

UCSF

UC San Francisco Previously Published Works

Title

Why do Americans use marijuana?

Permalink

<https://escholarship.org/uc/item/9sc4j5q2>

Authors

Kurtzman, Ellen T
Young-Wolff, Kelly C

Publication Date

2021-09-01

DOI

10.1016/j.drugalcdep.2021.108880

Peer reviewed



Published in final edited form as:

Drug Alcohol Depend. 2021 September 01; 226: 108880. doi:10.1016/j.drugalcdep.2021.108880.

Why Do Americans Use Marijuana?

Ellen T. Kurtzman^{1,*} [Associate Professor], Kelly C. Young-Wolff² [Research Scientist]

¹The George Washington University, School of Nursing 1919 Pennsylvania Ave., NW, Suite 500 Washington, DC 20006

²Kaiser Permanente Northern California Division of Research, 2000 Broadway, Oakland, CA 94612

Abstract

Background: Marijuana is the most commonly used illicit drug in the United States; yet, little is known about why adults use it. We examined the prevalence of past-month marijuana use by users' reasons for use—medical, recreational, and both—and identified correlates of each group.

Methods: Data from 20 states, which participated in the 2017-2019 Behavioral Risk Factor Surveillance System and fielded the marijuana use module, and multinomial logistic regression analysis were used to identify risk factors for past-month marijuana use by reason for use. User profiles were developed to illustrate how states' policy environments influenced reported reasons for use.

Results: The average predicted probabilities of past-month marijuana use for medical, recreational, and both reasons were 28.6%, 38.2%, and 33.1%, respectively. Age, gender, marital and employment status, income, mode and frequency of administration, and health status were associated with reasons for use. The reasons that young adult males who were infrequent marijuana users and binge drinkers gave for their marijuana use varied by state policy environment—in legal states, the average predicted probabilities were 5.3% lower for recreational reasons and 5.0% higher for both reasons. Reported reasons for past-month marijuana use did not significantly differ by state policy environment among daily users who were older women in poor mental and physical health.

Discussion: Significant differences existed in the characteristics of past-month marijuana users by reasons for use. Our estimates can serve as a baseline against which post-legalization marijuana users' reasons for use can be compared as state policy environments shift.

*Corresponding author— Ellen T. Kurtzman, Tel: 202-994-9439, Cell: 202-669-0876, etk@gwu.edu.

Contributors

Kurtzman conceptualized and designed the study, conducted the analysis, and wrote the first draft of the manuscript. Young-Wolff reviewed the analysis and edited and revised the first draft. Both authors contributed to and approved the final manuscript.

Declaration of Competing Interest

Both authors confirm they have no financial or personal relationships that could inappropriately influence this the research, authorship, or publication of this article.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Keywords

substance abuse; marijuana use; health policy; cannabis; Behavioral Risk Factor Surveillance System (BRFSS)

1. Introduction

Cannabis, which is often referred to as marijuana, is the most commonly used illicit drug in the United States, and its use has increased over the past decade. In 2010, for example, 11.5% of Americans aged 12 or older were past-year marijuana users. Less than a decade later, in 2018, 16% of the country's population—nearly 44 million Americans—reported being past-year users (Substance Abuse and Mental Health Services Administration (SAMHSA), 2020a). Each day, there are approximately 8,400 new marijuana users.

While marijuana's therapeutic benefit has been demonstrated for selected indications (e.g., nausea associated with cancer chemotherapy, anorexia associated with weight loss in HIV/AIDS patients) (National Academies of Sciences, 2017), there is general consensus that it adversely effects the developing brain and should be avoided by pregnant women and children/adolescents (U.S. Department of Health and Human Services, 2019; Volkow et al., 2017). A variety of health, social, legal, and financial problems have been associated with high frequency marijuana use—for example, respiratory conditions (e.g., shortness of breath), social problems (e.g., losing friends, trouble at work), other illicit drug use (Fischer et al., 2010; Walden and Earleywine, 2008; Zeisser et al., 2012).

In the United States, the population of marijuana users is expected to grow given states' marijuana policy environments, which are changing rapidly with an overall movement toward liberalization (New Frontier Data, 2020). To date, 36 states and the District of Columbia (DC) have legalized medical marijuana, and 15 states and DC have legalized it for adult recreational use. More states are considering such actions drawing on early adopters and lessons from alcohol and tobacco legislation in their approaches (Adrian, 2015; Hall, 2010; Levine and Reinarman, 1991) In addition to the positive impact these policies have on patients' access to marijuana for treatment, the trend toward legalization is an effort to respond to the social justice concerns among disadvantaged, minority populations that have shouldered a disproportionate amount of the burden associated with marijuana prohibition (Adinoff and Reiman, 2019).

In establishing their policies, states have distinguished between medical and recreational marijuana (Pacula and Smart, 2017); however, it is not understood whether marijuana users make this same distinction. A few studies have compared the characteristics or patterns of marijuana consumption between medical and recreational users; however, limitations in their designs and samples have introduced confounding (Choi et al., 2017; Lin et al., 2016) or limited generalizability (Choi et al., 2017; Compton et al., 2017; Lin et al., 2016; Pacula et al., 2016; Rotermann and Pagé, 2018; Roy-Byrne et al., 2015; Turna et al., 2020). Other studies have relied on data from the early 2000s when far fewer states had legalized marijuana for medical or recreational purposes (Choi et al., 2017; Compton et al., 2017; Lin et al., 2016).

Using data from 2017-2019, our study addresses these limitations and advances what is known about why adults use marijuana. Specifically, by comparing users by their reasons for use—medical, recreational, or both—and by identifying the correlates of each subgroup, we were able to develop past-month marijuana user profiles by reasons for use. Additionally, given the effect states' policy environments have on attitudes towards and use of marijuana—some research has demonstrated that residents in states that have legalized recreational marijuana more commonly attribute some benefit to marijuana and more commonly use all forms and multiple forms of marijuana (Steigerwald et al., 2020)—we control for state policy environment. In this way, our findings establish a baseline against which post-legalization outcomes can be compared as states' environments shift. Finally, our study makes use of 2017-2019 data from Behavioral Risk Factor Surveillance System (BRFSS), a national probability sample survey, which enabled us to produce national estimates. To our knowledge, this is the first time these national data were used to compare marijuana users by their reasons for use.

2. Methods

2.1 Data source

We used the most current data available from the BRFSS, which is the nation's premier system of health-related telephone surveys that collect state data from U.S. residents, 18 years and older, about their health-related risk behaviors, chronic health conditions, and use of preventive services (Centers for Disease Control and Prevention, 2019, 2013; Centers for Disease Control and Prevention (CDC), 2020a, 2020b, 2019, 2018a, 2018b, 2018c, 2018d, 2017). Established in 1984, the BRFSS is currently collected in all 50 states, the District of Columbia, and two U.S. territories (Guam and Puerto Rico). More than 400,000 adult interviews are completed each year.

In 2016, BRFSS added an optional marijuana module, which included questions about past-month marijuana use (*“During the past 30 days, on how many days did you use marijuana or hashish?”*) and routes of administration (*“During the past 30 days, how did you use marijuana?”*). In 2017, the question about routes of administration was changed from asking about *all* routes of administration to the *primary* route of administration, and a question about respondents' reasons for marijuana use was added—*“When you used marijuana or hashish during the past 30 days, was it for medical reasons to treat or decrease symptoms of a health condition, or was it for non-medical reasons to get pleasure or satisfaction (such as: excitement, to “fit in” with a group, increased awareness, to forget worries, for fun at a social gathering)”*—with five response options: only medical reasons to treat or decrease symptoms of a health condition; non-medical purposes to get pleasure or satisfaction; both medical and nonmedical reasons; don't know/not sure; refused.

Since its introduction, the number of states including the optional marijuana module has grown. See Supplemental Table S1 in the online version of this article. For our analysis, we combined the last three years of BRFSS data (2017-2019) for the 20 states that asked about respondents' reasons for using marijuana any of the three years. During the study period, the median, annual response rate among all participating states and territories was 45.9% (range: 30.6%–64.1%) in 2017, 49.8% (range: 38.8%–67.2%) in 2018, and 49.4%

(range: 37.3%-73.1%) in 2019 (Centers for Disease Control and Prevention, 2019; Centers for Disease Control and Prevention (CDC), 2020a, 2018a).

2.1 Inclusion criteria

For this study, we included the subsample of respondents who were asked about and reported using marijuana or hashish at least one day in the past month *and* who were asked about and had complete responses to the question about reasons for use. We did not exclude users who met these two criteria but did not have complete data on other correlates used in our analysis.

