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## Health conditions and motivations for marijuana use among young adult medical marijuana patients and non-patient marijuana users

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### Abstract

**Introduction**—While marijuana has been legal for medical purposes in California since 1996, little is known about the health histories of young adult medical marijuana patients who are a significant proportion of medical marijuana patients. We examine whether young adult medical marijuana patients report health conditions and motivations for use that were consistent with medical use of marijuana in California.

**Methods**—Young adults (N=366) aged 18 to 26 years old were sampled in Los Angeles in 2014–15 and segmented into medical marijuana “patients” (n=210), marijuana users with a current recommendation and non-patient users or “non-patients” (n=156), marijuana users who never had a medical marijuana recommendation. Differences between patients and non-patients regarding self-reported health histories and past/current motivations for marijuana use were expressed as unadjusted risk ratios.

**Results**—Compared to non-patients, patients were significantly more likely to report a range of lifetime health problems, such as psychological, physical pain and gastrointestinal. In the past 90 days, patients were significantly more likely to report motivations for marijuana use than non-patients concerning sleep, anxiety, physical pain and focusing. Psychological and pain problems were the most common health conditions reported to receive a medical marijuana

recommendation. Patients were significantly less likely than non-patients to report any privacy concerns about obtaining a medical marijuana recommendation.

**Conclusions**—Patients were significantly more likely to report a range of health conditions and motivations associated with medical use than non-patients. A great majority of patients reported obtaining a medical marijuana recommendation for health problems in accordance with California law.

### Keywords

medical marijuana; young adults; physical health; psychological health

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## Introduction

The use of marijuana for medical purposes is now legal in 28 out of 50 states (plus the District of Columbia) in the US, [1] a trend including 16 states that have legalised marijuana for medical purposes since 2010. California, the most populous state in the US with 38.3 million citizens, was the first to legalise marijuana for medical purposes in 1996 and has one of the broadest definitions of health conditions for which a physician can recommend medical marijuana: “cancer, anorexia, AIDS, chronic pain, spasticity, glaucoma, arthritis, migraine, or any other illness for which marijuana provides relief” [2]. Since 1996, results from more than 40 clinical trials indicate that marijuana (cannabis) and cannabinoids can be effective in the treatment of several physical conditions, including chronic pain, neuropathic pain, spasticity associated with multiple sclerosis, and nausea [3]. Similarly strong clinical evidence is lacking in support of marijuana’s effectiveness in treating some psychiatric conditions, such as post-traumatic stress disorder, agitation in Alzheimer’s disorder and Tourette’s disorder [4]. However, a survey of California physicians who recommended medical marijuana to patients reported effectiveness for a range of conditions, including post-traumatic stress disorder, depression, anxiety and insomnia [5].

A high proportion of early medical marijuana patients (henceforth referred to as “patients”) in California were HIV positive or diagnosed with AIDS and used marijuana to treat nausea and wasting syndrome [6–8]. A shift towards treating pain and psychological conditions, which is allowed under California law, began in the 2000s among patients [9,10], and were the primary indications among more recent studies reporting health conditions of patients [11–14]. Across all periods of research in the US, patients were predominantly white, male and over 35 years old [8,10–14], which leaves large gaps in understanding the health of non-whites, women and young adult patients, who represent a significant proportion of the broader population of medical marijuana patients [15].

Adolescents and young or emerging adults, commonly defined as persons aged 18 to 25 years old [16], report a variety of psychological and physical problems according to U.S. and international studies. These problems include: anxiety, mood, impulse-control, and substance use [17]; physical pain [18], such as back pain and musculoskeletal complaints [19]; abdominal pain and irritable bowel syndrome symptoms [20]; and asthma [21]. Overall, approximately 15% of young adults reported at least one chronic medical condition in 2004–2006 [22]. The prevalence of psychological and physical problems among young

adults is likely greater than reported estimates as suggested by high rates of misuse of prescription medications for the purposes of self-medication [23–27].

Among young adults, 19.6% (6.8 million persons) reported using marijuana in the past month in 2014, which is the highest rate among any age group in the US [28]. Nearly all research to date on health among young adult marijuana users has focused on illicit, recreational or non-medical use. Overall, studies indicate that these young adult non-patient marijuana users or “non-patients”, as a consequence of non-medical marijuana use, are at an increased risk for: physical ailments (e.g. respiratory problems, pulmonary effects), psychological problems (e.g., depression, anxiety, insomnia; drug dependence), criminal justice involvement, as well as lower academic achievement and functioning [29–40]. Other studies of young non-patients indicate that some psychological problems precede [41–42] rather than precipitate marijuana use, suggesting that marijuana may be used as a coping tool for some psychological problems. Similarly, results from a subsample of young adult patients indicate that psychological problems were the primary reasons for current marijuana use [13]. While data on young adult patients is very limited, these studies suggest some similarities in motives for marijuana use between young patients and non-patients. No studies have compared motives for marijuana use or health histories between young adult patients and non-patients.

Stigma may be associated with becoming a patient or using marijuana as a patient [43], as evidenced by the fact that while 5.9% of Californians report ever having “used marijuana medically” [15] only approximately 2.0% have received a medical marijuana recommendation [44]. For instance, there is a perception that rather than having bonafide health problems and using marijuana for its medical properties, patients are primarily taking advantage of the law to use marijuana recreationally [45]. This perception may extend even more so to young patients given that young adults report the highest rates of illicit marijuana use among any age group [28]. No studies have examined the health conditions reported by young adult patients to physicians, how these health conditions compare to permissible health conditions for medical marijuana under California law, or factors that might discourage young adults from seeking a medical marijuana recommendation.

