcohol (“more than just a few sips”), cannabis (marijuana), synthetic cannabinoids, LSD, hallucinogens other than LSD, salvia divinorum, powder cocaine, crack, ketamine, GHB, ketamine, “bath salts” (only assessed in years 2012–2013), methamphetamine (“crystal meth,” “ice”), Rohypnol (“roofies”), heroin, and nonmedical use of opioids (narcotics, “pain killers”), stimulants, tranquilizers and sedatives. MTF did not assess ecstasy/MDMA use in this survey form so this variable could not be analyzed (discussed further in *Limitations*). Answer options for use of each drug were (1) 0 occasions, (2) 1–2 occasions, (3) 3–5 occasions, (4) 6–9 occasions, (5) 10–19 occasions, (6) 20–39 occasions, and (7) 40 or more occasions. Recent use of each was dichotomized (into yes/no). Recent use was also dichotomized into “more frequent” use indicating whether each drug was used ≥6 times in the last year.

### 2.3. Statistical analyses

Analyses focused on students ( $N=7373$ ) who answered the question about rave attendance. Descriptive statistics for each demographic covariate were examined first, and then we examined potential relations between each covariate and (1) any rave attendance (yes/no), and (2) frequent rave attendance (yes/no). All covariates were fit into two separate multivariable logistic regression models, which produced adjusted odds ratios (AORs) in order to determine conditional associations while controlling for all other covariates. Therefore, the first model delineated associations regarding any attendance and the second model delineated associations regarding frequent attendance. These covariates have been examined and controlled for in numerous other MTF studies (e.g., Palamar et al., 2014a, 2014b; Palamar and Ompad, 2014). In both models, we controlled for potential cohort effects and/or secular trends by entering indicators for cohort, with 2011 as the comparison. In addition, since there was a substantial amount of missing data—particularly missing race (16.7%) and missing religiosity (25.5%), we included missing data indicators in multivariable models instead of deleting these cases. For example, for the 16.7% who were missing race, an indicator variable was included to account for the missing level of race so these cases would still be included in the analyses. This method has been used in many MTF analyses (e.g., Palamar and Ompad, 2014; Terry-McElrath et al., 2013). Retaining these cases allowed us to maintain power.

Next, we compared rates of recent use of each drug according to whether or not any rave attendance was reported. Comparisons were tested using Rao–Scott chi-square tests for homogeneity, which correct for the complex study design (Rao and Scott, 1984). We implemented a strict correction for potential non-independent drug use outcomes by using a Bonferroni correction ( $\alpha=0.05/18=0.003$ ). We also computed proportions to determine how much more prevalent use is among rave attendees compared to non-attendees. We then repeated these analyses to examine differences by more frequent use (used ≥6 times). To further examine differences in use by level of attendance, we then repeated analyses comparing those who only attend raves a few times a year with more frequent attendees.

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