Published in final edited form as:

Am J Drug Alcohol Abuse. 2015 May ; 41(3): 197–205. doi:10.3109/00952990.2015.1011745.

Prevalence and Correlates of Hashish Use in a National Sample of High School Seniors in the United States

Joseph J. Palamar^{1,2}, Lily Lee³, and Michael Weitzman^{4,5,6}

¹Department of Population Health, New York University Langone Medical Center, New York, NY

²Center for Drug Use and HIV Research, New York University, New York, NY

³Brooklyn College, City University of New York, Brooklyn, New York

⁴Department of Pediatrics, New York University Langone Medical Center, New York, NY

⁵Department of Environmental Medicine, New York University Langone Medical Center, New York, NY

⁶The Global Institute for Public Health, New York University, New York, NY

Abstract

Background—Cannabis (marijuana) use and acceptance towards use are increasing in the US, and state-level policies are becoming more liberal. A wealth of research has been conducted to examine risk factors for use; however, studies rarely differentiate between different forms of marijuana.

Objective—We sought to determine prevalence of use and delineate who is at risk for use of this more potent form of marijuana.

Methods—We examined data from a nationally representative sample of high school seniors in the Monitoring the Future study (2007–2011; weighted $N=10,597$). We determined how sociodemographic factors and reasons for marijuana use correlated with recent (12-month) hashish use.

Results—Prevalence of recent hashish use was 6.5% and it was used by 18.3% of recent marijuana users. Hashish and other marijuana use tended to share many of the same correlates; however, associations were often stronger for hashish use. Females were consistently at low risk for use and users of other drugs were consistently at high risk for use. Black students tended to be at low risk for hashish use. Low risk of identifying as Hispanic or religious and high risk of higher personal income or going out more evenings per week for fun disappeared when controlling for other drug use. Using marijuana because the student felt he/she was “hooked” nearly doubled the odds for hashish use.

Conclusions—This was the first national study to examine prevalence and correlates of hashish use. These findings can inform prevention in a time of increasing popularity of marijuana use.

Correspondence to this article should be addressed to Joseph J. Palamar, 227 East 30th Street, 7th Floor, New York, NY 10016. Telephone: 1-646-501-2884, joseph.palamar@nyumc.org.

None of the authors have any declarations of interest to declare.

Keywords

hashish; marijuana; adolescents; socioeconomic status

Introduction

Public support for cannabis (marijuana) legalization is increasing in the US, alongside increases in use and widespread changes in attitudes towards use (1–4). State-level policy is beginning to shift, with four states plus the District of Columbia legalizing recreational use and at least another 20 states decriminalizing recreational use or legalizing medical use. As a variety of marijuana products become more easily or legally accessible, it is important to examine who is at risk for use of particular products in order to inform prevention and harm reduction strategies. Despite a wealth of research on marijuana, surprisingly very little epidemiologic research has focused on hashish (“hash”), a hypercompressed and more potent form of *cannabis sativa*.

Colorado and Washington were the first two states to legalize recreational use and there is now no penalty for private possession of up to 1oz by adults age 21 or older (5–7). In Colorado, the same regulations currently apply to hashish. In Washington, an adult can legally possess up to 16ozs of marijuana-infused products (commonly containing hashish) in solid form (e.g., brownies), or 72 ounces of cannabis-infused products in liquid form (e.g., soda, which may contain hash oil). Both hashish and non-hashish marijuana can be smoked, vaporized, or cooked in food. Hashish can be used either in its natural state or converted into a more concentrated oil (8). However, compared to other marijuana, hashish usually contains a higher concentration of Δ^9 -tetrahydrocannabinol (THC), which is the most potent psychoactive cannabinoid (9–11). While a typical marijuana cigarette (“joint”) contains only 0.5–5% THC, hashish tends to contain 2–20% with some estimates as high as 50% (12).

Different methods of marijuana use can lead to differences in absorption and metabolism of THC. When smoked, THC is absorbed from the lungs into the bloodstream within minutes (11). THC reaches its peak levels within 10 minutes after smoking and rapidly declines to 5–10% of its initial levels within an hour (11). Hashish, however, retains most of its parent THC in a form that can be more readily absorbed, either through ingestion or through smoke (13). When hashish is ingested, THC absorption is slower, taking 1 to 3 hours to enter the bloodstream; the result is a less intense high of longer duration (13). A major metabolite, 11-hydroxy-THC, is 20% more potent than THC and results in higher concentrations after being swallowed rather than smoked (14).

Teen marijuana use (with hashish use included in the definition) has been researched extensively. In 2013, almost half of high school seniors (45.5%) reported using marijuana in their lifetime (1). Lifetime, annual and 30-day use is more prevalent among males, Hispanics and among those who reside in cities (15). Those who report marijuana use—particularly frequent marijuana use—are also at high risk for using other illicit drugs (16,17). Research is needed to determine not only whether hashish has different effects than what we normally deem “marijuana” on surveys, but also to delineate correlates of use to determine who may be at highest risk for use. Findings from our previous research suggest

that it may not always be appropriate to collapse multiple forms of the same drug or drug delivery system into a single category, as is commonly done with marijuana (18–22).

Hashish is usually more potent than non-hashish marijuana, yet there is a remarkably limited literature on its epidemiology and correlates of use. Here we examine whether hashish and (non-hashish) “marijuana” have different sociodemographic correlates of, and reasons for use in a large, nationally representative sample of adolescents approaching adulthood.