Since much is known about young adult non-patients and little is known about young adult patients, we undertook a descriptive analysis of young adult patients and non-patients in Los Angeles, California with several objectives focusing on health: (i) compare demographic characteristics and health histories; (ii) compare past and current motivations for marijuana use; (iii) compare concerns relating to seeking a medical marijuana recommendation; and (iv) among patients, report health conditions indicated to physicians when obtaining their recommendation and assess the veracity of these health conditions. Overall, these objectives will inform the broader aim of determining whether young adult patients report health conditions and motivations for use that are consistent with medical use of marijuana in California, which is relevant for understanding if policies allowing for access to medical marijuana are reaching their intended target.

## Methods

### Sample

Participants (N=366) were recruited and interviewed in Los Angeles between February 2014 and April 2015. Enrolment criteria included the following: aged between 18 and 26 years old; used marijuana at least four times in the last 30 days; lived in the Los Angeles metro area; and spoke/read English. Additionally, the sample was stratified based upon whether young adults had a current medical marijuana recommendation issued by a California-based physician, i.e. medical marijuana patients (n=210), or not, i.e. non-patient users (n=156). Additionally, non-patients enrolled in the study were restricted to only those who had never received a medical marijuana recommendation.

Interviewers used targeted [46] and chain referral [47] sampling to recruit participants in natural settings, such as parks, streets, college campuses and medical marijuana dispensaries. Additionally, recruitment flyers were posted in public locations across the Los Angeles area and on Craigslist. Young persons who were screened for eligibility received a \$3 gift card while persons who qualified and were interviewed received a \$25 cash incentive.

Of the 710 individuals who were screened, 436 (61.4%) met the study eligibility requirements. Among the 180 non-patients who met eligibility requirement, 156 (86.7%) were enrolled in the study. Among the 256 patients who met eligibility requirements, 210 (82.0%) were enrolled in the study. No statistically significant differences (i.e. age, gender, race/ethnicity) were found between individuals enrolled and not enrolled in the study.

### Data Collection

The study instrument was developed using Research Electronic Data Capture (REDCap). Interviews were conducted in semi-private locations in the neighbourhoods where participants were recruited or lived. Most questions were administered face-to-face with the exception of psychometric scales and sensitive questions involving sexual behaviour, which were self-administered. Informed consent of all participants was obtained prior to the start of each interview. All study procedures were approved by the Institutional Review Boards at Children's Hospital Los Angeles and Drexel University.

### Measures

Sociodemographic data were captured using structured questions about age, gender, sexual identity, race/ethnicity, education, employment and insurance coverage [24]. History of arrest for marijuana possession and history of submitting to a drug test for marijuana use were also measured.

Questions assessing lifetime health problems were adapted from prior studies of medical marijuana patients [7,9] and based upon conditions found in the International Classifications of Diseases (ICD-9). To determine lifetime physical and psychological health, all participants were asked, *Have you ever experienced any physical or psychological problems in the following areas?* Affirmative responses resulted in follow-up questions such as, *What kind of mood or other psychological conditions have you experienced?*

Questions assessing motivations for marijuana use were adapted from marijuana motivation scales primarily focused on non-medical use [44,45] and research focused on medical use [5,9]. To assess motivations for marijuana use during adolescence (defined here as before the age of 19), all participants were asked, *During this period, what were the reasons you used marijuana?* Response options included both medical motivations that improve both physical and mental health, and non-medical motivations. For recent marijuana use, all participants were asked, *What are some of the reasons you used marijuana in the past 90 days?*

To assess concerns relating to seeking a medical marijuana recommendation, participants were asked, *Do you have any of the following privacy concerns about obtaining a doctor's recommendation for medical marijuana?* Response options included items related to participant's name being stored in a state database and employer, family and government finding out about the medical marijuana recommendation.

To document the condition patients received the medical marijuana recommendation for, patients only were asked, *What was the main or primary health condition – the problem that was giving you the most difficulties – that the doctor made the medical marijuana recommendation for?* To assess whether patients had ever received prior medical attention for a health condition, patients were asked, *Did you ever receive a diagnosis for this primary health condition?* To assess whether the health condition reported to a doctor for the medical marijuana recommendation was legitimate or not, patients were asked, *Was this a genuine health condition that you reported to the doctor?* To assess reasons for current marijuana use, patients were asked, *What are the conditions or reasons you are currently using marijuana for?*

## Data Analysis

Means and frequencies of variables of interest were calculated to describe the study sample. Differences between patients and non-patients were assessed using Pearson's  $\chi^2$ -tests and independent sample *t*-tests. Unadjusted risk ratios and their 95% confidence intervals were calculated from contingency table analyses to compare patients and non-patients on binary variables. A preliminary investigation of the relationships between demographic variables (e.g. age, gender, race/ethnicity) and outcomes of interest (e.g. physical/psychological problems) did not reveal significant findings. Therefore, risk ratios were not adjusted for demographic variables. To correct for the large number of statistical tests performed, we followed the Benjamini-Hochberg procedure [50] which involved ranking observed *P* values in ascending order, computing an adjusted *p*-value based on the ranking position of the observed *p*-value in the test, and comparing the observed *p*-value to the False Discovery Rate (FDR) of 0.05. Using this procedure, three statistically significant results fell below  $\alpha$  0.05 and were omitted. All analyses were performed using SPSS, version 23.0 (SPSS Inc., Chicago, IL, USA) in 2015–16.

## Results

Overall, the average age of the sample was 21.2 years old, two-thirds were men, 82% identified as heterosexual, and Hispanics comprised the largest ethnic group (see Table 1). No significant differences were found between patients and non-patients across these key

demographic variables. However, patients were significantly more likely to both have not applied for a job out of fear of failing a drug test and to have failed a drug test for marijuana compared to non-patients.

The most common lifetime health problems across all participants were psychological and pain followed by gastrointestinal, neurological and drug/alcohol problems (see Table 2). Compared to non-patients, patients were significantly more likely to report all of these lifetime problems: psychological, pain, gastrointestinal, neurological, and drug/alcohol problems. Within these categories, the top health problems reported by patients included insomnia, anxiety, depression, non-specific pain, nausea, lower back pain, migraines, and attention deficit hyperactivity disorder (ADHD). One patient reported being HIV positive. Top health problems reported by non-patients were insomnia, non-specific pain, anxiety, and depression.