2.2 Measures of past-month marijuana use and daily use

For purposes of analysis, first, we dichotomized responses to the question about past-month marijuana use—that is, respondents who reported 1-30 days of past-month marijuana or hashish (hereafter referred to as “marijuana”) were coded as users (1=past-month marijuana user; 0=otherwise). In recognition of users’ heterogeneous consumption patterns and to focus our analysis on the heaviest users, we also constructed two alternative specifications of frequency. First, we specified a categorical variable, which created six subgroups: 1-4, 5-9, 10-14, 15-19, 20-24, and 25-30 days of use. Next, we created a variable reflecting daily use—that is, respondents were categorized as either daily users (20 or more days of past-month marijuana users) or non-daily users (1-19 days of past-month marijuana use), which is a common definition (European Monitoring Centre for Drugs and Drug Addiction, 2013; Substance Abuse and Mental Health Services Administration (SAMHSA), 2020b).

2.3 Measures of reasons for marijuana use

The dependent variable of greatest interest was marijuana users’ reasons for use, which was drawn directly from the BRFSS question and had three response categories: medical versus recreational versus both reasons (medical and recreational). Additionally, because several prior studies had categorized marijuana users’ reasons for use differently—for example, comparing those who reported *only* recreational reasons for use to a category, which combined those who reported *only* medical with those who reported both reasons for use, referred to as “any medical reason” (Choi et al., 2017; Pacula et al., 2016; Turna et al., 2020)—we also created two alternative, binary specifications representing these constructs—specifically, medical reasons only versus any recreational (1=medical only; 0=any recreational) and recreational reasons only versus any medical (1=recreational only; 0=any medical).

2.4 States’ policy environments

To capture states’ policy environments, we created separate, binary variables reflecting the status of medical and recreational marijuana legalization from 2017-2019 in each state. See Supplemental Table S1 in the online version of this article. For all but three states, marijuana laws were stable throughout the study period. In Oklahoma, Utah, and West Virginia, medical marijuana laws were enacted and implemented in August 2018, December 2018, and June 2019, respectively. In these cases, the values of the policy variable was adjusted to reflect the month and year of legalization. After examining trends in legalization, we also

created an alternative categorical specification, which combined the legal and recreational statuses by each state-year (1= fully legal; 2= mixed [legal medical + illegal recreational]; 3=fully illegal).

2.5 Statistical analysis

We estimated overall and state-level percentages of the U.S. adult population who reported past-month marijuana use by reasons for use. We used bivariate analyses to examine the demographic characteristics, health status, and risk behaviors of the sample and the population from which the sample was drawn by reasons for marijuana use (medical versus recreational versus both).

Using multivariable regression analyses, we tested the relationship between an array of predictors and each reason for marijuana use. Because the outcome of primary interest was categorical—i.e., respondents reported using marijuana for (1) medical reasons only, (2) recreational reasons only, or (3) both reasons—we used multinomial logistic regression and estimated adjusted relative risk ratios. Based on underlying theory and previous research, we incorporated a multitude of covariates for statistical control. Ultimately, the final model included: gender, age, race, ethnicity, marital status, education, employment status, income, number of past-month days of poor mental and physical health, frequency of use (daily versus non-daily user), route of administration, tobacco use, binge drinking, and the categorical marijuana policy variable. All models were also adjusted for state and year fixed effects.

Because the interpretation of multinomial logistic regression parameter estimates is not straightforward (Long and Freese, 2014; Norton et al., 2019), we made two adjustments. First, we estimated the average marginal effects for each explanatory variable—that is, how an incremental change in each risk factor affects the predicted probability of reporting past-month marijuana use by each reason for use. To explore the relationship between states' legal environments and marijuana users' reasons for use, we created user profiles—i.e., hypothetical observations with illustrative values (Long and Freese, 2014)—and varied the legal environment. In each case, we estimated the average predicted probability of reporting each reason for use and compared those probabilities in states that were fully legal versus fully illegal. Additionally, we used the binary version of the dependent variable—i.e., recreational only versus any medical—and used logistic regression to re-estimate the relationships between each covariate and reporting only recreational (versus medical) reasons for marijuana use.

To provide nationally representative and generalizable results, all estimates were adjusted for sampling weights and BRFSS' complex survey design; confidence intervals were based on standard errors computed using the linearized variance estimator. We followed the CDC's guidelines for combining multiple years of BRFSS data and data reliability/suppression (Centers for Disease Control and Prevention (CDC), 2020b, 2019, 2018b; Klein et al., 2002). Stata/SE version 15.1 was used for all analyses (StataCorp, 2017). The George Washington University Committee on Human Research, Institutional Review Board determined that this study did not meet the definition of human subjects research.

3. Results

The three-year study sample included 313,676 respondents, the vast majority of whom reported no marijuana use (n=252,810). Of the remaining 60,866 observations, we excluded 41,941 with missing data (n=41,730 missing marijuana use data; n=211 missing reasons for use data). The remaining 18,925 respondents served as our analytic sample. Survey respondents who were excluded from our analysis differed from those included based on most characteristics. See Table S2, in the online version of this article.

After making these exclusions, the weighted prevalence of self-reported marijuana use from 2017-2019 was 11.1%—a sample representing approximately 6.4 million U.S. adults. On average, marijuana users reported 15.4 days (CI: 15.2-15.6) of use in the past month.

3.1 Past-month marijuana prevalence by reasons for use

Approximately thirty percent (29.4%) reported using marijuana for medical reasons only, 37.7% for recreational reasons only, and 32.9% for both reasons. Group differences were statistically significant (Table 1).

Past-month users' reasons for marijuana use varied across the 20 states in the sample (Table 1 and Figure 1). The percentages of users who reported medical reasons only ranged from 20.6% in Wyoming to 47.3% in Oklahoma; recreational use only ranged from 21.1% in Oklahoma to 59.3% in Puerto Rico; both uses ranged from 11.9% in Puerto Rico to 39.8% in Wyoming.

3.2 Characteristics of marijuana users by reasons for use

For the majority of characteristics we examined, statistically significant differences were detected by reasons for use (Table 2). For example, past-month marijuana users who cited medical reasons for use (versus recreational reasons or both reasons) were more likely to be female (47.8% versus 34.2% and 37.7%), married (35.4% versus 27.9% and 27.5%), not employed (47.9% versus 30.4% and 34.6%), low income (37.3% versus 23.5% and 28.6%), and be in poor/fair health (32.8% versus 11.3% and 19.0%). They were also more likely eat/drink (14.7% versus 10.3% and 7.5%) or dab/other marijuana (10.7% versus 2.4% and 4.0%) and less likely to smoke marijuana (61.2% versus 76.1% and 75.5%). Additionally, medical marijuana users were also more likely to be older than recreational users. Users in each of the following age bands were more likely to report medical versus recreational or both reasons: 45-54 years of age (15.6% versus 11.4% and 11.4%), 55-64 years of age (16.5% versus 11.4% and 12.5%), and 65+ years of age (12.8% versus 6.2% and 5.9%).

Compared to those who reported medical or both reasons for use, marijuana users who reported recreational use were more likely to be male (65.95% versus 52.2% and 62.3%), 18-24 years of age (28.5% versus 12.5% and 23.8%), and college graduates (24.5% versus 18.2% and 19.5%). Although these users were more likely to report binge drinking (48.6% versus 23.3% and 41.1%), they used marijuana infrequently (1-4 days in the past month; 46.9% versus 25.8% and 18.8%) and were less likely to reside in states that had legalized medical and recreational use (i.e., fully legal; 49.1% versus 53.9% and 53.6%). Additional statistically significant differences by characteristic are detailed in Table 2.

3.3 Predicted probabilities of marijuana use by risk factors

Table 3 presents the predicted probabilities of past-month marijuana use at each level of risk and by reasons for use. We also present marginal effects, which represent the change in the probability of each outcome as the risk factors change, while holding all other characteristics constant. Adjusted relative risk ratios from the multinomial logistic regression model are presented in supplemental Table S3 in the online version of this article.

Overall, the average predicted probabilities of marijuana use for medical, recreational, and both reasons were 28.6%, 38.2%, and 33.1%, respectively. Several covariates were associated with marijuana users' reported reasons for use including, but not limited to, gender, age, race, education status and employment.

Associations between both health status and frequency of use and reasons for use were large in magnitude and statistically significant. For example, respondents who reported 14+ versus no days of poor mental health had significantly increased chances of reporting marijuana use for medical reasons (+4.7% [CI: 1.2%- 8.3%]) or both reasons (+8.5.0% [CI: 4.7%- 12.3%]) and a significantly decreased probability of reporting recreational reasons (-13.3% [CI: -17.0% to - 9.5%]). This same pattern—that is, greater probabilities of reporting medical reasons or both reasons among those in poor health—was also evident for physical health.

Marijuana users who reported daily use had a 6.3% (CI: 3.8%-8.8%) increased probability of reporting medical reasons and a 15.6% (CI: 12.8%-18.5%) increased probability of reporting both reasons. Daily users had a significantly reduced likelihood of reporting recreational reasons for use (-21.9% [CI: -24.6% to -19.2%]). Estimates from the logistic regression model showed similar patterns. See Supplemental Table S4 in the online version of this article.