Methods

Design

Data were examined from Monitoring the Future (MTF), an annual representative survey of high school students in approximately 130 public and private schools throughout 48 states in the US (1). Schools were selected through a multi-stage random sampling procedure; first geographic areas were selected, then schools within geographic areas, and then classes within selected schools. Constructs assessed were divided into six questionnaire forms and distributed randomly. This study focuses on data collected through Form 1, the only form that assesses hashish use, in addition to general marijuana use and sociodemographics. Analyses focused on data collected from high school seniors in years 2007–2011 (2011 was the last year recreational marijuana use was still illegal in all US states). Student response rates in 2007–2011 were 79–85% (1).

Variables

With regard to sociodemographic variables, MTF assessed student sex, age (dichotomized as <18 vs. 18), and race/ethnicity (i.e., white, black, Hispanic). Population density was categorized by non-, small, and large metropolitan statistical areas (MSAs). Small MSAs are defined as counties or groups of counties with at least one city of 50,000 inhabitants and the 24 largest MSAs are defined as large MSAs. Non-MSAs are the remaining areas (1). Religiosity was assessed via a composite of two ordinal items which assessed religious attendance and importance (range: 1–4). We divided the mean-composite into tertiles indicating low (1.0–2.0), moderate (2.5–3.0) and high (3.5–4.0) religiosity (23).

To assess family structure, students were asked to indicate with which parent(s) they resided. Students answered whether they resided with no parents, one parent or two parents. Parent’s level of educational attainment was assessed via ordinal scales and a mean score for both parents (or raw score if only one parent) was coded into three groups representing low (1.0–3.0), medium (3.5–4.0), and high (4.5–6.0) education. Students were also asked about the number of evenings they usually go out per week for fun and recreation and we coded answers into: 1) 0–1 evening(s), 2) 2–3 evenings, and 3) 4–7 evenings. Student weekly income was assessed by asking how much money the student earns during the average week from: 1) a job or other work, and 2) from “other sources.” We recoded responses for each item into \$10 or less, \$11–50, or \$51 or more. Coding of sociodemographic variables was guided by previous research (3,4,19,20,23–25).

With respect to drug use, students were asked about frequency of lifetime use of marijuana, alcohol (“more than just a few sips”), cigarettes and select illicit drugs. Students were asked,

“On how many occasions (if any) have you used marijuana in your lifetime?” The survey reminded students that “Marijuana is sometimes called weed, pot, dope; hashish is sometimes called: hash, hash oil” and then asked, “On how many occasions (if any) have you used hashish in your lifetime?” The same questions were asked for use in the last 12 months. Possible responses for these questions were: 0 occasions, 1–2 occasions, 3–5 occasions, 6–9 occasions, 10–19 occasions, 20–39 occasions, and 40+ occasions. We dichotomized recent (12-month) hashish use (into yes/no) and also created a trichotomous variable indicating: 1) no recent use of either, 2) recent use of marijuana, but not hashish, and 3) recent use of hashish (regardless of other marijuana use).

The same response options applied to lifetime use of alcohol and other illicit drugs. The illicit drugs considered in this study were powder cocaine, crack, heroin, LSD, and hallucinogens other than LSD. With respect to nonmedical (illicit) use of prescription drugs, this study considered use of amphetamine/controlled stimulants, narcotics other than heroin, tranquilizers/benzodiazepines, and sedatives/barbiturates. We dichotomized use of each of any of these nine illicit drugs into lifetime use: yes/no. Lifetime alcohol use was dichotomized into use on <10 vs. 10 occasions. Lifetime cigarette use was assessed via an ordinal item with different answer options: never, once or twice, occasionally but not regularly, regularly in the past, regularly now. We collapsed the two regular smoker categories because no recent marijuana users identified as past regular smokers. Finally, students who indicated use of marijuana in the last 12 months were asked, “What have been the most important reasons for your using marijuana or hashish?” Students were asked to answer yes/no to 11 items (listed in Table 2).

Analyses

Descriptive statistics were first examined. We then analyzed data for the 10,597 students (Weighted N) with complete drug use data. Specifically, we fit two conditional multinomial logistic regression models to delineate correlates of 1) hashish use (regardless of other marijuana use) and 2) other marijuana use (marijuana users not indicating hashish use) compared to no use. The first model contained only sociodemographic variables; the second model also contained drug use variables. We controlled for a variety of sociodemographic variables commonly utilized in other MTF analyses (3,4,19,20,23,25). In these conditional models, each covariate was associated with its own adjusted odds ratio (AOR) in explaining each categorical outcome (compared to no use). Two binary conditional models were then computed focusing on the subsample of recent (12-month) marijuana users ($N = 2,650$) in order to more directly examine differences between both forms. The first model contained only sociodemographic variables and the second model also contained drug use variables. For consistency, we entered the same sociodemographic covariates, but in the second model we also included 1) frequency of recent marijuana use, and 2) reasons for marijuana use (which were only assessed with regard to recent use).

All models were adjusted by cohort with indicators for each year (with year 2007 as the comparison) included (26). Multivariable models included missing data indicators for covariates with missing data in order to maximize sample size. For example, 14.9% of the sample was missing race and 26.3% were missing religiosity. Utilizing case-complete data

(with no missing values) would have required the deletion of roughly half of the sample. Including a missing data indicator for covariates with missing data allowed the full analytic sample to be retained. Thus, each model technically contained no missing data, which would have led to listwise deletion of missing cases. In order to ensure that inclusion of missing data indicators did not bias results, all models were recomputed using case-complete data and results were almost identical. This is also commonly done in other MTF analyses (3,20,25,27). All analyses were design-based for complex survey data (28), weighted according to the study's sampling scheme, and conducted using SAS 9.3 software.

