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Use of psilocybin (“mushrooms”) among US adults: 2015–2018

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ABSTRACT

We sought to estimate the prevalence of lifetime psilocybin use among a national sample of US adults ages 18 and older and associated demographic/substance use correlates. Pooled data from the 2015–2018 National Survey on Drug Use and Health were utilized among 168,650 individuals 18 years or older. An estimated 9.68% of individuals reported lifetime use of psilocybin. Differences were found among demographics, drug use, and sexual identity, with bisexual identification being associated with greater lifetime use. Nearly two-thirds of individuals who have ever used Lysergic acid diethylamide (LSD), methamphetamine, and/or heroin also reportedly used psilocybin. Findings from the present study can inform harm reduction efforts and behavioral health messaging.

KEYWORDS

psilocybin, mushrooms, drug use, harm reduction

INTRODUCTION

Psilocybin (4-phosphoryloxy-N,N-dimethyltryptamine) is the main psychoactive, naturally occurring alkaloid in over 200 species of mushrooms worldwide. As the prodrug of psilocin (4-OH-dimethyltryptamine), these compounds act in accordance with and are related to the endogenous neurotransmitter, serotonin. Known colloquially as “shrooms” and “magic mushrooms” (Drug Enforcement Administration, 2020), psilocybin was first synthesized in the late 1950’s and used for therapeutic purposes and treatment of compulsions (Passie, Seifert, Schneider, & Emrich, 2002).

Transient side effects of psilocybin include increased heart rate, nausea, changes in mood, and fluctuations in muscle control (Passie et al., 2002), although most of the effects of psilocybin have been reported as positive. Moreover, psilocybin is not neurotoxic or causes physical damage somatically (Johnson, Richards, & Griffiths, 2008), although the main side effects of prolonged use include anxiety, depersonalization, and derealization (Strassman, 1984), although the etiology of those side effects remains debatable (Gouzoulis, Hermle, & Sass, 1994; Tylš, Páleníček, & Horáček, 2014). In a study of healthy humans, low doses of psilocybin were reported to be pleasurable, enriching, and non-threatening (Studerus, Komater, Hasler, & Vollenweider, 2011). In fact, well-prepared hallucinogen-naïve participants can take over 25 mg of psilocybin safely (Johnson et al., 2008).

Since the Schedule I status of psilocybin was enacted in the early 1970’s, research has floundered, although as of recently, a resurgence in psilocybin research has emerged, given its non-toxic properties (Van Amsterdam, Opperhuizen, & van den Brink, 2011), rare physical damage (Passie et al., 2002), and low harm potential (Johnson, Griffiths, Hendricks, & Henningfield, 2018) to treat psychiatric disorders such as depression, obsessive compulsive disorders, and addiction (Mithoefer, Grob, & Brewerton, 2016). For example, one study of adults in Arizona with obsessive compulsive disorder (OCD) saw reductions in core OCD

symptoms after ingesting low doses of psilocybin (Moreno, Wiegand, Taitano, & Delgado, 2006). Another study found evidence of a potential role with psilocybin and smoking-cessation (Johnson, Garcia-Romeu, & Griffiths, 2017).

There is a paucity of literature on the epidemiology of psilocybin use among nationally representative samples of adults in the United States (US). Although one study found that over 30 million adults in the US were psychedelic users (Krebs & Johansen, 2013a), there remains a dearth of research of psilocybin use among US populations. Research on the prevalence can guide policy and behavioral health interventions. To this end, our study examines the prevalence and correlates of psilocybin use among a nationally representative sample of American adults.

METHODS

Pooled data from the 2015–2018 National Survey on Drug Use and Health were analyzed. Briefly, the National Survey on Drug Use and Health is an annual survey conducted in the United States and the District of Columbia that assesses behavioral health utilization, substance use, and mental health (Center for Behavioral Health Statistics and Quality (CBHSQ), 2019). A total of 168,650 adults ages 18 and older participated in the study. All survey respondents used computer assisted interviewing methods to ensure participant confidentiality and were compensated \$30 if they completed the survey (CBHSQ, 2018). Additional NSDUH methodology can be found elsewhere (Center for Behavioral Health Statistics and Quality, 2019). The NSDUH has been found to be reliable (kappa scores >0.80; Center for Behavioral Health Statistics and Quality, 2019). The weighted response rate for the 2015–2018 NSDUH was between 67.3 and 71.0%. We used data from 2015, given that 2015 was the first year NSDUH asked sexual orientation. For the present analysis, three categories of sexual orientation were created: Heterosexual, Gay/Lesbian, and Bisexual. We excluded those who said “don’t know” or “not sure” (2.3%; $n = 2,286$). A University Institutional Review board deemed this non-human subjects research due to no identifying information.