Motivations to use marijuana were separated into non-medical (e.g. fun, experiment) and medical purposes (e.g. sleep, pain), during adolescence and past 90 days (Table 3). During adolescents, top non-medical motivations, i.e. fun, experiment, were more frequently reported than top medical motivations, i.e. relax, sleep. No significant differences were found between patients and non-patients in any non-medical motivation domains (Table 3). Regarding medical motivations, patients were significantly more likely to report motivations pertaining to sleep, anxiety, depression and focusing (i.e. attention problems) than non-patients. During the past 90 days, top non-medical motivations were less frequently reported than top medical motivations. Patients were significantly more likely to report one non-medical motivation – using marijuana to think differently – than non-patients. Patients were significantly more likely to report medical motivations concerning relaxation, sleep, anxiety, physical pain and focusing. Overall, significant differences between patients and non-patients' motivations for marijuana use were consistently found in the medical domain during both adolescence and in the past 90 days.

A majority of both patients and non-patients expressed some privacy concerns relating to the process of obtaining a medical marijuana recommendation (see Table 4). The possibility of a current or future employer finding out was the most common concern followed by their name being saved in a state database. Patients, who all possessed a doctor's recommendation at the time of interview, were significantly less likely to report any privacy concerns and reported significantly fewer concerns than non-patients.

Among patients only, the mean age of receiving a doctor's recommendation for medical marijuana was 19.8 years old, which occurred approximately four to five years after the mean age of first episode of a primary health condition (14.9), non-medical marijuana initiation (15.1), or receiving a diagnosis for a primary health condition (15.6) (see Table 5). Furthermore, patients reported self-treating with marijuana at a mean age of 17.6 – approximately two years prior to receiving a medical marijuana recommendation. Psychological and pain problems were the most common primary health conditions reported to physician to receive a medical marijuana recommendation (Table 5). Approximately 85% or more of all recommendations that patients reported to a physician was reportedly a "genuine" health condition, with the most common being neurological and pain problems.

Conversely, approximately 15% (n=26) of recommendations were based on a fabricated health problem. Among these, a majority (57.7%) indicated that access to marijuana for recreational purposes was the primary reason; one-third reported obtaining their recommendation as protection from arrest (data not shown in Table 5). Among patients reporting a genuine health condition to a physician, most had received a diagnosis for this condition by a physician (except for gastrointestinal conditions). Among patients ever indicating a psychological problem, 89.2% reported current marijuana use for this condition; among patients ever indicating a pain condition, 62.4% reported current use for this condition.

## Discussion

To our knowledge, this is the first detailed report on the physical and psychological health of young adult patients in the scientific literature. Overall, these results support the conclusion that young adult patients enrolled in this study reported health conditions and motivations for use that were consistent with medical use of marijuana under California law.

The primary types of problems ever experienced by young patients included psychological conditions (e.g. insomnia, anxiety, depression, ADHD), pain, nausea, and migraines. While these health problems are commonly found in the general population of adolescents and young adults [17,21], patients were more likely than non-patients to report them, suggesting higher prevalence among patients in the sample. Our results are in contrast to an US study comparing adult patients and non-patients, which found few differences in physical or psychological health between patients and non-patients [51]. Among young patients ever reporting one of these health problem, top reasons for current marijuana use were problems relating to psychological conditions and pain as well as gastrointestinal and neurological problems, which is consistent with the trend toward reporting using marijuana for psychological and pain conditions among older [5,9,12] and younger patients [13]. A small but notable subgroup reported using marijuana to treat reported drug or alcohol misuse, possibly using marijuana as substitute for these other substances [52–56].

Patients were more likely to report motivations for marijuana use as adolescents consistent with medical use (i.e. focusing, anxiety, depression) compared to non-patients. These results suggest that patients may have discovered some medical benefits for marijuana as non-patients [55] years before getting a medical marijuana recommendation, which was corroborated by patients reporting self-treatment with marijuana for health conditions approximately two years before obtaining a recommendation. In the past 90 days, patients were also more likely to report motivations aligned with medical use, e.g. anxiety, focusing, physical pain. Among patients, these results suggest a consistent trajectory of motivations for medical use linking periods before and after receiving a medical marijuana recommendation.

Consistent with their lifetime health histories, patients in this sample reported the types of health problems to a physician that would qualify them for a medical marijuana recommendation under California law [5]. Conditions relating to psychological problems and pain comprised nearly 90% of conditions reported to a physician. Over 85% reported

that the health condition they indicated to a physician when obtaining a medical marijuana recommendation was genuine.

Notably, a group of patients reporting a fabricated health problem to a physician did so to obtain a recommendation as protection against arrest for marijuana possession, a legitimate concern given that approximately 10% of patients reported being arrested for marijuana. Drug-related convictions can substantially impact young adults' future economic and educational opportunities [57,58]. While not part of the original intention of California's medical marijuana law, reducing drug arrests among some young adult marijuana users may be an unintended effect of the law.

Findings indicate that a majority of patients also used marijuana for non-medical or recreational purposes [59,60]. Given that all patients initiated marijuana use prior to receiving a recommendation, use for recreational purposes is not surprising since marijuana use has historically been learned in the context of "pleasure" [61] with its medical applications discounted [62]. Patients who use for both medical and non-medical purposes, however, may present challenges to broader definitions and conceptions of what constitutes legitimate or appropriate use of marijuana.

Non-patients were found to be significantly less likely to have had psychological and physical health problems or report marijuana motivations aligned with medical use compared to patients. Non-patients, however, reported relatively high levels of physical and psychological problems overall [22, 38–42] as well as current motivations associated with medical use, e.g., pain, anxiety, or sleep. One-third reported using marijuana to cope with depression, some other problem, or as a substitute for alcohol. Hence, it is clear that non-patients in the sample had also experienced a range of health problems but to a lesser extent than patients. Their health conditions suggest that a proportion of non-patients might qualify for a medical marijuana recommendation in California. Related, non-patients expressed greater privacy concerns (e.g. name stored in a state database, family finding out) about obtaining a medical marijuana recommendation than patients [43]. These privacy concerns could partially explain why some non-patients – who might have had a qualifying physical and psychological condition – decided against obtaining a medical marijuana recommendation.