Results

As shown in Table 1, the majority of the sample was white or resided in an MSA. A quarter (25.1%) of recent marijuana users reported lifetime hashish use (9.4% of the full sample) and 18.3% of recent marijuana users reported use of recent (12-month) use of hashish (6.5% of the full sample). Percentages of students indicating specific reasons for use are presented in Table 2.

With regard to recent use among the full sample (Table 3), compared to males, females were at low odds for hashish use, and older students were at decreased odds for both forms only when controlling for other drug use. Compared to white students, black and Hispanic students were at low odds for use of either form, but when controlling for other drug use, black students were at more than double the odds for using each form of marijuana, and the Hispanic association lost significance. Residing in an MSA somewhat consistently increased the odds for use of each form, and religiosity was protective against both forms, particularly hashish, and highest religiosity was associated with lower odds. Residing with one or two parents was protective against use of both forms, but controlling for other drug use, residing with two parents remained a protective factor against other marijuana use, but not hashish. Number of evenings out per week robustly increased odds of use of each form, particularly hashish, even when controlling for other drug use. Higher income from a job or other sources tended to be a strong risk factor for use of each form, but when controlling for other drug use, high income from job ($>\$50/\text{week}$) increased odds for use of hashish ($\text{AOR} = 1.38, p = .019$), but not other marijuana. Frequent alcohol use robustly increased odds for use of hashish ($\text{AOR} = 7.80, p < .001$), more so than other marijuana ($\text{AOR} = 4.27, p < .001$). All levels of cigarette smoking strongly increased odds for use of each form, particularly hashish. Regular cigarette smoking was associated with a robust increased in odds of hashish use ($\text{AOR} = 18.70, p < .001$). Likewise, other illicit drug use increased odds of hashish use, more so than it increased odds for other marijuana use.

Among recent marijuana users (Table 4), compared to males, females were consistently at lower odds for hashish use although this association weakened when controlling for other drug use. Compared to white students, black students were at strongly reduced odds for hashish use and Hispanics were also at low risk; however, after controlling for other drug use, black students were at half the odds for hashish use ($\text{AOR} = 0.48, p = .026$) and identifying as Hispanic was no longer significant. Compared to less religious students, moderate and highly religious students were at low risk for hashish use, but these significant associations disappeared when controlling for other drug use. Going out 4–7 evenings per

week and earning >\$50 per week from a job were risk factors for hashish use, but these significant associations also disappeared when controlling for other drug use. Frequent alcohol use, regular cigarette smoking and other illicit drug use all increased odds for hashish use, and as frequency of recent marijuana use increased, odds for use of hashish increased. Finally, with regard to reasons for marijuana use, using to seek deeper insight and understanding was associated with increased odds for hashish use (AOR = 1.51, $p = .009$) and using because the student felt he or she was “hooked” almost doubled the odds of hashish use (AOR = 1.94, $p = .024$).

Discussion

The recent increase in popularity of marijuana use coupled with more liberal state-level policies has begun to change the landscape of adolescent marijuana use. More potent forms of marijuana, such as hashish, may present a threat to adolescent health. This is the first paper to examine correlates of hashish use in a nationally representative sample of US high school students. Data from MTF indicates that nearly half (45.5%) of high school seniors have used marijuana at some point in their lives, with two-thirds (36.4%) using it in the past year (1). We examined data from MTF, years 2007–2011 and found that hashish has been used by nearly one out of ten seniors. Our findings suggest that 1) users of both forms of marijuana share many of the same risk factors; but 2) various factors tend to be bigger risk factors for hashish use as compared to general marijuana use.

Many sociodemographic factors explaining general marijuana use were similar to those of hashish use; however, we delineated numerous differences in associations, which were often stronger for hashish. Females were consistently at low risk for hashish use, but not general marijuana use. In some respects, these findings corroborate previous research that females tend to be at low risk for “harder” drugs than males (20,25,29,30). Hashish tends to be much more potent than other marijuana, and it is primarily the males that are at higher risk for use of this more potent form. Males are also at higher risk for marijuana dependence (30,31) so further research is needed to examine whether this high potency form of marijuana increases the risk of problematic use patterns.

One particularly consistent difference across use of different forms of marijuana was that students with higher income (earning >\$50 per week from a job) were at increased odds for use of hashish, but not for general marijuana, at least until controlling for other drug use. This corroborates prior research showing that access to higher income can be associated with risk-taking behavior, including drug use (19,20,25,32,33). This association may be due to socioeconomic status—as indicated by higher income—or simply the fact that money is often needed to purchase drugs (20,32,34–36).

Important race/ethnicity findings were delineated from these analyses. Compared to non-users, black and Hispanic students were at low risk for hashish use, but not other marijuana. However, when controlling for other drug use, identifying as Hispanic was no longer protective against hashish use, and black students were at more than double the risk for use of both forms. Interestingly, looking more specifically into the marijuana-using subsample, blacks were (again) only at half the odds for hashish use. So while black students are at risk

for general marijuana use (compared to non-users) while controlling for drug use and other factors, they are actually at low risk for hashish use. This finding can help inform interpretation of other national reports that also suggest higher reported rates of marijuana use among whites (e.g., the National Survey on Drug Use and Health [NSDUH]) (15,37). However, despite blacks using at lower levels into adulthood, marijuana-related arrest and incarceration rates are higher for blacks throughout many US cities (38). We found that among marijuana users, blacks are at low risk for recent hashish use; however, further research needs to be conducted to determine whether this racial-protective factor paradoxically places blacks at greater risk for arrest. Since hashish is often ingested rather than smoked, blacks who smoke (e.g., in public) may be at greater risk for arrest since most other non-hashish marijuana is smoked and thus has a strong odor that can lead to detection by authorities.