3.4 Associations with states' marijuana legalization

Among respondents in fully legal states, the chance of reporting recreational reasons was 5.5% lower (CI: -10.9 to -0.1) than in illegal states (Table 3), but the chance of reporting both reasons was 7.0% higher (CI: 1.6%- 12.4%). While the predicted probability of reporting medical reasons was lower with states' liberalization of marijuana, differences were not statistically significant.

Our user profiles confirmed these patterns (Figure 2). We deliberately modeled illustrative profiles possessing characteristics associated with medical and recreational reasons for use based on our results: an older woman in poor mental and physical health who is a daily marijuana user and a young adult male who is an infrequent marijuana user (1-4 days in the past month) and a binge drinker. In the first case, we found that the average predicted probabilities of reporting medical, recreational, and both reasons did not significantly vary by states' legal environments. For the second user profile, we found that the predicted probability of reporting recreational reasons was 5.3% lower ($p=0.03$) in a fully legal state than in a fully illegal state. Conversely, the predicted probability of reporting both reasons was 5.0% higher ($p=0.01$) in a fully legal than in an illegal state. The difference in the probabilities of reporting medical reasons in legal versus illegal states (7.9% and 8.2%, respectively) was not statistically significant.

4. Discussion

Our study makes two, unique contributions. First, we estimated the change in probability (average marginal effect) associated with incremental changes in risk factors on each reason for use and created user profiles to illustrate these relationships. Second, we used three years of BRFSS data to examine marijuana users' reasons for use, data which we do not believe has been previously used for this purpose.

We found that the prevalence of past-month marijuana use in our sample was 11.2%, which was similar to, but not the same as, rates reported from other U.S. sample surveys. For example, two studies based on BRFSS data from 2016 and 2016-2017, respectively, found prevalence rates of 9.1% (Schauer et al., 2020) and 13.6% (Parekh et al., 2020). The National Survey on Drug Use and Health (NSDUH) reported rates of past-month marijuana use among persons aged 12 or older from 11.2% in 2017 to 13.0% in 2019 (Substance Abuse and Mental Health Services Administration (SAMHSA), 2018, 2019, 2020). Findings from a study that used 2005-2018 National Health and Nutrition Examination Survey (NHANES) data reported a 14.4% past-month marijuana prevalence rate (Diep et al., 2021). Differences in these estimates could be attributable to time trends, study inclusion criteria, and/or differences in each survey's design and data collection procedures.

Like other studies (Pacula et al., 2016), we found that adults were most likely to report recreational reasons for use (37.7%) followed by both reasons (32.9%) and medical reasons (29.4%). The characteristics we identified as being associated with marijuana users' reasons for use—gender, age, race, education, health status, and frequency of use—also comport with prior research (Choi et al., 2017; Compton et al., 2017; Lin et al., 2016; Pacula et al., 2016; Rotermann and Pagé, 2018; Roy-Byrne et al., 2015). Consistent with prior studies (Baldassarri et al., 2020; Pacula et al., 2016), we found that medical marijuana users were less likely to report smoking marijuana and more likely to eat/drink, vape, and use other routes of administration. This pattern is consistent with evidence, which has found that vaporization is a commonly used mode of delivery among medical marijuana users because of its relative health advantages over smoking (e.g., reduced respiratory impact and exacerbation of certain medical symptoms) and the flexibility, portability, efficiency, and ease of use that accompanies vaporization devices (Aston et al., 2019; Lankenau et al., 2017). It is possible that eating/drinking offers similar benefits. Additional studies are needed to explore this phenomenon.

We found that being a woman increased the odds of reporting medical reasons for past-month marijuana use (versus recreational reasons). While prior studies have found that women were more likely to report using marijuana for medical reasons compared to recreational ones (Lin et al., 2016; Roy-Byrne et al., 2015; Turna et al., 2020), in only one of these studies was the difference statistically significant (Bruce et al., 2020). Our findings complement a recent study (Boehnke et al., 2019), which explored gender differences in medical marijuana use and found that women were more likely than men to use medical marijuana for a variety of symptoms including pain, anxiety, and nausea—conditions which commonly qualify patients for medical use (Compton et al., 2017; Lin et al., 2016; Turna et al., 2020).

Finally, we found that past-month marijuana users who reported medical reasons for use were more likely to be older and in poorer health, and they were more likely to be daily users. Prior studies have produced similar findings (Chen et al., 1997; Fischer et al., 2010; Hall and Solowij, 1998; Hughes et al., 2014; Walden and Earleywine, 2008; Zeisser et al., 2012). Notably, we also found that marijuana users who reported using for both medical and recreational reasons were the most likely to be daily users. Because the frequency and quantity of marijuana consumed have been associated with marijuana dependence and other adverse effects (Mikuriya et al., 2007; Park and Wu, 2017), persons who report using for medical and/or both reasons could bear greater risks. Studies that compare daily and intermittent marijuana users' reasons for use and adverse outcomes, and which draw on diverse populations, are needed to better understand these relationships and optimize generalizability (Looby and Earleywine, 2007).

Our findings regarding the association between legalization and marijuana users' reported reasons for use were unexpected. We found that in fully legal states (versus illegal states), the predicted probability of reporting recreational use was significantly lower while the probability of reporting both reasons was significantly higher. While these findings are counterintuitive, restrictive recreational marijuana laws and higher tax rates incentivize medical use (Mikuriva et al., 2007; Park and Wu, 2017). These forces could drive recreational users, especially those who use marijuana to self-medicate (Substance Abuse and Mental Health Services Administration (SAMHSA), 2020c), towards using and reporting medical reasons or both reasons for use, which might explain our findings. Alternatively, states that have legalized marijuana for recreational use tend to hold liberal positions on other issues and attract residents who share those values. It is entirely possible that persons who hold such liberal values are more likely to view marijuana favorably, recognize its therapeutic benefits, and attribute at least some of their use to a medical need.

Limitations

Our findings should be placed within the context of data and study limitations. BRFSS data are self-reported, which could introduce reporting bias. While we combined the three most recent years of BRFSS data, we effectively limited our sample to 20 states and 18,925 marijuana users. This diminishes the generalizability of our results. We know that marijuana prevalence varies by state (Substance Abuse and Mental Health Services Administration (SAMHSA), 2020c), at least in part, because of states' policies regarding marijuana use, possession, and sales (Cerdá, Wall, Keyes, Galea, & Hasin, 2011). If the subset of states that opted to include the BRFSS marijuana module also had different use rates or reasons for marijuana use, confounding could have been introduced.

Further, we excluded 294,751 respondents from our sample ($n=252,810$ who reported no marijuana use; $n=41,941$ with missing marijuana or reasons for use data). These respondents differed from those retained on many characteristics. For example, respondents in our study sample were more likely to be male, older, report using tobacco and binge drinking and less likely to be married. If this same pattern existed for the variables of greatest interest, our estimates could be biased. (Mercurio et al., 2019) Additional research using other national samples is needed to replicate our findings.

Additionally, the BRFSS asks respondents about their reasons with three responses: medical, recreational, or both. In reality, marijuana users' reasons for use may be more nuanced; users might not fit "neatly" into these three categories. For example, some may view marijuana as having general health benefits—helping with relaxation or enhancing wellness. This is supported by studies, which have found users describing marijuana as a "natural" alternative to or substitute for other prescription medications (Ayers et al., 2019) and the marijuana industry's marketing of it as a lifestyle product (Pacula and Smart, 2017). In these cases, it is unclear how a user might answer the BRFSS question. Further, the BRFSS does not ask respondents about several potentially important predictors of marijuana users' reasons for use, including quantity, duration of use or dose.

Our coding of states' policy environments as a categorical variable could be an imprecise reflection of how states' policy environments influence consumption patterns (Pacula and Smart, 2017). Given that local government entities have enacted additional policies that further regulate marijuana markets, studies that also account for local policies and other factors such as retail availability of marijuana are needed. Finally, our analysis offers insight into the correlates of reasons for marijuana use, but because of the BRFSS' cross-sectional nature, causal inferences cannot be made.

5. Conclusion

A growing number of Americans report using marijuana and an increasing number of states have legalized it, however, there have been few studies examining whether adult marijuana users primarily use for medical, recreational, or both reasons. Our study extends what is known about this, controls for states' policy environments, and distinguishes the characteristics of each subgroup. In doing so, our estimates establish a baseline for marijuana consumption against which changes can be measured as policy environments continue to evolve.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgements

The 2017-2019 Behavioral Risk Factor Surveillance System (BRFSS) dataset was used for this research. The survey questions, and data can be found at: <https://www.cdc.gov/brfss/>. Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Data. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2017-2019.

Role of Funding Source

Dr. Kurtzman did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. Dr. Young-Wolff was supported by an NIDA K01 Award (DA043604).