Demographically, there were no significant differences between patients and non-patients regarding age, gender, sexual identity, race/ethnicity, education or employment status, which suggests that young adult patients reflect the broader population of young adult non-patients along several key background characteristics. However, significant differences between patients and non-patients around concerns of drug testing and failing a drug test for marijuana use suggest that apprehensions linked to employment eligibility may be discourage some non-patients from seeking a medical marijuana recommendation. With 43.7% of young adult patients reporting Hispanic or Latino ethnicity, this is the first study of patients to capture more Hispanics than non-Hispanic whites, which also reflects the broader demographic features of Los Angeles with Hispanics approaching 50% of the city's population.

Results from this analysis suggest that medical marijuana laws are reaching its intended target among young adults in Los Angeles since persons with histories of physical and psychological problems comprised the great majority of young adult patients. High proportions of non-patients reporting histories of physical and psychological problems suggest that some of these young adults may be eligible for a medical marijuana recommendation. Future studies should examine additional factors beyond privacy concerns, e.g. knowledge of program, cost of recommendations, cost of medical marijuana, that prevent young adults with medical conditions from obtaining a medical marijuana recommendation.

There are several limitations to this study. First, causal relationships cannot be determined due to the cross-sectional study design. Second, the sample was not randomly selected so the results may not be representative of all young patients and non-patients in Los Angeles. Related, a high proportion reported some college or above, which means that the sample is likely to over represent college-educated young adults. However, the sampling approach captured a largely diverse sample of young adult patients and non-patients that were closely matched along key demographic variables. Third, responses to interview questions are subject to recall bias and social desirability bias, particularly questions pertaining to whether the health condition reported to physician to obtain the recommendation was genuine or not.

## Conclusions

A high proportion of young adult patients reported histories of physical and psychological problems and motivations for marijuana consistent with medical use. Patients were significantly more likely to report a range of health conditions and motivations associated with medical use than non-patients. While a great majority of patients appears to have obtained a medical marijuana recommendation for legitimate health problems, a notable proportion of non-patients also reported health problems that might qualify them for a medical marijuana recommendation under California law.

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## References

1. Many states have legalized medical marijuana, so why does DEA still say it has no therapeutic use?. Forbes; 2016 Nov 16. [cited 2016 December 18]. Available from: <http://www.forbes.com/sites/ritarubin/2016/11/16/many-states-have-legalized-medical-marijuana-so-why-does-dea-still-say-it-has-no-therapeutic-use/#73c3a01a35a1>
2. Cal. Health and Safety Code § 113.62.5

3. Hill KP. Medical marijuana for treatment of chronic pain and other medical and psychiatric problems. *JAMA*. 2015; 313:2474–83. [PubMed: 26103031]
4. Wilkinson ST, Radhakrishnan R, D'Souza DC. Systematic review of evidence for medical marijuana in psychiatric indications. *J Clin Psychiatry*. 2016; 77(8):1050–64. [PubMed: 27561138]
5. Mikuriya TH, Hergenrather J, Denney P, et al. Medical marijuana in California, 1996–2006. *J Cannabis Clin Pract*. 2007 Winter-Spring;:1–4.
6. Corral V. Differential effects of medical marijuana based on strain and route of administration: a three-year observational study. *J Cannabis Ther*. 2001; 1:43–59.
7. Gieringer, D. Medical use of cannabis in California. In: Grotenhermen, F., Russo, E., editors. *Cannabis and Cannabinoids: Pharmacology, Toxicology and Therapeutic Potential*. New York: Haworth Press; 2002. p. 143-151.
8. Harris D, Jones R, Shank R. Self-reported marijuana effects and characteristics of 100 San Francisco medical marijuana club members. *J Addict*. 2000; 19:37–41.
9. Nunberg H, Kilmer B, Pacula RL, Burgdorf J. An analysis of applicants presenting to a medical marijuana specialty practice in California. *J Drug Policy Anal*. 2011; 4:1–14. [PubMed: 23750291]
10. Reinerman C, Nunberg H, Lanthier F, Heddleston T. Who are medical marijuana patients? Population characteristics from nine California assessment clinics. *J Psychoactive Drugs*. 2011; 43:128–35. [PubMed: 21858958]
11. Ilgen M, Bohnert K, Kleinberg F, et al. Characteristics of adults seeking medical marijuana certification. *Drug Alcohol Depend*. 2013; 132:654–9. [PubMed: 23683791]
12. Bonn-Miller MO, Boden MT, Bucossi MM, Babson K. Self-reported cannabis use characteristics, patterns and helpfulness among medical cannabis users. *Am J Drug Alcohol Abuse*. 2014; 40:23–30. [PubMed: 24205805]
13. Grella CE, Rodriguez L, Kim T. Patterns of medical marijuana use among individuals sampled from medical marijuana dispensaries in Los Angeles. *J Psychoactive Drugs*. 2014; 46:263–72.
14. Aggarwal SK, Carter GT, Sullivan MD, Zumbunnen C, Morrill R, Mayer JD. Prospectively surveying health-related quality of life and symptom relief in a lot-based sample of medical cannabis-using patients in urban Washington State reveals managed chronic illness and debility. *Am J Hosp Palliat Care*. 2013; 30:523–31. [PubMed: 22887696]
15. Ryan-Ibarra S, Induni M, Ewing D. Prevalence of medical marijuana use in California, 2012. *Drug Alcohol Rev*. 2015; 34:141–6. [PubMed: 25255903]
16. Arnett JJ. Emerging adulthood: a theory of development from the late teens through the twenties. *American Psychologist*. 2000; 55:469–80. [PubMed: 10842426]
17. Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE. Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the national co-morbidity survey replication. *Arch Gen Psychiatry*. 2005; 62:593–602. [PubMed: 15939837]
18. Roth-Isigkeit A, Thyen U, Stoven H, Schwarzenberger J, Schucker P. Pain among children and adolescents: Restrictions in daily living and triggering factors. *Pediatrics*. 2005; 115:e152–62. [PubMed: 15687423]
19. Fortuna RJ, Robbins BW, Caiola E, Joynt M, Halterman JS. Prescribing of controlled medications to adolescents and young adults in the United States. *Pediatrics*. 2010; 126:1108–16. [PubMed: 21115581]
20. Hyams JS, Burke G, Davis PM, Rzepski B, Andrulonis P. Abdominal pain and irritable bowel syndrome in adolescents: a community-based study. *J Pediatr*. 1996; 129:220–6. [PubMed: 8765619]
21. Akinbami LJ, Moonman JE, Bailey C, et al. Trends in asthma prevalence, health care use, and mortality in the United States, 2001–2010. *NCHS Data Brief*. 2012; 94:1–8.
22. National Center for Health Statistics. *Health, United States, 2008*. Hyattsville, MD: 2009.
23. Bardhi F, Sifaneck SJ, Johnson BD, Dunlap E. Pills, thrills and bellyaches: Case studies of prescription pill use and misuse among marijuana/blunt smoking middle class young women. *Contemp Drug Probl*. 2007; 34:53–102. [PubMed: 19081798]
24. Lankenau SE, Schrage SM, Silva K, et al. Misuse of prescription and illicit drugs among high-risk young adults in Los Angeles and New York. *J Public Health Res*. 2012; 1:22–30. [PubMed: 22798990]