Another key finding was that other drug use was a robust risk factor for hashish use. Specifically, other illicit drug use, regular cigarette smoking and frequent alcohol use each increased the risk for use. Results also indicate that higher frequency of cigarette smoking increases odds of use, but frequency of recent marijuana use was perhaps the most robust risk factor, with more frequent use more strongly increasing odds of using hashish. While temporality could not be determined, it may be that those who use non-hashish marijuana very frequently are more likely to be exposed to and/or eventually use this more potent version of the drug. It may also be that higher frequency marijuana use may be linked to increased tolerance, leading many users to seek this more potent marijuana product. In addition, including other drug use in models often drowned out—or in some cases, reversed—associations of sociodemographic variables. Many studies do not control for drug use in models, and this finding points to the importance of doing so because associations commonly change in light of these factors (25).

In addition, we examined how reasons for marijuana use relate to hashish use and found that those who use to seek deeper insights or understanding, a common reason for hallucinogen use (39), are at increased odds for hashish use. Alarming, those who said they are “hooked” on marijuana were at nearly double the odds for use (with more than half of those who felt they were hooked reporting hashish use). This finding helps shed some light regarding understudied aspects of marijuana dependence. Perhaps in some cases hashish use can be viewed as a form of marijuana use “severity” (40,41) as it tends to be more potent, used among more frequent marijuana users, and many marijuana users who feel they are dependent also use this form of the drug.

Limitations

Since this study was cross-sectional, temporality could not be inferred. Missing data, particularly of religiosity and race, was problematic; however, we included missing data indicators in models in order to avoid list-wise deletion, as has been done in previous studies. We also computed case-complete models with no missing data to ensure that results from our fully-retained analytic sample were similar. Hashish (not collapsed with general marijuana use) was only assessed in a sixth of the sample each year so we combined cohorts from five years into a single cross-section to increase power. Hashish use did not

significantly differ over time, giving us confidence in combining cohorts. State-level MTF data are not available so it is unknown which students resided in a state where medical marijuana was legal or available. It is possible that students in states with medical marijuana dispensaries might have had easier access to hashish (e.g., through diversion) than students in non-medical marijuana states. Although recreational use was illegal in all states during the years of this study, it is unknown how results apply to states where recreational marijuana use is now legal. MTF also did not ask about method of use (e.g., smoked, ingested). Finally, MTF does not include students who were no longer enrolled or dropped out of school before their final year of high school.

Conclusions

This was the first national study to examine correlates of hashish use. We delineated various correlates of use, which were often different (or stronger) in comparison to use of other marijuana. Frequent marijuana users and those who use marijuana because they feel they are “hooked” are at high risk for hashish use, so in some instances hashish use can be viewed as an indicator of severity of marijuana use. These findings can inform prevention in a time of increasing popularity of marijuana use and increasing rates of use of hashish products.

Acknowledgments

Monitoring the Future data were collected through a research grant (R01 DA-01411) from the National Institute on Drug Abuse (NIDA), National Institutes of Health (NIH). The content is solely the responsibility of the authors and does not necessarily represent the official views of the principal investigators, NIH or NIDA. The authors would like to thank the principal investigators (PIs: Johnston, Bachman, O’Malley, and Schulenberg) at The University of Michigan, Institute for Social Research, Survey Research Center, and the Inter-university Consortium for Political and Social Research for providing access to these data (<http://www.icpsr.umich.edu/icpsrweb/landing.jsp>).

Michael Weitzman was supported in part, by NIH/NCI 3 P30 CA016087-33S1. The project otherwise was not funded. The National Institute on Drug Abuse, Inter-university Consortium for Political and Social Research, and Monitoring the Future principal investigators, had no role in analysis, interpretation of results, or in the decision to submit the manuscript for publication.

References

1. Johnston, LD.; O’Malley, PM.; Bachman, JG.; Schulenberg, JE.; Miech, RA. Monitoring the Future: National Survey Results on Drug Use, 1975–2013: Volume I, Secondary School Students. Ann Arbor, MI: Institute for Social Research, The University of Michigan; 2014. Available at: http://www.monitoringthefuture.org/pubs/monographs/mtf-vol1_2013.pdf [last accessed 24 November 2014]
2. Pew Research Center. [last accessed 24 November 2014] Majority now supports legalizing marijuana. 2013. Available from: <http://www.people-press.org/files/legacy-pdf/4-4-13%20Marijuana%20Release.pdf>
3. Palamar JJ, Ompad DC, Petkova E. Correlates of intentions to use cannabis among US high school seniors in the case of cannabis legalization. *Int J Drug Policy*. 2014; 25:424–435. [PubMed: 24589410]
4. Palamar JJ. An examination of opinions toward marijuana policies among high school seniors in the United States. *J Psychoactive Drugs*. 2014; 46:351–361. [PubMed: 25364985]
5. National Organization for the Reform of Marijuana Laws. [last accessed 24 Nov 2014] Washington Laws & Penalties. 2014. Available from: <http://norml.org/laws/item/washington-penalties-2>
6. National Organization for the Reform of Marijuana Laws. [last accessed 24 Nov 2014] Colorado Laws & Penalties. 2014. Available from: <http://norml.org/laws/item/colorado-penalties>