References

Adinoff B, Reiman A, 2019. Implementing social justice in the transition from illicit to legal cannabis. *American Journal of Drug and Alcohol Abuse*. 10.1080/00952990.2019.1674862

- Adrian M, 2015. What the History of Drugs Can Teach Us about the Current Cannabis Legalization Process: Unfinished Business. *Substance Use and Misuse*50, 990–1004. 10.3109/10826084.2015.1013725 [PubMed: 26361906]
- Aston ER, Scott B, Farris SG, 2019. A qualitative analysis of cannabis vaporization among medical users. *Experimental and Clinical Psychopharmacology*27, 301–308. 10.1037/pha0000279 [PubMed: 31120278]
- Ayers JW, Caputi TL, Leas EC, 2019. The Need for Federal Regulation of Marijuana Marketing. *JAMA*321. 10.1001/jama.2019.4432
- Baldassarri SR, Camenga DR, Fiellin DA, Friedman AS, 2020. Marijuana Vaping in U.S. Adults: Evidence From the Behavioral Risk Factor Surveillance System. *American Journal of Preventive Medicine*59, 449–454. 10.1016/j.amepre.2020.03.014 [PubMed: 32684361]
- Boehnke KF, Gangopadhyay S, Clauw DJ, Haffajee RL, 2019. Qualifying Conditions Of Medical Cannabis License Holders In The United States. *Health Affairs*38. 10.1377/hlthaff.2018.05266
- Bruce D, Grove TJ, Foster E, Shattell M, 2020. Gender Differences in Medical Cannabis Use: Symptoms Treated, Physician Support for Use, and Prescription Medication Discontinuation. *Journal of Women’s Health*. 10.1089/jwh.2020.8437
- Centers for Disease Control and Prevention, 2019. BRFSS 2018 Summary Data Quality Report. Atlanta.
- Centers for Disease Control and Prevention (CDC), 2020a. BRFSS 2019 Summary Data Quality Report. Atlanta.
- Centers for Disease Control and Prevention (CDC), 2020b. Complex Sampling Weights and Preparing 2019 BRFSS Module Data for Analysis . Atlanta.
- Centers for Disease Control and Prevention (CDC), 2019. Complex Sampling Weights and Preparing 2018 BRFSS Module Data for Analysis. Atlanta.
- Centers for Disease Control and Prevention (CDC), 2018a. BRFSS 2017 Summary Data Quality Report. Atlanta .
- Centers for Disease Control and Prevention (CDC), 2018b. Complex Sampling Weights and Preparing 2017 BRFSS Module Data for Analysis. Atlanta.
- Chen K, Kandel DB, Davies M, 1997. Relationships between frequency and quantity of marijuana use and last year proxy dependence among adolescents and adults in the United States. *Drug and Alcohol Dependence*46. 10.1016/S0376-8716(97)00047-1
- Choi NG, DiNitto DM, Marti CN, 2017. Nonmedical versus medical marijuana use among three age groups of adults: Associations with mental and physical health status. *American Journal on Addictions*26, 697–706. 10.1111/ajad.12598
- Compton WM, Han B, Hughes A, Jones CM, Blanco C, 2017. Use of marijuana for medical purposes among adults in the United States. *JAMA - Journal of the American Medical Association*. 10.1001/jama.2016.18900
- Diep C, Bhat V, Wijesundera DN, Clarke HA, Ladha KS, 2021. The Association between Recent Cannabis Use and Suicidal Ideation in Adults: A Population-based Analysis of the NHANES from 2005 to 2018: L’association Entre L’utilisation Récente de Cannabis et L’idéation Suicidaire Chez les Adultes: Une Analyse Dans la Population de la NHANES de 2005 à 2018. *The Canadian Journal of Psychiatry*. 10.1177/0706743721996112
- European Monitoring Centre for Drugs and Drug Addiction, 2013. Characteristics of frequent and high-risk cannabis users European Monitoring.
- Fischer B, Rehm J, Irving H, Ialomiteanu A, Fallu JS, Patra J, 2010. Typologies of cannabis users and associated characteristics relevant for public health: A latent class analysis of data from a nationally representative Canadian adult survey. *International Journal of Methods in Psychiatric Research*19, 110–124. 10.1002/mpr.307 [PubMed: 20506447]
- Hall W, 2010. What are the policy lessons of National Alcohol Prohibition in the United States, 1920-1933? *Addiction*105, 1164–1173. 10.1111/j.1360-0443.2010.02926.x [PubMed: 20331549]
- Hall W, Solowij N, 1998. Adverse effects of cannabis. *The Lancet*352. 10.1016/S0140-6736(98)05021-1

- Hughes JR, Fingar JR, Budney AJ, Naud S, Helzer JE, Callas PW, 2014. Marijuana use and intoxication among daily users: An intensive longitudinal study. *Addictive Behaviors*39, 1464–1470. 10.1016/j.addbeh.2014.05.024 [PubMed: 24935797]
- Klein RJ, Proctor SE, Boudreault MA, Turczyn KM, 2002. Healthy People 2010 criteria for data suppression. *Healthy People 2010 Stat Notes*1–12. [PubMed: 12117004]
- Lankenau SE, Fedorova E. v., Reed M, Schragger SM, Iverson E, Wong CF, 2017. Marijuana practices and patterns of use among young adult medical marijuana patients and non-patient marijuana users. *Drug and Alcohol Dependence*170, 181–188. 10.1016/j.drugalcdep.2016.10.025 [PubMed: 27987475]
- Levine HG, Reinarman C, 1991. *From Prohibition to Regulation: Lessons from Alcohol Policy for Drug Policy*. Source: The Milbank Quarterly.
- Lin LA, Ilgen MA, Jannausch M, Bohnert KM, 2016. Comparing adults who use cannabis medically with those who use recreationally: Results from a national sample. *Addictive Behaviors*61, 99–103. 10.1016/j.addbeh.2016.05.015 [PubMed: 27262964]
- Long JS, Freese J, 2014. *Regression Models for Categorical Dependent Variables Using Stata* (3rd ed.), 3rd ed. ed. Stata Press.
- Looby A, Earleywine M, 2007. Negative consequences associated with dependence in daily cannabis users. 10.1186/1747-597X-2
- Mikuriya T, Hergenrather J, Denney P, Lucido F, Bearman D, Nunberg H, 2007. Medical marijuana in California, 1996–2006. O’Shaughnessy’s: Journal of the California Cannabis Research Medical Group8–10.
- National Academies of Sciences, Engineering, and Medicine, 2017. *The Health Effects of Cannabis and Cannabinoids: The Current State of Evidence and Recommendations for Research*. National Academies Press, Washington.
- New Frontier Data, 2020. Cannabis in America for 2021 & Beyond [WWW Document]. URL <https://newfrontierdata.com/product/cannabis-in-america-for-2021-and-beyond/> (accessed 4.2.21).
- Norton EC, Dowd BE, Maciejewski ML, 2019. Marginal Effects—Quantifying the Effect of Changes in Risk Factors in Logistic Regression Models. *JAMA*321. 10.1001/jama.2019.1954
- Pacula RL, Jacobson M, Maksabedian EJ, 2016. In the weeds: A baseline view of cannabis use among legalizing states and their neighbours. *Addiction*. 10.1111/add.13282
- Pacula RL, Smart R, 2017. Medical Marijuana and Marijuana Legalization. *Annual Review of Clinical Psychology*13, 397–419. 10.1146/annurev-clinpsy-032816-045128
- Parekh T, Pemmasani S, Desai R, 2020. Marijuana Use Among Young Adults (18–44 Years of Age) and Risk of Stroke: A Behavioral Risk Factor Surveillance System Survey Analysis. *Stroke*51, 308–310. 10.1161/STROKEAHA.119.027828 [PubMed: 31707926]
- Park JY, Wu LT, 2017. Prevalence, reasons, perceived effects, and correlates of medical marijuana use: A review. *Drug and Alcohol Dependence*. 10.1016/j.drugalcdep.2017.03.009
- Rotermann M, Pagé M-M, 2018. Prevalence and correlates of non-medical only compared to self-defined medical and non-medical cannabis use, Canada, 2015. *Health Reports*29, 3–13.
- Roy-Byrne P, Maynard C, Bumgardner K, Krupski A, Dunn C, West II, Donovan D, Atkins DC, Ries R, 2015. Are medical Marijuana users different from recreational users? the view from primary care. *American Journal on Addictions*24, 599–606. 10.1111/ajad.12270
- Schauer GL, Njai R, Grant-Lenzy AM, 2020. Modes of marijuana use – smoking, vaping, eating, and dabbing: Results from the 2016 BRFSS in 12 States. *Drug and Alcohol Dependence*209. 10.1016/j.drugalcdep.2020.107900
- StataCorp, 2017. *Stata Statistical Software: Release*15.
- Steigerwald S, Cohen BE, Vali M, Hasin D, Cerda M, Keyhani S, 2020. Differences in Opinions About Marijuana Use and Prevalence of Use by State Legalization Status. *Journal of Addiction Medicine*14. 10.1097/ADM.0000000000000593
- Substance Abuse and Mental Health Services Administration (SAMHSA), 2020a. 2019 National Survey on Drug Use and Health (NSDUH).
- Substance Abuse and Mental Health Services Administration (SAMHSA), 2020b. 2019 National Survey on Drug Use and Health (NSDUH): Methodological Summary and Definitions.