25. McCabe SE, Cranford JA. Motivational subtypes of nonmedical use of prescription medications: Results from a national study. *J Adolesc Heal.* 2012; 51:445–52.
26. McCabe SE, Boyd CJ. Do motives matter? Nonmedical use of prescription medications among adolescents. *The Prevention Researcher.* 2012; 19:10–3.
27. Silva K, Kecojevic A, Lankenau SE. Perceived drug use functions and risk reduction practices among high-risk nonmedical users of prescription drugs. *J Drug Issues.* 2013; 43:483–96. [PubMed: 25477621]
28. Center for Behavioral Health Statistics and Quality. Behavioral health trends in the United States: Results from the 2014 National Survey on Drug Use and Health. 2015HHS Publication No. SMA 15-4927, NSDUH Series H-50
29. Bancks MP, Pletcher MJ, Kertesz SG, Sidney S, Rana JS, Schreiner PJ. Marijuana use and risk of prediabetes and diabetes by middle adulthood: the Coronary Artery Risk Development in Young Adults (CARDIA) study. *Diabetologia.* 2015; 58:2736–44. [PubMed: 26364621]
30. Baggio S, N’Goran A, Deline S, et al. Patterns of cannabis use and prospective associations with health issues among young males. *Addiction.* 2014; 109:937–45. [PubMed: 24450535]
31. Brook JS, Stimmel MA, Zhang C, Brook DW. The association between earlier marijuana use and subsequent academic achievement and health problems: a longitudinal study. *Am J Addict.* 2008; 17:155–60. [PubMed: 18393060]
32. Degenhardt L, Coffey C, Romaniuk H, et al. The persistence of the association between adolescent cannabis use and common mental disorders into young adulthood. *Addiction.* 2013; 108:124–33. [PubMed: 22775447]
33. Wittchen HU, Frohlich C, Behrendt S, et al. Cannabis use and cannabis use disorders and their relationship to mental disorders: a 10-year prospective-longitudinal community study in adolescents. *Drug Alcohol Depend.* 2007; 88(Suppl 1):60–70.
34. Buckner JD, Bonn-Miller MO, Zvolensky MJ, Schmidt NB. Marijuana use motives and social anxiety among marijuana-using young adults. *Addict Behav.* 2007; 32:2238–52. [PubMed: 17478056]
35. Hogan J, Gonzalez A, Howell A, Bonn-Miller MO, Zvolensky MJ. Pain-related anxiety and marijuana use motives: A pilot test among active marijuana-using young adults. *Cogn Behav Ther.* 2010; 39:283–92. [PubMed: 21038155]
36. Zvolensky MJ, Marshall EC, Johnson K, Hogan J, Bernstein A, Bonn-Miller MO. Relations between anxiety sensitivity, distress tolerance, and fear reactivity to bodily sensations to coping and conformity marijuana use motives among young adult marijuana users. *Exp Clin Psychopharmacol.* 2009; 17:31–42. [PubMed: 19186932]
37. Roane BM, Taylor DJ. Adolescent insomnia as a risk factor for early adult depression and substance abuse. *Sleep.* 2008; 31:1351–6. [PubMed: 18853932]
38. Bonn-Miller MO, Vujanovic AA, Felder MT, Bernstein A, Zvolensky MJ. Posttraumatic stress symptom severity predicts marijuana use coping motives among traumatic event-exposed marijuana users. *J Trauma Stress.* 2007; 20:577–86. [PubMed: 17721963]
39. Maniglio R. Association between peer victimization in adolescence and cannabis use: A systematic review. *Aggress Violent Behav.* 2015; 25:252–8.
40. Drug Enforcement Agency The dangers and consequences of marijuana abuse U.S. Department of Justice. 2014. Available at: <https://www.dea.gov/docs/dangers-consequences-marijuana-abuse.pdf> (accessed July 2016)
41. Buckner JD, Schmidt NB, Lang AR, Small JW, Schlauch RC, Lewinsohn PM. Specificity of social anxiety disorder as a risk factor for alcohol and cannabis dependence. *J Psychiatr Res.* 2008; 42:230–9. [PubMed: 17320907]
42. Feingold D, Weiser M, Rehm J, Lev-Ran S. The association between cannabis use and mood disorders: A longitudinal study. *J Affect Disord.* 2015; 172:211–8. [PubMed: 25451420]
43. Satterlund TD, Lee JP, Moore RS. Stigma among California’s Medical Marijuana Patients. *J Psychoactive Drugs.* 2015; 47:10–7. [PubMed: 25715067]
44. Marijuana Policy Project. Medical Marijuana Patient Numbers. 2016. Available at: <https://www.mpp.org/issues/medical-marijuana/state-by-state-medical-marijuana-laws/medical-marijuana-patient-numbers/> (accessed March, 2016)