7. USA Today. [last accessed 24 Nov 2014] Legal pot prompts a question: What about hash?. 2013. Available from: <http://www.usatoday.com/story/news/nation/2013/07/14/washington-pot-hash/2515645/>
8. McLaren J, Swift W, Dillon P, Allsop S. Cannabis potency and contamination: a review of the literature. *Addiction*. 2008; 103:1100–1109. [PubMed: 18494838]
9. Mechoulam R. Marihuana chemistry. *Science*. 1970; 168:1159–1163. [PubMed: 4910003]
10. Mechoulam R, Gaoni Y. The absolute configuration of Δ^9 -tetra-hydrocannabinol, the major active constituent of hashish. *Tetrahedron Lett*. 1967; 12:1109–1111. [PubMed: 6039537]
11. National Highway Traffic Safety Administration. [last accessed 24 Nov 2014] Cannabis/Marijuana (delta 9-Tetrahydrocannabinol, THC). 2013. Available from: <http://www.nhtsa.gov/people/injury/research/job185drugs/cannabis.htm>
12. United Nations Office on Drugs and Crime. World Drug Report 2006. Volume 1: Analysis. Vienna: United Nations Office on Drugs and Crime; 2006.
13. Huestis MA. Human cannabinoid pharmacokinetics. *Chem Biodivers*. 2007; 4:1770–1804. [PubMed: 17712819]
14. Schilke EW, Schwoppe DM, Karschner EL, Lowe RH, Darwin WD, Kelly DL, Goodwin RS, Gorelick DA, Huestis MA. Delta9-tetrahydrocannabinol (THC), 11-hydroxy-THC, and 11-nor-9-carboxy-THC plasma pharmacokinetics during and after continuous high-dose oral THC. *Clin Chem*. 2009; 55:2180–2189. [PubMed: 19833841]
15. Johnston, LD.; O'Malley, PM.; Bachman, JG.; Schulenberg, JE.; Miech, RA. Demographic Subgroup Trends among Adolescents in the Use of Various Licit and Illicit Drugs, 1975–2013 (Monitoring the Future Occasional Paper No. 81). Ann Arbor, MI: Institute for Social Research, The University of Michigan; 2014. Available from: <http://www.monitoringthefuture.org/pubs/occpapers/mtf-occ81.pdf> [last accessed 11 Jan 2015]
16. Fergusson DM, Boden JM, Horwood LJ. Cannabis use and other illicit drug use: testing the cannabis gateway hypothesis. *Addiction*. 2006; 101(4):556–569. [PubMed: 16548935]
17. Fergusson DM, Horwood LJ. Does cannabis use encourage other forms of illicit drug use? *Addiction*. 2000; 95(4):505–520. [PubMed: 10829327]
18. Amrock SM, Gordan T, Zelikoff JT, Weitzman M. Hookah use among adolescents in the United States: results of a national survey. *Nicotine Tob Res*. 2014; 16:231–237. [PubMed: 24154512]
19. Palamar JJ, Zhou S, Sherman S, Weitzman M. Hookah use among US high school seniors. *Pediatrics*. 2014; 134:227–234. [PubMed: 25002664]
20. Palamar JJ, Ompad DC. Demographic and socioeconomic correlates of powder cocaine and crack use among high school seniors in the United States. *Am J Drug Alcohol Abuse*. 2014; 40:37–43. [PubMed: 24191647]
21. Gossop M, Griffiths P, Powis B, Strang J. Cocaine: patterns of use, route of administration, and severity of dependence. *Br J Psychiatry*. 1994; 164:660–664. [PubMed: 7921717]
22. Gossop M, Manning V, Ridge G. Concurrent use and order of use of cocaine and alcohol: behavioural differences between users of crack cocaine and cocaine powder. *Addiction*. 2006; 101:1292–1298. [PubMed: 16911728]
23. Palamar JJ. Predictors of disapproval towards “hard drug” use among high school seniors in the United States. *Prev Sci*. 2014; 15:725–735. [PubMed: 24101213]
24. Wallace JM Jr, Vaughn MG, Bachman JG, O'Malley PM, Johnston LD, Schulenberg JE. Race/ethnicity, socioeconomic factors, and smoking among early adolescent girls in the United States. *Drug Alcohol Depend*. 2009; 104:S42–49. [PubMed: 19628345]
25. Palamar JJ, Kamboukos D. An examination of sociodemographic correlates of ecstasy use among high school seniors in the United States. *Subst Use Misuse*. 2014; 49:1774–1783. [PubMed: 24955818]
26. Wray-Lake L, Maggs JL, Johnston LD, Bachman JG, O'Malley PM, Schulenberg JE. Associations between community attachments and adolescent substance use in nationally representative samples. *J Adolesc Health*. 2012; 51:325–331. [PubMed: 22999832]
27. Terry-McElrath YM, O'Malley PM, Johnston LD. Simultaneous alcohol and marijuana use among U.S. high school seniors from 1976 to 2011: trends, reasons, and situations. *Drug Alcohol Depend*. 2013; 133:71–79. [PubMed: 23806871]