MEASURES

Lifetime psilocybin use

To assess lifetime use, the question, “Have you ever, even once, used psilocybin, found in mushrooms?” was used. We used lifetime use, given that the NSDUH only inquires about lifetime use.

Lifetime drug use

Since we assessed lifetime use of psilocybin, we also assessed lifetime use of Lysergic acid diethylamide (LSD), heroin, marijuana, methamphetamine, and cocaine.

Demographics

Demographic variables included gender, race/ethnicity (White, Black, Hispanic, Asian, or other), education level (less than high school, high school, some college/2-year college degree, or 4-year college degree), self-reported health status, and income.

DATA ANALYSIS

We estimated the lifetime prevalence of psilocybin and demographic characteristics. Rao–Scott tests were used to analyze bivariate associations (Rao & Scott, 1987). Multivariate logistic regression analyses, controlling for covariates, were conducted to determine conditional associations. All data were weighted to be representative of the US population and to adjust for the complex sampling design, post-stratification, and adjusted values of the mean (Heeringa, West, & Berglund, 2017). Data were conducted in Stata (SE 16, StataCorp, 2019) using the proper survey commands (Heeringa et al., 2017). We used multiple-imputed variables provided by NSDUH when available to limit the amount of missing data. We also included survey year as a covariate. The level of significance was set at $P < 0.05$ and all analyses were two-tailed.

RESULTS

Demographics and bivariate associations

The sample consisted of nearly equal percentages of men (51.5%) and women (48.5%). Of the sample, 9.68% ($n = 17,602$) reported lifetime use of psilocybin. Survey year was a significant predictor of lifetime psilocybin use ($P < 0.0001$). Those at highest association for lifetime use were men ($P < 0.0001$), ethnic minority ($P < 0.0001$), 26 years or older ($P < 0.0001$), bisexual ($P < 0.0001$), reported increased education ($P < 0.0001$), reported higher income ($P < 0.0001$), reported health status other than great ($P < 0.0001$), and reported lifetime use of other drugs ($P < 0.0001$).

Multivariate logistic regression

There was not a significant association for survey year 2016 and 2017, but there was one for 2018 (aOR: 1.11, 95% CI 1.01–1.22), when compared to 2015. Compared to females, men were more likely to report lifetime use of psilocybin (aOR: 1.90, 95% CI 1.77–2.04). Compared to 18–25 year olds, 26–34 year olds were more likely to report lifetime use of psilocybin (aOR: 1.29, 95% CI 1.19–1.40), but 35–49 year olds (aOR: 0.83, 95% CI 0.76–0.90) and individuals 50 years or older (aOR: 0.47, 95% CI 0.42–0.51) were less likely to report ever using psilocybin. Individuals who identified as bisexual (aOR: 1.58, 95% CI 1.39–1.80) were more likely to report lifetime use of psilocybin when compared to individuals who identified as heterosexual. When compared to Non-Hispanic White individuals, African Americans (aOR:

0.21, 95% CI 0.17–0.25), Hispanics (aOR: 0.61, 95% CI 0.54–0.68), and “other/mixed race” individuals (aOR: 0.84, 95% CI 0.72–0.98) were less likely to report lifetime use. Individuals with a high school (aOR: 1.26, 95% CI 1.10–1.45), some college (aOR: 1.79, 95% CI 1.56–2.04), or college or more education (aOR: 2.43, 95% CI 2.11–2.81) were more likely to report lifetime use of psilocybin, compared to individuals with less than a high school education. Individuals who reported their health status as “good” (aOR: 0.84, 95% CI 0.77–0.93) and “fair/poor” (aOR: 0.79, 95% CI 0.69–0.90) were more likely to use psilocybin, when compared to individuals who reported their health as “excellent”. No significant differences were found use in income. Individuals who had ever used marijuana (aOR: 22.3, 95% CI 18.0–27.6), LSD (aOR: 12.7, 95% CI 11.8–13.7), methamphetamine (aOR: 1.71, 95% CI 1.55–1.89), cocaine (aOR: 4.31%, 95% CI 4.00–4.63), and heroin (aOR: 1.57, 95% CI 1.36–1.80) had a higher association of ever using psilocybin. Of concern, nearly two-thirds of individuals who used LSD (64.5%), heroin (62.5%), and methamphetamine (54.0%) also used psilocybin.