45. Reid, P., Condon, S. DEA chief says smoking marijuana as medicine “is a joke”. CBS News; Nov 4. 2015 Available at: <http://www.cbsnews.com/news/dea-chief-says-smoking-marijuana-as-medicine-is-a-joke/> (accessed March 2016)
46. Watters JK, Biernacki P. Targeted sampling: Options for the study of hidden populations. *Social Problems*. 1989; 36:416–30.
47. Biernacki P, Waldorf D. Snowball sampling: Problems, techniques and chain-referral sampling. *Sociol Methods Res*. 1981; 10:141–63.
48. Lee CM, Neighbors C, Hendershot CS, Grossbard JR. Development and preliminary validation of a comprehensive marijuana motives questionnaire. *J Stud Alcohol Drugs*. 2009; 70:279–87. [PubMed: 19261240]
49. Simons J, Correia CJ, Carey KB, Borsari BE. Validating a five-factor marijuana motives measure: relations with use, problems, and alcohol motives. *J Counsel Psy*. 1998; 45:265–73.
50. Benjamini Y, Hochberg Y. Controlling the false discovery rate: a practical and powerful approach to multiple testing. *J R Stat Soc*. 1995; 57:289–300.
51. Roy-Byrne P, Maynard C, Bumgardner K, Krupski A, Dunn C, West II, Donovan D, Atkins DC, Ries R. Are medical marijuana users different from recreational users? The view from primary care. *Am J Addict*. 2015; 24:599–606. [PubMed: 26337603]
52. Lankenau SE, Bloom JJ, Shin C. Longitudinal trajectories of ketamine use among young injection drug users. *Int J Drug Policy*. 2010; 21:306–14. [PubMed: 20138747]
53. Mikuriya TH. Cannabis as a substitute for alcohol: a harm-reduction approach. *J Cannabis Ther*. 2004; 4:79–93.
54. Reiman A. Cannabis as a substitute for alcohol and other drugs. *Harm Reduct J*. 2009; 6:1–5. [PubMed: 19138414]
55. Osborn LA, Lauritsen KJ, Cross N, et al. Self-medication of somatic and psychiatric conditions using botanical marijuana. *J Psychoactive Drugs*. 2015; 47:345–50. [PubMed: 26595140]
56. Lau N, Sales P, Averill S, Murphy F, Sato SO, Murphy S. A safer alternative: Cannabis substitution as harm reduction. *Drug Alcohol Rev*. 2015; 34:654–9. [PubMed: 25919477]
57. Ammerman S, Ryan S, Adelman WP. The impact of marijuana policies on youth: clinical, research, and legal update. *Pediatrics*. 2015; 135:e769–785. [PubMed: 25624385]
58. Kirk DS, Sampson RJ. Juvenile arrest and collateral educational damage in the transition to adulthood. *Sociol Educ*. 2013; 88:36–62. [PubMed: 25309003]
59. Pew Research Center. Majority now supports legalizing marijuana. 2013. Available at: <http://www.people-press.org/2013/04/04/majority-now-supports-legalizing-marijuana/> (accessed March 2016)
60. Schauer GL, King BA, Bunnell RE, Promoff G, McAfee TA. Toking, vaping, and eating for health or fun. *Am J Prev Med*. 2016; 50:1–8. [PubMed: 26277652]
61. Becker H. Becoming a marihuana user. *Am J Sociol*. 1953; 59:235–42.
62. Mikuriya T. Marijuana in medicine: past, present, and future. *California Medicine*. 1969; 110:34–40. [PubMed: 4883504]

**Table 1**

Sociodemographics and medical marijuana patient status (N=366)

Variable	Patients n=210 % (n)	Non-Patients n=156 % (n)	Total N=366 % (n)	Unadjusted risk ratios (95%CI)
Age, mean (sd)	21.4 (2.47)	20.9 (2.46)	21.2 (2.47)	$t(364)=1.84^a$
<b>Gender/sex at birth</b>	68.1 (143)	63.5 (99)	66.1 (242)	1.1 (0.9–1.3)
Male				
<b>Sexual identity</b>	80.5 (165)	82.7 (124)	81.9 (289)	0.9 (0.8–1.2)
Heterosexual				
<b>Ethnicity</b>				
Hispanic/Latino <sup>b</sup>	43.7 (90)	48.1 (74)	45.6 (164)	0.9 (0.8–1.1)
<b>Non-Hispanic race</b>				
White	28.6 (59)	21.4 (33)	25.6 (92)	1.2 (1.0–1.4)
Black/African American	17.5 (36)	20.8 (32)	18.9 (68)	0.9 (0.7–1.2)
Multiracial	5.8 (12)	6.5 (10)	6.1 (22)	1.0 (0.6–1.4)
Asian/Pacific Islander	4.4 (9)	3.2 (5)	3.9 (14)	1.1 (0.8–1.7)
<b>Education/employment history</b>				
Some college or above	73.3 (154)	68.4 (106)	71.2 (260)	1.1 (0.9–1.4)
Currently in school/educational program	66.2 (137)	71.8 (112)	68.6 (249)	0.9 (0.7–1.1)
Employed	56.2 (118)	48.1 (75)	52.7 (193)	1.2 (1.0–1.4)
Ever not applied for a job due to fear of failing a drug test from marijuana use	51.0 (107)	33.3 (52)	43.4 (159)	<b>1.4 (1.1–1.6)**</b>
Ever tested positive for marijuana during drug test <sup>c</sup>	20.0 (42)	8.3 (13)	15.0 (55)	<b>1.4 (1.2–1.7)*</b>
<b>Current health insurance</b>	77.1 (155)	78.1 (118)	77.6 (273)	1.0 (0.8–1.2)
<b>Ever arrested</b>	40.5 (85)	34.2 (53)	37.8 (138)	1.1 (0.9–1.3)
<b>Ever arrested for marijuana possession<sup>d</sup></b>	10.5 (22)	4.5 (7)	7.9 (29)	1.4 (1.1–1.7)