28. Heeringa, SG.; West, BT.; Berglund, PA. Applied survey data analysis. London: Chapman and Hall; 2010.
29. McCabe SE, Morales M, Cranford JA, Delva J, McPherson MD, Boyd CJ. Race/ethnicity and gender differences in drug use and abuse among college students. *J Ethn Subst Abuse*. 2007; 6:75–95. [PubMed: 18192205]
30. Cotto JH, Davis E, Dowling GJ, Elcano JC, Staton AB, Weiss SR. Gender effects on drug use, abuse, and dependence: a special analysis of results from the National Survey on Drug Use and Health. *Gend Med*. 2010; 7:402–413. [PubMed: 21056867]
31. Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality. The TEDS Report: Gender Differences in Primary Substance of Abuse across Age Groups. Rockville, MD: 2014. Available from: <http://www.samhsa.gov/data/sites/default/files/sr077-gender-differences-2014.pdf> [last accessed 24 Nov 2014]
32. Zhang B, Cartmill C, Ferrence R. The role of spending money and drinking alcohol in adolescent smoking. *Addiction*. 2008; 103:310–319. [PubMed: 18042192]
33. Martin BA, McCoy TP, Champion H, et al. The role of monthly spending money in college student drinking behaviors and their consequences. *J Am Coll Health*. 2009; 57:587–596. [PubMed: 19433396]
34. Scragg R, Laugesen M, Robinson E. Cigarette smoking, pocket money and socioeconomic status: results from a national survey of 4th form students in 2000. *N Z Med J*. 2002; 115:U108. [PubMed: 12362183]
35. Swartz JA, Hsieh CM, Baumohl J. Disability payments, drug use and representative payees: an analysis of the relationships. *Addiction*. 2003; 98:965–975. [PubMed: 12814502]
36. Petry NM. Effects of increasing income on polydrug use: a comparison of heroin, cocaine and alcohol abusers. *Addiction*. 2000; 95:705–717. [PubMed: 10885045]
37. Center for Behavioral Health Statistics and Quality. 2013 National Survey on Drug Use and Health Public Use File. Substance Abuse and Mental Health Services Administration; Rockville, MD: 2014.
38. American Civil Liberties Union. [last accessed 24 Nov 2014] The war on marijuana in black and white. 2013. Available from: <https://www.aclu.org/sites/default/files/assets/1114413-mj-report-rfs-rel1.pdf>
39. Grof, S. LSD Psychotherapy. Sarasota, FL: Multidisciplinary Association for Psychedelic Studies (MAPS); 2008.
40. Shrier LA, Walls C, Rhoads A, Blood EA. Individual and contextual predictors of severity of marijuana use events among young frequent users. *Addict Behav*. 2013; 38:1448–1456. [PubMed: 23010685]
41. Hayaki J, Hagerty CE, Herman DS, de Dios MA, Anderson BJ, Stein MD. Expectancies and marijuana use frequency and severity among young females. *Addict Behav*. 2010; 35:995–1000. [PubMed: 20621423]

Table 1

Sample characteristics.

	Full Sample <i>N</i> = 10,597		Recent Marijuana-Using Subsample <i>N</i> = 2,650	
	<i>N</i>	%	<i>N</i>	%
Sex				
Male	4,804	45.3	1,312	49.5
Female	5,343	50.4	1,257	47.4
Missing	450	4.3	81	3.1
Age, years				
<18	4,439	41.9	1,153	43.5
18	5,910	55.8	1,445	54.5
Missing	248	2.3	52	2.0
Race				
White	6,424	60.6	1,703	64.3
Black	1,140	10.8	231	8.7
Hispanic	1,450	13.7	319	12.0
Missing	1,584	14.9	397	15.0
Population Density				
Non-MSA	2,269	21.4	483	18.2
MSA	8,328	78.6	2,167	81.8
Religiosity				
Low	3,109	29.3	1,025	38.7
Moderate	2,264	21.4	596	22.5
High	2,433	23.0	303	11.4
Missing	2,791	26.3	727	27.4
Family Structure				
0 Parents	588	5.6	178	6.7
1 Parent	2,669	25.2	749	28.3
2 Parents	6,986	65.9	1,633	61.6
Missing	354	3.3	90	3.4
Parent Education				
Low	3,089	29.2	756	28.5
Moderate	2,830	26.7	731	27.6
High	3,971	37.5	997	37.6
Missing	707	6.7	166	6.3
Number of Evenings Out Per Week				
0–1	2,627	24.8	404	15.2
2–3	5,042	47.6	1,253	47.3
4–7	2,086	19.7	738	27.8
Missing	841	7.9	256	9.6
Weekly Income from Job				

	Full Sample N = 10,597		Recent Marijuana-Using Subsample N = 2,650	
	N	%	N	%
\$10 or Less	4,339	40.9	932	35.2
\$11–50	1,159	10.9	277	10.4
\$51 or More	4,115	38.8	1,169	44.1
Missing	985	9.2	273	10.3
Weekly Income from Other Source				
\$10 or Less	5,279	49.8	1,195	45.1
\$11–50	3,284	31.0	882	33.3
\$51 or More	930	8.8	278	10.5
Missing	1,105	10.4	294	11.1
Lifetime Hashish Use				
No	9,599	90.6	1,984	74.9
Yes	998	9.4	666	25.1
Recent (12-Month) Hashish Use				
No	9,911	93.5	2,164	81.7
Yes	686	6.5	486	18.3
Lifetime Alcohol Use				
<10 Times	6,097	57.5	609	23.0
>10 Times	4,500	42.5	2,041	77.0
Lifetime Cigarette Use				
Never Smoked	6,215	58.6	716	27.0
1–2 Times	1,808	17.1	660	24.9
Smoke Occasionally	1,162	10.9	674	25.4
Smoke(d) Regularly	1,412	13.3	599	22.6
Frequency of Recent Marijuana Use				
0 Times	7,168	67.6	0	0.0
1–2 Times	886	8.4	729	27.5
3–5 Times	563	5.3	463	17.5
6–9 Times	400	3.8	314	11.8
10–19 Times	360	3.4	263	9.9
20–39 Times	303	2.9	223	8.4
40+ Times	917	8.7	658	24.8
Lifetime Other Illicit Drug Use				
No	8,132	76.7	1,479	55.8
Yes	2,465	23.2	1,170	44.2

Note. MSA = metropolitan statistical area. Percentages were weighted so do not always add up perfectly to 100%.