DISCUSSION

To our knowledge, this is one of the first known studies to estimate the prevalence and correlates to lifetime psilocybin use among a national sample of adults. Overall, our findings suggest that approximately 9.68% of US adults have ever used psilocybin. To compare our findings, results from the 2016 NSDUH found that 8.5% of individuals have ever used psilocybin. Further, results from the 2017 NSDUH found that 8.8% of adults have ever used psilocybin (Center for Behavioral Health Statistics and Quality, 2018), suggesting that our results found a steady increase over time. Our findings also indicated that 2018 was a significant year for increase of psilocybin. Given the legalization and legislation of psilocybin in several US states (Office of Attorney General, 2019) and the increased use of psilocybin in clinical trials (Sliwoski, 2018), yearly trends remains an area for research, including research on more recent use.

Differences in psilocybin use also appear when considering race/ethnicity, health status, and education. For example, when compared to Non-Hispanic White individuals, African Americans, Hispanics, and other/Mixed individuals were less likely to have ever used psilocybin. Although previous research has suggested that ethnic minorities are less likely to have ever used psychedelics or other hallucinogenic drugs (Krebs & Johansen, 2013b; Stone, O'Brien, De La Torre, & Anthony, 2007), nevertheless, our findings corroborate previous studies to suggest this association. Further research is warranted on the relationship between race/ethnicity and psilocybin use; however, one study found that among Hispanic college students, psilocybin was the number one club drug used (Resor & Cooper, 2010). Conversely, our findings also found that lifetime use increased as more education was attained, with college

education being the biggest association. Our findings corroborate international findings suggesting a high prevalence of psilocybin use among college individuals (Viohl et al., 2019). Furthermore, individuals who reported their health as “good” or “fair/poor” were significantly less likely to have ever used psilocybin. More research is warranted on the aspects of health status and psychedelic use, although many users of psilocybin report no adverse side effects, regardless of health status (Studerus et al., 2011).

When focusing on sexual orientation, however, we found that compared to individuals who identify as heterosexual, individuals who identify as bisexual are at highest risk for lifetime use, although a high percentage of gay/lesbian individuals (16.5%) report lifetime use of psilocybin. In general, sexual minorities (e.g., those who identify as gay, lesbian, or bisexual) are more likely to engage in substance use compared to individuals who identify as heterosexual (Brewster & Tillman, 2012; Evans-Polce, Veliz, Boyd, Hughes, & McCabe, 2020). An overarching reason to explain this association is in terms of minority stress (Meyer, 2003). As societal pressures to “fit in” to the dominant population, minorities reported elevated stress and therefore turn to deleterious health habits to cope with negative affect. Psilocybin has been noted to reduce anxious states and stressful feelings (Goldberg, Pace, Nicholas, Raison, & Hutson, 2020) and may explain this association. Considering one of the goals of Healthy People 2020 (Office of Disease Prevention and Health Promotion, 2020) is to reduce health disparities, interventions are needed to reduce these disparities. Specifically, interventions focusing on interpersonal and surrounding risk factors associated with minority stress are needed. For example, developing adaptive coping resources (e.g., appraisal, denial of negative thoughts) may reduce overall minority stress (Chaudoir, Wang, & Pachankis, 2017).

Lastly, our findings demonstrate that use of other illicit substances (marijuana, LSD, methamphetamine, cocaine, and heroin) was associated with lifetime use of psilocybin, with individuals using marijuana 22 times more likely to have ever used psilocybin. This is not surprising, considering that psilocybin has been used co-morbidly with other drugs (Riley & Hayward, 2004). While other studies have found that, for example, tobacco has been used with psilocybin (Riley & Hayward, 2004), no other studies to date has examined co-morbid substance use among national samples of adults. Indeed, our findings suggest that use of several other drugs are associated with psilocybin. Of concern, nearly two-thirds of individuals who have ever used LSD, methamphetamine, and/or heroin also reportedly used psilocybin. Harm reduction strategies (e.g., treating users with dignity, avoiding the harm of illicit substance use, achievable goals; Lenton & Single, 1998) may prove useful in reducing illicit substance use with psilocybin.

This study is not without limitations. Data are self-reported and subject to recall bias. Questions were limited to lifetime use; future studies should assess past-year use or past-month use. NSDUH also did not ask about the frequency of use or reasons of use.

Data from nationally representative samples of adults revealed that a sizeable percentage (9.68%) of adults have ever used psilocybin. Significant differences in lifetime psilocybin use were found between sex, age, race/ethnicity, sexual orientation, and prior lifetime drug use. Lifetime users of psilocybin used prior lifetime drugs, were men, and identified as bisexual, with users of marijuana nearly 23 times more likely to have ever used psilocybin. We believe our findings can inform policy initiatives and prevention efforts.

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