Boldface indicates statistical significance:

\*  $P < 0.05$ ,

\*\*  $P < 0.01$

<sup>a</sup> Indicates t-test statistic (degrees of freedom)

<sup>b</sup> Among Hispanic/Latinos, participants also identified as: Multiracial (N=26), White (N=9), Native American (N=2), and Black (N=1).

<sup>c</sup> The percentage is based on entire sample but only 59 people who ever failed a drug test for a job application or any other reason received this question.

<sup>d</sup> The percentage is based on entire sample but only 37 people who had ever had a marijuana-related arrest received this question.

**Table 2**

Lifetime physical or psychological problems (N=366)

Variable	Patients n=210 % (n)	Non-patients n=156 % (n)	Total N=366 % (n)	Unadjusted risk ratios (95% CI)
<b>Psychological problems</b>	88.6 (186)	65.4 (102)	78.7 (288)	<b>2.1 (1.5–3.0)***</b>
Insomnia	73.3 (154)	48.7 (76)	62.8 (230)	
Anxiety	60.5 (127)	37.2 (58)	50.5 (185)	
Depression	52.9 (111)	33.3 (52)	44.5 (163)	
ADHD	22.9 (48)	13.5 (21)	18.9 (69)	
Post-traumatic stress	11.9 (25)	1.9 (3)	7.7 (28)	
<b>Pain</b>	84.8 (178)	67.9 (106)	77.6 (284)	<b>1.6 (1.2–2.1)**</b>
Non-specific pain	51.9 (109)	46.2 (72)	49.5 (181)	
Lower back pain	27.6 (58)	15.4 (24)	22.4 (82)	
Injury	13.8 (29)	7.7 (12)	11.2 (41)	
Pre-menstrual stress	9.5 (20)	3.8 (6)	7.1 (26)	
Skeletal	8.1 (17)	4.5 (7)	6.6 (24)	
Spinal	7.6 (16)	4.5 (7)	6.3 (23)	
Chronic regional pain syndrome	6.2 (13)	3.8 (6)	5.2 (19)	
Sprain	4.8 (10)	2.6 (4)	3.8 (14)	
Scoliosis	2.9 (6)	3.2 (5)	3.0 (11)	
Arthritis	2.4 (5)	0	1.4 (5)	
<b>Gastrointestinal problems</b>	41.9 (88)	23.7 (37)	34.2 (125)	<b>1.4 (1.2–1.6)**</b>
Nausea	31.9 (67)	16.7 (26)	25.4 (93)	
Other intestinal	12.9 (27)	8.3 (13)	10.9 (40)	
Peptic ulcer	1.9 (4)	0.6 (1)	1.4 (5)	
Gastritis	1.4 (3)	0	0.8 (3)	
<b>Neurological problems</b>	24.3 (51)	12.2 (19)	19.1 (70)	<b>1.4 (1.1–1.6)*</b>
Migraine or headaches	22.9 (48)	12.2 (19)	18.3 (67)	
Head or brain injury	1.9 (4)	1.3 (2)	1.6 (6)	
<b>Drug/alcohol dependence</b>	16.7 (35)	5.8 (9)	12.0 (44)	<b>1.5 (1.2–1.8)*</b>
Other illicit drug	8.6 (18)	3.2 (5)	6.3 (23)	
Alcohol	6.7 (14)	1.9 (3)	4.6 (17)	
Prescription opioids	2.9 (6)	0.6 (1)	1.9 (7)	
Other prescription drug	2.9 (6)	0.6 (1)	1.9 (7)	
Heroin	0.5 (1)	0.6 (1)	0.5 (2)	
<b>Other chronic medical conditions</b>	5.2 (11)	1.3 (2)	3.6 (13)	1.5 (1.2–1.9)
Asthma	3.8 (8)	1.3 (2)	2.7 (10)	
Hypertension	0.5 (1)	0	0.3 (1)	
HIV	0.5 (1)	0	0.3 (1)	

Boldface indicates statistical significance:

\*  
 $P < 0.05$ ,

\*\*  
 $P < 0.01$ ,

\*\*\*  
 $P < 0.001$

ADHD, attention deficit hyperactivity disorder.

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**Table 3**

Motivations for marijuana use during adolescence and past 90 days (N=366)