- Substance Abuse and Mental Health Services Administration (SAMHSA), 2020c. 2018-2019 National Survey on Drug Use and Health National Maps of Prevalence Estimates, by State [WWW Document]. URL <https://www.samhsa.gov/data/sites/default/files/reports/rpt32803/2019NSDUHsaeMaps/2019NSDUHsaeMaps/2019NSDUHsaeMaps.pdf> (accessed 4.6.21).
- Substance Abuse and Mental Health Services Administration (SAMHSA), 2019. 2018 National Survey on Drug Use and Health (NSDUH).
- Substance Abuse and Mental Health Services Administration (SAMHSA), 2018. 2017 National Survey on Drug Use and Health (NSDUH).
- Turna J, Balodis I, Munn C, van Ameringen M, Busse J, MacKillop J, 2020. Overlapping patterns of recreational and medical cannabis use in a large community sample of cannabis users. *Comprehensive Psychiatry* 102. 10.1016/j.comppsy.2020.152188
- U.S. Department of Health and Human Services, O. of the S.G., 2019. Surgeon General’s Advisory: Marijuana Use and the Developing Brain.
- Volkow ND, Compton WM, Wargo EM, 2017. The risks of marijuana use during pregnancy. *JAMA - Journal of the American Medical Association*. 10.1001/jama.2016.18612
- Walden N, Earleywine M, 2008. How high: Quantity as a predictor of cannabis-related problems. *Harm Reduction Journal* 5. 10.1186/1477-7517-5-20
- Zeisser C, Thompson K, Stockwell T, Duff C, Chow C, Vallance K, Ivsins A, Michelow W, Marsh D, Lucas P, 2012. A “standard joint”? the role of quantity in predicting cannabis-related problems. *Addiction Research and Theory* 20, 82–92. 10.3109/16066359.2011.569101

Highlights:

- Adult respondents reported recreational reasons for use most frequently
- Medical marijuana users more likely to be older, in poorer health, and daily users
- Legalization decreased the predicted probability of reporting recreational use

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

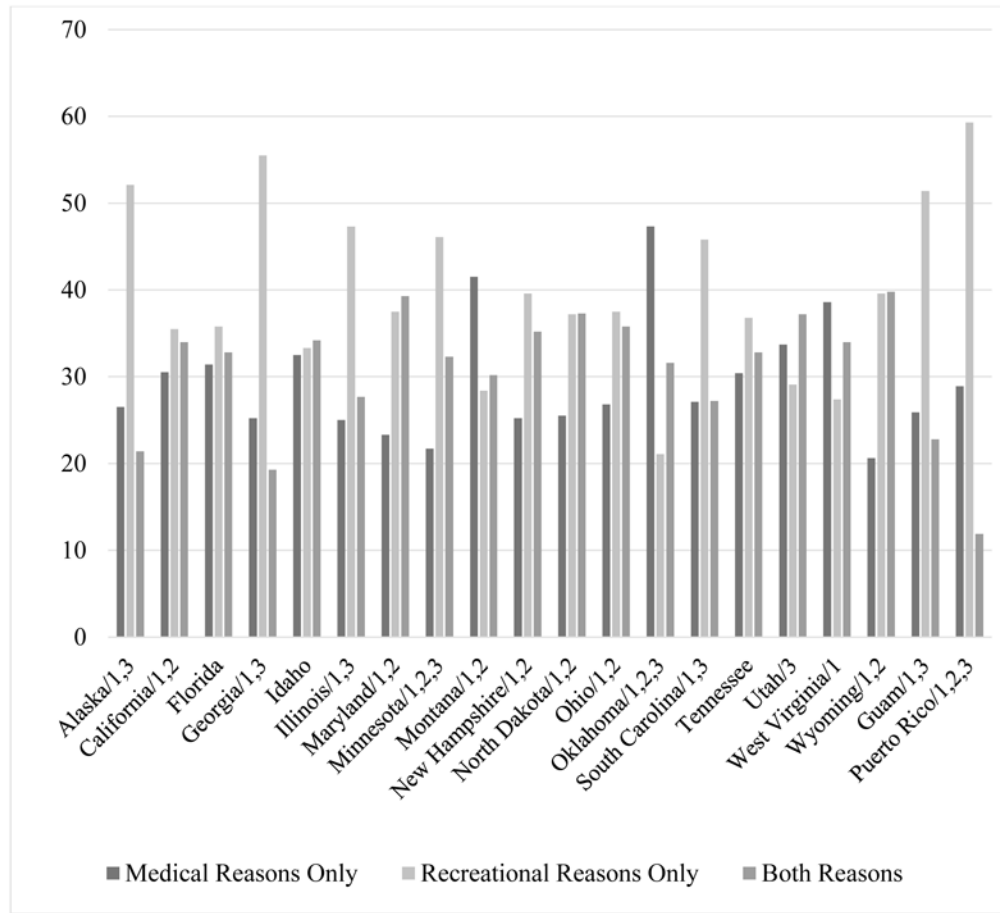


Fig. 1. Past-Month Marijuana Use by Reasons for Use in 20 States, Adults Age 18 (Weighted), 2017-2019 (N=18,925)

Source: BRFSS, 2017-2019

Responses derived from self-reported past 30-day marijuana or hashish use. Results exclude 211 observations of cannabis users without responses to the question about reasons for use (93 don't know; 79 refused; 39 blank/missing). All estimates are adjusted for sampling weights and BRFSS' complex survey design; confidence intervals are based on standard errors computed using the linearized (or robust) variance estimator.

¹ Relationship between medical and recreational reasons is statistically significant based on an adjusted Wald test, p < 0.05

² Relationship between medical and both reasons is statistically significant based on an adjusted Wald test, p < 0.05

³ Relationship between recreational and both reasons is statistically significant based on an adjusted Wald test, p < 0.05

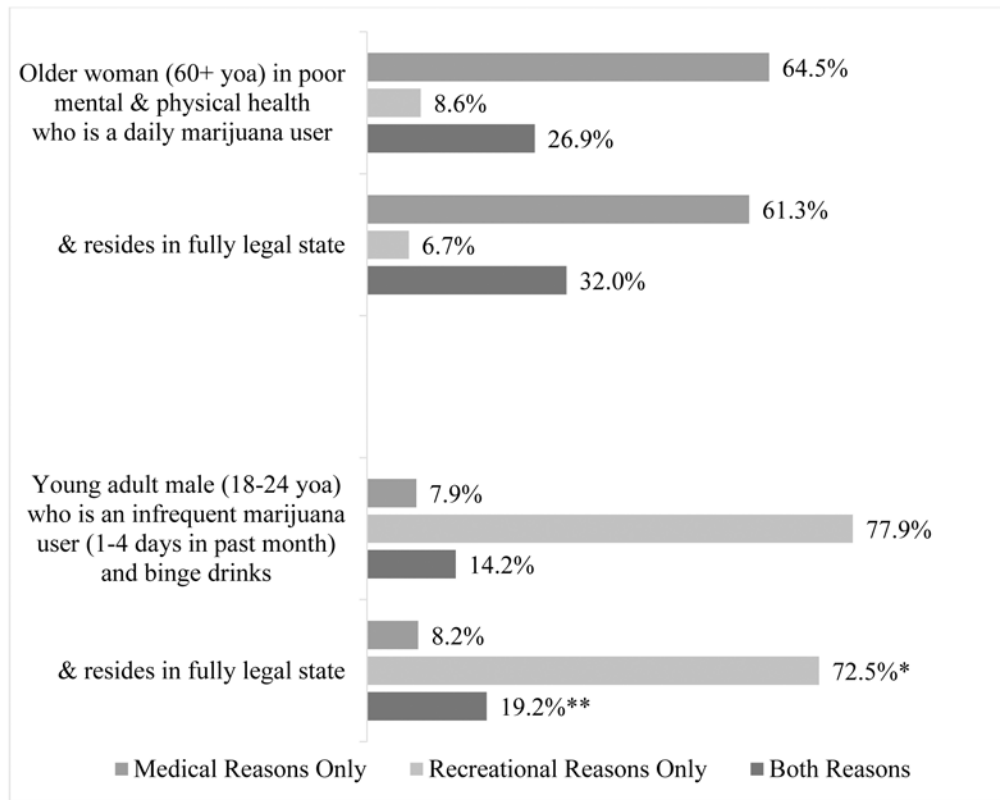


Fig. 2. Average Predicted Probabilities of Past-Month Marijuana Use by User Profile and Reasons for Use, 20 States (Weighted), 2017-2019 (N=15,788)

Source: BRFSS, 2017-2019

Results are based on estimating the predicted probability of reporting each reason for use using hypothetical observations with illustrative values while varying states' legal status. All estimates are adjusted for sampling weights and BRFSS' complex survey design; confidence intervals are based on standard errors computed using the linearized (or robust) variance estimator.

yoa = years of age

* Statistically significant decrease in average predicted probability of past-month marijuana use for recreational reasons only (p 0.05), holding all else constant

** Statistically significant increase in average predicted probability of past-month marijuana for both reasons (p 0.01), holding all else constant

Table 1.