Table 2Reasons for marijuana use among recent marijuana users (Weighted $N=2,650$).

	<i>N</i>	%
To experiment—to see what it's like	1,690	63.8
To relax or relieve tension	1,642	62.0
To feel good or get high	1,883	71.0
To seek deeper insights/understanding	622	23.5
To have a good time with my friends	1,800	67.9
To fit in with a group I like	167	6.3
To get away from my problems/troubles	695	26.2
Because of boredom, nothing else to do	845	31.9
Because of anger or frustration	499	18.8
To get through the day	314	11.9
Because I am 'hooked'—I have to have it	94	3.5

Table 3

Multinomial logistic regressions comparing correlates of hashish and other marijuana use to non-marijuana use (Weighted $N = 10,597$).

	Model 1			Model 2		
	Hashish		Other Marijuana		Hashish	
	AOR	(95% CI)	AOR	(95% CI)	AOR	(95% CI)
Sex						
Male	Ref		Ref		Ref	
Female	0.49***	(0.40–0.61)	0.94	(0.81–1.05)	0.42***	(0.34–0.54)
Age, years						
<18	Ref		Ref		Ref	
18	0.85	(0.70–1.04)	0.91	(0.81–1.01)	0.74*	(0.59–0.94)
Race						
White	Ref		Ref		Ref	
Black	0.43***	(0.27–0.69)	0.91	(0.75–1.10)	2.18**	(1.30–3.66)
Hispanic	0.42***	(0.29–0.61)	0.86	(0.72–1.02)	0.77	(0.52–1.15)
Population Density						
Non-MSA	Ref		Ref		Ref	
MSA	1.28	(1.00–1.64)	1.27***	(1.11–1.46)	1.67***	(1.25–2.23)
Religiosity						
Low	Ref		Ref		Ref	
Moderate	0.54***	(0.40–0.73)	0.73***	(0.63–0.84)	0.53***	(0.38–0.74)
High	0.19***	(0.13–0.28)	0.31***	(0.26–0.36)	0.33***	(0.21–0.50)
Family Structure						
0 Parents	Ref		Ref		Ref	
1 Parent	0.51**	(0.34–0.77)	0.67**	(0.53–0.86)	0.79	(0.48–1.28)
2 Parents	0.43***	(0.29–0.63)	0.51***	(0.40–0.64)	0.80	(0.50–1.27)
Parent Education						
Low	Ref		Ref		Ref	
Moderate	1.10	(0.84–1.44)	0.99	(0.85–1.14)	1.10	(0.80–1.50)

	Model 1						Model 2					
	Hashish			Other Marijuana			Hashish			Other Marijuana		
	AOR	(95% CI)	AOR	(95% CI)	AOR	(95% CI)	AOR	(95% CI)	AOR	(95% CI)	AOR	(95% CI)
High	1.05	(0.81–1.35)	0.94	(0.81–1.08)	1.28	(0.95–1.72)	1.07	(0.90–1.26)				
Number of Evenings Out Per Week												
0–1	Ref		Ref		Ref		Ref		Ref			
2–3	2.40***	(1.75–3.28)	1.75***	(1.51–2.02)	2.06***	(1.42–2.98)	1.48***	(1.24–1.76)				
4–7	5.42***	(3.87–7.57)	2.62***	(2.21–3.10)	3.25***	(2.18–4.85)	1.77***	(1.44–2.18)				
Weekly Income from Job												
\$10 or Less	Ref		Ref		Ref		Ref		Ref			
\$11–50	1.03	(0.70–1.53)	1.22*	(1.02–1.47)	0.99	(0.62–1.58)	1.17	(0.95–1.44)				
\$51 or More	1.86***	(1.50–2.32)	1.41***	(1.24–1.59)	1.38*	(1.05–1.80)	1.09	(0.94–1.27)				
Weekly Income from Other Source												
\$10 or Less	Ref		Ref		Ref		Ref		Ref			
\$11–50	1.32*	(1.04–1.68)	1.33***	(1.17–1.51)	1.07	(0.81–1.41)	1.14	(0.98–1.32)				
\$51 or More	2.09***	(1.53–2.85)	1.33***	(1.10–1.62)	1.19	(0.83–1.71)	0.92	(0.72–1.16)				
Lifetime Alcohol Use												
<10 Times					Ref		Ref		Ref			
>10 Times					7.80***	(5.53–11.03)	4.27***	(3.71–4.90)				
Lifetime Cigarette Use												
Never Smoked					Ref		Ref		Ref			
1–2 Times					4.60***	(3.11–6.81)	3.45***	(2.92–4.07)				
Smoke Occasionally					13.21***	(8.87–19.66)	6.87***	(5.64–8.38)				
Smoke(d) Regularly					18.70***	(12.75–27.44)	6.60***	(5.38–8.11)				
Lifetime Other Illicit Drug Use												
No					Ref		Ref		Ref			
Yes					6.58***	(5.15–8.43)	2.29***	(1.97–2.66)				

Note. The comparison group for hashish ($N = 686$) and other marijuana ($N = 2,744$) was students who used neither hashish nor other marijuana ($N = 7,168$). AORs are adjusted odds ratios as all other variables were controlled in the multivariable model. The model included cohort and missing data indicators. Results were computed both with and without the missing data indicators and results were nearly identical. MSA = metropolitan statistical area. CI = confidence interval.

100' > d

'10' > d
**
'50' > d
*

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 4
Binary logistic regressions comparing hashish use to use of other marijuana (Weighted $N = 2,650$).