<b>Adolescence</b>	<b>Patients n=201 % (n)</b>	<b>Non-Patients n=142 % (n)</b>	<b>Total N=343<sup>a</sup> % (n)</b>	<b>Unadjusted risk ratios (95%CI)</b>
<b>Non-medical motivations</b>				
To have fun	81.1 (163)	76.1 (108)	79.0 (271)	1.1 (0.9–1.4)
To experiment	75.1(151)	72.5 (103)	74.1(254)	1.1 (0.9–1.3)
To celebrate	63.7 (128)	62.7 (89)	63.3 (217)	1.0 (0.8–1.2)
To help think differently or creatively	63.2 (127)	54.2 (77)	59.5 (204)	1.2 (1.0–1.4)
To relieve boredom	49.8 (100)	52.8 (75)	51.0 (175)	1.0 (0.8–1.1)
<b>Medical motivations</b>				
To help relax or feel more confident	72.6 (146)	65.5 (93)	69.7 (239)	1.2 (0.9–1.4)
To help sleep	64.2 (129)	51.4 (73)	58.9 (202)	<b>1.3 (1.0–1.5) *</b>
To relieve feeling anxious	58.2 (117)	44.4 (63)	52.5 (180)	<b>1.3 (1.1–1.5) *</b>
To relieve physical pain	51.7 (104)	42.3 (60)	47.8 (164)	1.2 (1.0–1.4)
To help me focus	51.7 (104)	35.9 (51)	45.2 (155)	<b>1.3 (1.1–1.6) *</b>
To cope with feeling depressed	45.3 (91)	31.0 (44)	39.4 (135)	<b>1.3 (1.1–1.5) *</b>
As a substitute for alcohol	37.3 (75)	32.4 (46)	35.3 (121)	1.1 (0.9–1.3)
<b>Past 90 days</b>	<b>Patients n=210 % (n)</b>	<b>Non-patients n=156 % (n)</b>	<b>Total N=366 % (n)</b>	<b>Unadjusted risk ratios (95%CI)</b>
<b>Non-medical motivations</b>				
To have fun	68.6(144)	71.8(112)	69.9(256)	0.9 (0.8–1.1)
To experiment	20.0(42)	17.9(28)	19.1(70)	1.1 (0.9–1.3)
To celebrate	68.6(144)	66.7(104)	67.8(248)	1.0 (0.9–1.3)
To help think differently or creatively	75.2(158)	62.2(97)	69.7(255)	<b>1.3 (1.1–1.6) *</b>
To relieve boredom	47.6(100)	46.2(72)	47.0(172)	1.0 (0.9–1.2)
<b>Medical motivations</b>				
To help relax or feel more confident	87.6(184)	78.2(122)	83.6(306)	<b>1.4 (1.0–1.9) *</b>
To help sleep	82.9(174)	72.4(113)	78.4(287)	<b>1.3 (1.0–1.7) *</b>
To relieve feeling anxious	69.5(146)	53.8(84)	62.8(230)	<b>1.3 (1.1–1.7) *</b>
To relieve physical pain	71.4(150)	53.8(84)	63.9(234)	<b>1.4 (1.1–1.7) **</b>
To help me focus	64.3(135)	48.7(76)	57.7(211)	<b>1.3 (1.1–1.6) *</b>
To cope with feeling depressed	45.2(95)	35.9(56)	41.3(151)	1.2 (1.0–1.4)
As a substitute for alcohol	41.0(86)	34.0(53)	38.0(139)	1.1 (1.0–1.4)

Boldface indicates statistical significance:

\*  $P < 0.05$ ,\*\*  $P < 0.01$ ,\*\*\*  $P < 0.001$

<sup>a</sup>Only participants who reported initiating marijuana use before the age of 19 (n=343) received the question about motivations for marijuana use during adolescence.

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**Table 4**

Privacy concerns relating to obtaining a doctor's recommendation for medical marijuana (N=366)

Variable	Patients n=210 % (n)	Non-patients n=156 % (n)	Total N=366 % (n)	Unadjusted Risk Ratios (95%CI)
<b>Any privacy concerns<sup>a</sup></b>	63.3 (133)	76.3 (119)	68.9 (252)	<b>0.8 (0.7–0.9) *</b>
Name saved in a state database associated with medical marijuana	30.5 (64)	48.1 (75)	38.0 (139)	
Current/future employer finding out	44.3 (93)	65.4 (102)	53.3 (195)	
Federal government finding out	29.5 (62)	41.0 (64)	34.4 (126)	
Family finding out	12.9 (27)	24.4 (38)	17.8 (65)	
Someone or something else finding out	12.9 (27)	19.9 (31)	15.8 (58)	
<b>Number of privacy concerns, mean (SD)</b>	1.3 (1.4)	2.0 (1.6)	1.6 (1.5)	<b><i>t</i>(364)= -0.7 ***</b>

Boldface indicates statistical significance:

\*  
 $P < 0.05$ ,\*\*  
 $P < 0.01$ ,\*\*\*  
 $P < 0.001$ <sup>a</sup> Includes five specified privacy concerns plus 'other' privacy concerns reported by 5 participants (4 patient and 1 non-patient).

**Table 5**

Primary health conditions, reason for marijuana use, and ages of initiation of key health events among young adult medical marijuana patients (n=210)

Health Condition	Primary health condition for recommendation % (n)	Primary health condition was genuine % (n)	Ever diagnosed for primary health condition % (n)	Reasons for current marijuana use <sup>a</sup> % (n)
Psychological	53.8 (113/210)	84.1 (95/113)	63.2 (60/95)	89.2 (166/186)
Pain	35.2 (74/210)	89.2 (66/74)	68.2 (45/66)	62.4 (111/178)
Gastrointestinal	4.3 (9/210)	88.9 (8/9)	25.0 (2/8)	40.9 (36/88)
Neurological	2.4 (5/210)	100 (5/5)	80.0 (4/5)	37.3 (19/51)
Drug/alcohol	0	0	0	17.1 (6/35)
Other chronic medical conditions	1.0 (2/210)	100 (2/2)	100 (2/2)	9.1 (1/11)
<b>Age</b>				Mean (SD)
First episode of primary health condition (n=184) <sup>b</sup>				14.9 (3.9)
First marijuana use (n=210)				15.1 (2.3)
Diagnosis for primary health condition (n=119) <sup>c</sup>				15.6 (3.9)
First self-treatment with marijuana (n=196) <sup>d</sup>				17.6 (2.4)
Obtained doctor's recommendation for medical marijuana (n=210)				19.8 (2.2)

<sup>a</sup>Refer to Table 2 (lifetime prevalence of health conditions for patients) for denominator.

<sup>b</sup>Only participants who reported a primary health condition received this question.

<sup>c</sup>Only participants who reported receiving a diagnosis for a primary health condition received this question.

<sup>d</sup>Only participants who reported self-treating with marijuana received this question.