Past-Month Marijuana Use by Reasons for Use in 20 States, Adults Age 18 (Weighted), 2017-2019
(N=18,925)[§]

State	Medical Only (n=6,068)			Recreational Only (n=7,059)			Both (medical and recreational) (n=5,798)		
	N	%	95%, CI	N	%	95%, CI	N	%	95%, CI
Total ^{1,2,3}	6068	29.4	28.2-30.6	7059	37.7	36.4-39.0	5798	32.9	31.6-34.2
Alaska ^{1,3}	129	26.5	20.0-34.1	200	52.1	43.7-60.4	74	21.4	15.5-29.0
California ^{1,2}	1125	30.5	28.5-32.6	1251	35.5	33.4-37.6	1168	34.0	32.0-36.1
Florida	333	31.4	26.2-37.2	311	35.8	29.9-42.1	339	32.8	26.9-39.3
Georgia ^{1,3}	62	25.2	18.9-32.7	110	55.5	47.2-63.5	43	19.3	13.9-26.3
Idaho	272	32.5	27.7-37.8	255	33.3	28.5-38.5	220	34.2	28.7-40.1
Illinois ^{1,3}	130	25.0	20.8-29.7	213	47.3	41.9-52.7	130	27.7	23.2-32.8
Maryland ^{1,2}	552	23.3	20.7-26.2	567	37.5	34.1-41.0	660	39.3	35.9-42.7
Minnesota ^{1,2,3}	726	21.7	20.0-23.5	1385	46.1	43.9-48.3	896	32.3	30.2-34.4
Montana ^{1,2}	230	41.5	36.1-47.1	125	28.4	23.5-33.8	143	30.2	25.2-35.7
New Hampshire ^{1,2}	353	25.2	22.0-28.7	432	39.6	35.7-43.8	350	35.2	31.4-39.2
North Dakota ^{1,2}	152	25.5	20.8-30.9	160	37.2	31.5-43.3	145	37.3	31.2-43.9
Ohio ^{1,2}	213	26.8	22.2-31.9	220	37.5	32.3-43.0	235	35.8	30.7-36.4
Oklahoma ^{1,2,3}	236	47.3	42.4-52.3	104	21.1	17.4-25.4	142	31.6	27.1-36.4
South Carolina ^{1,3}	358	27.1	23.9-30.6	502	45.8	41.9-49.7	296	27.2	23.8-30.8
Tennessee	309	30.4	26.4-34.7	319	36.8	32.4-41.5	231	32.8	28.2-37.8
Utah ³	254	33.7	29.4-38.2	179	29.1	25.0-33.5	216	37.2	32.8-42.0
West Virginia ¹	264	38.6	33.9-43.6	141	27.4	23.0-32.3	180	34.0	29.3-39.0
Wyoming ^{1,2}	170	20.6	17.3-24.4	247	39.6	35.0-44.3	218	39.8	35.2-44.7
Guam ^{1,3}	88	25.9	18.9-34.2	166	51.4	43.0-59.7	80	22.8	16.8-30.1
Puerto Rico ^{1,2,3}	112	28.9	21.3-35.1	172	59.3	52.3-65.9	32	11.9	8.0-17.3

Source: Source: BRFSS 2017-2019

All estimates are adjusted for sampling weights and BRFSS' complex survey design; confidence intervals are based on standard errors computed using the linearized (or robust) variance estimator

Analysis of 20 states: 12 states collected marijuana variables in 2017: AK, CA, GA, ID, MN, NH, OK, SC, TN, WY, Guam, PR; 16 states collected marijuana variables in 2018: CA, FL, ID, MD, MN, MT, NH, ND, OH, OK, SC, TN, WV, WY, Guam, PR; 14 states collected marijuana variables in 2019: CA, ID, IL, MD, MN, NH, ND, OK, SC, TN, UT, WV, WY, Guam

[§]Excludes 211 observations of cannabis users without responses to the question about reasons for use (93 don't know; 79 refused; 39 blank/missing); responses derived from self-reported past 30-day marijuana or hashish use

¹Relationship between medical and recreational reasons is statistically significant based on an adjusted Wald test, $p = 0.05$

²Relationship between medical and both reasons is statistically significant based on an adjusted Wald test, $p = 0.05$

³Relationship between recreational and both reasons is statistically significant based on an adjusted Wald test, $p = 0.05$

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 2.

Characteristics of Past Month-Marijuana Users by Reason for Use in 20 States, Adults Age 18 (Weighted), 2017-2019 (N=18,925)[§]

Characteristics	Total (n=18,925)		Medical Reasons Only (n=6,068)		Recreational Reasons Only (n=7,059)		Both Reasons (medical and recreational) (n=5,798)	
	%	95%, CI	%	95%, CI	%	95%, CI	%	95%, CI
Gender								
Male ^{1,2,3}	60.7	59.3- 62.0	52.2	49.8- 54.7	65.9	63.7- 67.9	62.3	59.9- 64.6
Female ^{1,2,3}	39.3	38.0- 40.7	47.8	45.3- 50.3	34.2	32.1- 36.3	37.7	35.4- 40.1
Age								
18-24 ^{1,2,3}	22.2	21.0- 23.5	12.5	10.8- 14.4	28.5	26.5- 30.6	23.8	21.6- 26.1
25-34 ^{1,2}	26.2	25.0- 27.4	22.9	20.8- 25.1	26.5	24.6- 28.5	28.8	26.7- 31.0
35-44 ¹	17.7	16.6- 18.8	19.8	17.8- 22.0	16.0	14.5- 17.6	17.6	15.7- 19.7
45-54 ^{1,2}	12.7	11.8- 13.6	15.6	13.9- 17.4	11.4	10.1- 12.9	11.4	10.0- 13.0
55-64 ^{1,2}	13.3	12.5- 14.1	16.5	15.0- 18.1	11.4	10.1- 12.8	12.5	11.2- 13.9
65+ ^{1,2}	8.0	7.4-8.7	12.8	11.3- 14.4	6.2	5.4- 7.1	5.9	5.0- 6.8
Young adult (18-24 years of age) ^{1,2,3}	22.2	21.0- 23.5	12.5	10.8- 14.4	28.5	26.5- 30.6	23.8	21.6- 26.1
Other (≥ 25 years of age) ^{1,2,3}	77.8	76.6- 79.0	87.5	85.6- 89.2	71.5	69.4- 73.6	76.3	73.9- 78.4
Race								
White ^{1,3}	69.7	68.3- 71.0	72.0	69.6- 74.4	66.4	64.1- 68.6	71.5	69.1- 73.8
Black ^{1,3}	14.8	13.8- 15.8	12.5	10.9- 14.3	16.1	14.6- 17.8	15.2	13.4- 17.2
Other ³	15.6	14.4- 16.7	15.5	13.5- 17.6	17.5	15.6- 19.6	13.4	11.6- 15.3
Ethnicity								
Hispanic/Latino	21.1	19.9- 22.4	19.6	17.5- 22.0	22.2	20.3- 24.3	21.1	19.0- 23.5
Other	78.9	77.6- 80.1	80.4	78.0- 82.5	77.8	75.7- 79.7	78.9	76.5- 81.1
Marital status								
Married ^{1,2}	30.0	28.8- 31.2	35.4	33.1- 37.8	27.9	26.0- 29.9	27.5	25.4- 29.7
Other (never married, widowed, unmarried couple) ^{1,2}	70.0	68.8- 71.2	64.6	62.2- 66.9	72.1	70.1- 74.0	72.5	70.3- 74.6
Education								