	Raw Proportions			Model 1		Model 2	
	No Use, %	Use, %	AOR	(95% CI)	AOR	(95% CI)	
Sex							
Male	77.5	22.5	Ref		Ref		
Female	86.2	13.8	0.57***	(0.45–0.73)	0.75*	(0.57–1.00)	
Age, years							
<18	81.6	18.4	Ref		Ref		
18	81.7	18.3	1.01	(0.79–1.30)	0.88	(0.67–1.16)	
Race							
White	79.3	20.7	Ref		Ref		
Black	93.0	7.0	0.36***	(0.20–0.65)	0.48*	(0.25–0.92)	
Hispanic	85.6	14.4	0.60*	(0.39–0.93)	0.82	(0.52–1.32)	
Population Density							
Non-MSA	82.3	17.7	Ref		Ref		
MSA	81.5	18.5	0.99	(0.72–1.36)	1.02	(0.70–1.48)	
Religiosity							
Low	81.7	18.3	Ref		Ref		
Moderate	87.2	12.8	0.68*	(0.48–0.97)	0.81	(0.55–1.20)	
High	89.4	10.6	0.59*	(0.36–0.95)	0.95	(0.52–1.73)	
Family Structure							
0 Parents	84.3	15.7	Ref		Ref		
1 Parent	84.3	15.7	1.02	(0.60–1.74)	1.29	(0.73–2.29)	
2 Parents	80.8	19.2	1.14	(0.68–1.91)	1.58	(0.91–2.76)	
Parent Education							
Low	84.1	15.9	Ref		Ref		
Moderate	81.5	18.5	1.05	(0.76–1.45)	1.11	(0.77–1.59)	
High	80.6	19.4	1.11	(0.82–1.52)	1.33	(0.92–1.91)	
Number of Evenings Out Per Week							

	Raw Proportions			Model 1		Model 2	
	No Use, %	Use, %	AOR	(95% CI)	AOR	(95% CI)	
0-1	87.6	12.4	Ref		Ref		
2-3	84.0	16.0	1.25	(0.84-1.87)	1.17	(0.75-1.84)	
4-7	74.8	25.2	2.09***	(1.37-3.19)	1.30	(0.80-2.12)	
Weekly Income from Job							
\$10 or Less	82.9	17.1	Ref		Ref		
\$11-50	86.3	13.7	0.78	(0.48-1.29)	0.75	(0.43-1.31)	
\$51 or More	80.1	19.9	1.33*	(1.01-1.74)	1.25	(0.92-1.71)	
Weekly Income from Other Source							
\$10 or Less	82.3	17.7	Ref		Ref		
\$11-50	82.9	17.1	0.91	(0.67-1.21)	0.83	(0.60-1.15)	
\$51 or More	76.0	24.0	1.41	(0.95-2.07)	1.03	(0.67-1.83)	
Lifetime Alcohol Use							
<10 Times	93.4	6.6			Ref		
>10 Times	78.2	21.8			1.59*	(1.02-2.49)	
Lifetime Cigarette Use							
Never Smoked	90.8	9.2			Ref		
1-2 Times	86.8	13.2			1.18	(0.77-1.83)	
Smoke Occasionally	78.8	21.2			1.24	(0.80-1.91)	
Smoke(d) Regularly	68.3	31.7			1.88**	(1.19-2.97)	
Frequency of 12-Month Marijuana Use							
3-5 Times	95.0	5.0			Ref		
6-9 Times	92.9	7.1			2.28**	(1.30-3.98)	
10-19 Times	89.7	10.3			3.01***	(1.79-5.06)	
20-39 Times	91.3	8.7			5.06***	(3.00-8.57)	
40+ Times	62.5	37.5			9.26***	(5.84-14.69)	
Lifetime Other Illicit Drug Use							
No	90.3	9.7			Ref		
Yes	70.7	29.3			1.64**	(1.21-2.23)	

	Raw Proportions			Model 1		Model 2	
	No Use, %	Use, %	AOR	(95% CI)	AOR	(95% CI)	
Reasons for Marijuana Use							
To experiment—to see what it's like	85.8	14.2			0.83	(0.62–1.11)	
To relax or relieve tension	76.6	23.4			1.13	(0.79–1.60)	
To feel good or get high	77.9	22.1			1.17	(0.80–1.70)	
To seek deeper insights/understanding	66.1	33.9			1.51**	(1.11–2.06)	
To have a good time with my friends	78.5	21.5			1.06	(0.76–1.49)	
To fit in with a group I like	77.8	22.2			1.42	(0.84–2.40)	
To get away from my problems/troubles	75.6	24.4			0.86	(0.59–1.25)	
Because of boredom, nothing else to do	72.4	27.6			0.98	(0.72–1.33)	
Because of anger or frustration	73.6	26.4			0.90	(0.61–1.31)	
To get through the day	61.0	39.0			1.29	(0.84–1.98)	
Because I am 'hooked'—I have to have it	44.9	55.1			1.94*	(1.09–3.43)	

Note. The comparison group for hashish users ($N = 486$) was students who used marijuana, but not hashish ($N = 2,164$). AORs are adjusted odds ratios as all other variables were controlled in the multivariable models. The models included cohort and missing data indicators. Results were computed both with and without the missing data indicators and results were nearly identical. Percentages listed for reasons for marijuana use compare those who checked off "yes" to that reason (e.g., 55.1% of those who said they used hashish because they were hooked used hashish). MSA = metropolitan statistical area. CI = confidence interval.

* $p < .05$,

** $p < .01$,

*** $p < .001$