Characteristics	Total (n=18,925)		Medical Reasons Only (n=6,068)		Recreational Reasons Only (n=7,059)		Both Reasons (medical and recreational) (n=5,798)	
	%	95%, CI	%	95%, CI	%	95%, CI	%	95%, CI
Graduated from college/tech school ^{1,3}	21.0	20.1- 21.9	18.2	16.6- 19.8	24.5	22.9- 26.1	19.5	17.9- 21.1
Other ^{1,3}	79.0	78.1- 79.9	81.9	80.2- 83.4	75.5	73.9- 77.1	80.5	78.9- 82.1
Employment status								
Employed or self-employed ^{1,2,3}	63.1	61.8- 64.4	52.1	49.7- 54.6	69.6	67.5- 71.6	65.4	63.0- 67.6
Not employed (out of work/unable to work, homemaker, student, retired) ^{1,2,3}	36.9	35.6- 38.3	47.9	45.4- 50.4	30.4	28.4- 32.5	34.6	32.4- 37.0
Income								
< \$25,000 ^{1,2,3}	29.3	28.0- 30.5	37.3	34.9- 39.8	23.5	21.7- 25.5	28.6	26.5- 30.9
\$25,000/year ^{1,2,3}	70.8	69.5- 72.0	62.7	60.2- 65.1	76.5	74.5- 78.3	71.4	69.1- 73.5
Health status								
Excellent/very good/good ^{1,2,3}	79.9	78.8- 80.9	67.2	64.9- 69.4	88.8	87.3- 90.1	81.0	79.1- 82.7
Fair/poor ^{1,2,3}	20.2	19.1- 21.2	32.8	30.6- 35.1	11.3	9.9- 12.8	19.0	17.3- 20.9
Frequency								
1-4 days ^{1,2,3}	31.4	30.2- 32.7	25.8	23.7- 28.1	46.9	44.7- 49.1	18.8	17.1- 20.6
5-9 days	9.7	8.9- 10.5	9.3	8.1- 10.7	10.6	9.4- 11.9	9.1	7.7- 10.7
10-14 days	7.5	6.8-8.3	7.5	6.2-9.2	7.7	6.6- 9.0	7.4	6.2- 8.7
15-19 days ³	5.5	5.0-6.2	5.5	4.5-6.7	4.5	3.7- 5.3	6.8	5.6- 8.1
20-24 days ³	6.2	5.6-6.8	6.1	5.0-7.5	5.2	4.4- 6.1	7.4	6.2- 8.7
25-30 days ^{1,2,3}	39.6	38.3- 41.0	45.7	43.3- 48.2	25.2	23.3- 27.2	50.7	48.2- 53.1
Mode of use/1								
Smoke ^{1,2}	71.5	70.3- 72.8	61.2	58.8- 63.6	76.1	74.2- 78.0	75.5	73.4- 77.5
Vape ¹	12.4	11.6- 13.4	13.5	11.8- 15.2	11.2	9.9- 12.6	13.0	11.4- 14.7
Eat or drink ^{1,2,3}	10.7	9.8- 11.5	14.7	13.0- 16.5	10.3	9.0- 11.8	7.5	6.4- 8.8
Dab, other ^{1,2,3}	5.4	4.8-6.0	10.7	9.3- 12.3	2.4	1.8- 3.3	4.0	3.2- 5.0
Tobacco use (current smoker)								
No ^{1,3}	69.3	68.1- 70.5	66.6	64.2- 68.9	72.4	70.4- 74.2	68.3	66.1- 70.4

Characteristics	Total (n=18,925)		Medical Reasons Only (n=6,068)		Recreational Reasons Only (n=7,059)		Both Reasons (medical and recreational) (n=5,798)	
	%	95%, CI	%	95%, CI	%	95%, CI	%	95%, CI
Yes ^{1,3}	30.7	29.5- 31.9	33.4	31.1- 35.8	27.6	25.8- 29.6	31.7	29.6- 33.9
Binge drinker [‡]								
No ^{1,2,3}	61.3	59.9- 62.6	76.7	74.5- 78.7	51.4	49.2- 53.6	58.9	56.4- 61.3
Yes ^{1,2,3}	38.7	37.4- 40.1	23.3	21.3- 25.5	48.6	46.4- 50.8	41.1	38.7- 43.6
State's legal status								
Fully legal (legal for medical + recreational) ^{1,3}	52.0	50.7- 53.3	53.9	51.5- 56.2	49.1	46.9- 51.3	53.6	51.2- 55.9
Mixed (legal for medical; illegal for recreational) ¹	31.8	30.7- 33.0	29.4	27.4- 31.5	34.0	32.1- 36.0	31.4	29.4- 33.6
Fully illegal (illegal for medical + recreational) ³	16.2	15.5- 17.0	16.7	15.5- 18.1	16.9	15.7- 18.1	15.0	13.7- 16.4

Source: Source: BRFSS 2017-2019

All estimates are adjusted for sampling weights and BRFSS' complex survey design; confidence intervals are based on standard errors computed using the linearized (or robust) variance estimator

Analysis of 20 states: 12 states collected marijuana variables in 2017: AK, CA, GA, ID, MN, NH, OK, SC, TN, WY, Guam, PR; 16 states collected marijuana variables in 2018: CA, FL, ID, MD, MN, MT, NH, ND, OH, OK, SC, TN, WV, WY, Guam, PR; 14 states collected marijuana variables in 2019: CA, ID, IL, MD, MN, NH, ND, OK, SC, TN, UT, WV, WY, Guam

[§]Excludes 211 observations of cannabis users without responses to the question about reasons for use (93 don't know; 79 refused; 39 blank/missing); responses derived from self-reported past 30-day marijuana or hashish use

Derived from self-reported past 30-day marijuana or hashish use

[‡]Binge drinker defined as males having five or more drinks on one occasion, females having four or more drinks on one occasion

¹Relationship between medical and recreational reasons is statistically significant based on an adjusted Wald test, p = 0.05

²Relationship between medical and both reasons is statistically significant based on an adjusted Wald test, p = 0.05

³Relationship between recreational and both reasons is statistically significant based on an adjusted Wald test, p = 0.05

Table 3. Differences in Predicted Probabilities (marginal effects) of Past-Month Marijuana Use by Reasons for Use and Risk Factor in 20 states, Adults Age 18 (Weighted), 2017-2018 (N=15,788)

Variable	Reasons for Past-Month Marijuana Use					
	Medical Reasons Only ¹		Recreational Reasons Only ²		Both Reasons (medical + recreational) ³	
	Predicted Probability % (95% CI)	Difference in Predicted Probability % (95% CI)	Predicted Probability % (95% CI)	Difference in Predicted Probability % (95% CI)	Predicted Probability % (95% CI)	Difference in Predicted Probability % (95% CI)
Gender						
Male	25.8 (24.2, 27.4)	Ref	40.1 (38.3, 41.9) ^d	Ref	34.1 (32.3, 35.9) ^d	Ref
Female	32.9 (30.8, 35.0)	7.1 (4.5, 9.6) ^b	35.3 (33.0, 37.6)	-4.8 (-7.6, -2.0) ^b	31.8 (29.6, 34.1)	-2.3 (-5.2, 0.6)
Age						
18-24	19.1 (16.0, 22.2)	Ref	47.5 (43.9, 51.0) ^d	Ref	33.4 (29.9-36.9) ^d	Ref
25-34	27.1 (24.5, 29.6)	7.9 (4.0, 11.8) ^b	38.1 (35.5, 40.7) ^d	-9.4 (-13.7, -5.0) ^b	34.8 (32.1-37.6) ^d	1.4 (-3.0, 5.8)
35-44	33.3 (30.0, 36.6)	14.2 (9.6, 18.8) ^b	33.0 (30.0, 36.1)	-14.5 (-19.2, -9.7) ^b	33.7 (30.2-37.1)	0.3 (-4.7, 5.2)
45-54	32.5 (29.0, 36.1)	13.4 (8.6, 18.2) ^b	35.4 (32.0, 38.9)	-12.0 (-17.0, -7.0) ^b	32.0 (28.4-35.7)	-1.4 (-6.6, 3.8)
55-64	30.6 (27.6, 33.5)	11.4 (7.0, 15.9) ^b	36.2 (32.7, 39.7) ^c	-11.3 (-16.3, -6.2) ^b	33.3 (29.9-36.6)	-0.2 (-5.2, 4.9)
65+	35.2 (31.1, 39.4)	16.1 (10.8, 21.4) ^b	36.2 (31.9, 38.9)	-11.2 (-16.9, -5.5) ^b	28.5 (24.3-32.8)	-4.9 (-10.5, 0.8)
Race						
White	29.1 (27.6, 30.6)	-0.4 (-4.6, 3.9)	36.7 (35.1, 38.3) ^d	-5.6 (-10.3, -0.9) ^a	34.2 (32.6, 35.8) ^d	6.0 (1.7, 10.4) ^b
Black	25.5 (22.1, 28.8)	-4.0 (-9.2, 1.2)	40.9 (37.2, 44.6) ^d	-1.5 (-7.3, 4.3)	33.6 (29.8, 37.5) ^d	5.5 (-0.1, 11.1)
Other	29.5 (25.6, 33.4)	Ref	42.3 (38.0, 46.7) ^d	Ref	28.2 (24.2, 32.1)	Ref
Ethnicity						
Not Hispanic	28.3 (26.8, 29.8)	-1.7 (-5.6, 2.2)	38.1 (36.5, 39.8) ^d	-0.5 (-4.5, 3.6)	33.6 (31.9, 35.2) ^d	2.2 (-2.0, 6.3)
Hispanic	30.0 (26.5, 33.5)	Ref	38.6 (35.1, 42.1) ^d	Ref	31.4 (27.8, 35.0)	Ref
Marital status						

Variable	Reasons for Past-Month Marijuana Use					
	Medical Reasons Only ¹		Recreational Reasons Only ²		Both Reasons (medical + recreational) ³	
	Predicted Probability % (95% CI)	Difference in Predicted Probability % (95% CI)	Predicted Probability % (95% CI)	Difference in Predicted Probability % (95% CI)	Predicted Probability % (95% CI)	Difference in Predicted Probability % (95% CI)
Married	31.2 (28.7, 33.6)	3.8 (0.9, 6.7) ^b	36.8 (34.2, 39.3) ^d	-2.2 (-5.2, 0.8)	32.0 (29.4, 34.7)	-1.6 (-4.8, 1.5)
Other	27.4 (25.8, 28.9)	Ref	39.0 (37.3, 40.7) ^d	Ref	33.6 (32.0, 35.3) ^d	Ref
Education						
College graduate	24.4 (22.4, 26.4)	-5.5 (-8.1, -2.9) ^b	42.7 (40.4, 45.1) ^d	5.9 (3.0, 8.8) ^b	32.8 (30.4, 35.3) ^d	-0.4 (-3.4, 2.6)
Other	29.9 (28.3, 31.5)	Ref	36.9 (35.1, 38.6) ^d	Ref	33.2 (31.5, 34.9) ^c	Ref
Employment status						
Employed	26.9 (25.2, 28.6)	Ref	39.3 (37.6, 41.1) ^d	Ref	33.8 (32.0, 35.6) ^d	Ref
Not employed	31.5 (29.2, 33.9)	4.6 (1.6, 7.7) ^b	36.1 (33.5, 38.8)	-3.2 (-6.5, -0.1) ^a	32.3 (29.8, 34.9)	-1.4 (-4.6, 1.8)
Income						
<\$25K/year	32.9 (30.5, 35.4)	6.1 (3.1, 9.1) ^b	35.0 (32.3, 37.7)	-4.4 (-7.7, -1.0) ^b	32.1 (29.5, 34.6)	-1.7 (-4.9, 1.5)
\$25K/year	26.8 (25.3, 28.4)	Ref	39.4 (37.6, 41.2) ^d	Ref	33.7 (32.0, 35.5) ^d	Ref
Mental health (# days not good)						
0 days	27.9 (25.8, 30.0)	Ref	44.2 (41.9, 46.5) ^d	Ref	27.9 (25.8, 30.0)	Ref
1-13 days	26.8 (24.7, 28.9)	-1.1 (-4.0, 1.9)	35.5 (33.3, 37.8) ^d	-8.7 (-11.9, -5.5) ^b	37.6 (35.2, 40.1) ^d	9.7 (6.4, 13.0) ^b
14+ days	32.6 (29.9, 35.4)	4.7 (1.2, 8.3) ^b	30.9 (27.9, 33.9)	-13.3 (-17.0, -9.5) ^b	36.4 (33.4, 39.5)	8.5 (4.7, 12.3) ^b
Physical health (# days not good)						
0 days	24.1 (22.4, 25.8)	Ref	43.2 (41.3, 45.2) ^d	Ref	32.7 (30.8, 34.6) ^d	Ref
1-13 days	28.5 (26.2, 30.8)	4.4 (1.6, 7.3) ^b	35.4 (32.9, 37.9) ^d	-7.9 (-11.0, -4.7) ^b	36.1 (33.6, 38.6) ^d	3.4 (0.3, 6.6) ^a
14+ days	44.6 (40.6, 48.6)	20.5 (16.1, 25.0) ^b	23.4 (19.9, 26.9) ^d	-19.9 (-23.8, -15.9) ^b	32.0 (28.2, 35.8) ^d	-0.7 (-5.0, 3.6)
Frequency of use						
Not daily	25.9 (24.2, 27.6)	Ref	48.1 (46.1, 50.1) ^d	Ref	26.0 (24.2, 27.8)	Ref

Variable	Reasons for Past-Month Marijuana Use							
	Medical Reasons Only ^f		Recreational Reasons Only ^g		Both Reasons (medical + recreational) ^h		Difference in Predicted Probability % (95% CI)	Difference in Predicted Probability % (95% CI)
	Predicted Probability % (95% CI)	Difference in Predicted Probability % (95% CI)	Predicted Probability % (95% CI)	Difference in Predicted Probability % (95% CI)	Predicted Probability % (95% CI)	Difference in Predicted Probability % (95% CI)		
Daily	32.2 (30.2, 34.1)	6.3 (3.8, 8.8) ^b	26.2 (24.3, 28.1) ^d	-21.9 (-24.6, -19.2) ^b	41.6 (39.5, 43.8) ^d	15.6 (12.8, 18.5) ^b		
Mode								
Smoke	24.5 (23.1, 26.0)	Ref	40.8 (39.1, 42.5) ^d	Ref	34.6 (32.9, 36.3) ^d	Ref		
Vape	33.7 (30.1, 37.3)	9.2 (5.3, 13.1) ^b	33.1 (29.7, 36.5)	-7.7 (-11.5, -3.9) ^b	33.2 (29.4, 37.0)	-1.5 (-5.6, 2.7)		
Eat/drink	38.5 (34.3, 42.6)	13.9 (9.5, 18.3) ^b	35.0 (31.1, 38.8)	-5.8 (-10.0, -1.7) ^b	26.6 (22.6, 30.5) ^d	-8.1 (-12.4, -3.8) ^b		
Dab/other	52.5 (47.0, 58.1)	28.0 (22.3, 33.7) ^b	22.1 (16.9, 27.3) ^d	-18.7 (-24.2, -13.2) ^b	25.4 (20.2, 30.5) ^d	-9.3 (-14.7, -3.9) ^b		
Tobacco use (current smoker)								
No	28.1 (26.6, 29.7)	Ref	38.7 (37.0, 40.3) ^d	Ref	33.2 (31.5, 34.9) ^d	Ref		
Yes	29.8 (27.4, 32.2)	1.7 (-1.2, 4.5)	37.2 (34.6, 39.8) ^d	-1.5 (-4.5, 1.6)	33.0 (30.5, 35.5)	-0.2 (-3.3, 2.9)		
Alcohol use (binge drinker ^f)								
No	33.4 (31.7, 35.2)	Ref	33.8 (32.1, 35.6)	Ref	32.8 (31.0, 34.6)	Ref		
Yes	20.6 (18.7, 22.5)	-12.8 (-15.4, -10.2) ^b	44.9 (42.6, 47.2) ^d	11.1 (8.3, 14.0) ^b	34.5 (32.2, 36.8) ^d	1.7 (-1.2, 4.6)		
State's legal status								
Fully legal	28.8 (26.4, 31.2)	-1.5 (-6.6, 3.6)	35.5 (32.9, 38.0) ^d	-5.5 (-10.9, -0.1) ^a	35.8 (33.0, 38.5) ^d	7.0 (1.6, 12.4) ^b		
Mixed	27.4 (24.9, 29.9)	-2.9 (-5.9, 0.1)	41.7 (39.1, 44.8) ^d	0.7 (-2.5, 4.0)	30.9 (28.3, 33.6)	2.2 (-0.8, 5.2)		
Fully illegal	30.3 (26.7, 33.8)	Ref	41.0 (37.1, 44.8) ^d	Ref	28.7 (25.2, 32.3)	Ref		

Source: BRFSS, 2017-2019

^f = males reporting the consumption of five or more drinks on one occasion, females having four or more drinks on one occasion. Models were simultaneously adjusted for all variables in the table.

All estimates are adjusted for sampling weights and BRFSS' complex survey design; confidence intervals are based on standard errors computed using the linearized (or robust) variance estimator

Analysis of 20 states: 12 states collected marijuana variables in 2017: AK, CA, GA, ID, MN, NH, OK, SC, TN, WY, Guam, PR; 16 states collected marijuana variables in 2018: CA, FL, ID, MD, MN, MT, NH, ND, OH, OK, SC, TN, WV, WY, Guam, PR; 14 states collected marijuana variables in 2019: CA, ID, IL, MD, MN, NH, ND, OK, SC, TN, UT, WV, WY, Guam

^h Average predicted probability of reporting past-month marijuana use for medical reasons only = 28.6%.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

² Average predicted probability of reporting past-month marijuana use for recreational reasons only = 38.2%.

³ Average predicted probability of reporting past-month marijuana use for both reasons = 33.1%.

Difference in predicted probabilities between levels of risk (versus reference) is statistically significant:

b p 0.05

b p 0.01

c p 0.05

d p 0.01

Difference in predicted probabilities by reasons for use (versus medical reasons only) is statistically significant: