Medical Cannabis Use among Adults in the Southeastern United States

Cannabis
2019, Volume 2 (1), 53-65

researchmj.org
DOI: 10.26828/cannabis.2019.01.005


OPEN ACCESS

Claudia A. Salazar[1], Rachel L. Tomko[1], Saima A. Akbar[1,2], Lindsay M. Squeglia[1], Erin A. McClure[1]

[1] Department of Psychiatry and Behavioral Sciences, Medical University of South Carolina, Charleston, SC, USA

[2] Department of Psychology, Florida International University, Miami, FL, USA

ABSTRACT

To assess the self-reported reasons for medical cannabis use within the southeastern United States and compare recreational and medical cannabis users. This study was a cross-sectional survey administered in 2017 through Amazon's Mechanical Turk and enrolled 432 adult, regular cannabis users. Measures included demographics, cannabis use characteristics, and medical reasons for cannabis use. Under half (47%) of respondents endorsed using cannabis for both medical and recreational reasons and 12% reported medical use only. The most commonly cited reasons for medical cannabis use were psychiatric and 60 unique medical conditions were listed. Recreational and medical users were similar on several measures of current use, but did vary in their use history, methods of use, and product knowledge. Despite state laws and conclusive scientific evidence to support medical cannabis use for certain conditions, cannabis is still used frequently for a range of medical issues. These data may assist healthcare providers in better understanding medical cannabis use in states with tightened restrictions and tailoring information to medical cannabis users about their specific conditions and prioritizing therapeutic options.

Key words: cannabis, marijuana, medical marijuana, medical cannabis, southeastern United States, recreational

Cannabis is a commonly used drug in the United States (US) (Substance Abuse and Mental Health Services Administration, 2017), with legality status that is rapidly changing at a state-by-state level. Past-month cannabis use continues to rise in the US, especially among adults aged 26 and older (Substance Abuse and Mental Health Services Administration, 2017). A recent nationally representative study showed that the risk of cannabis use and cannabis use disorders has increased, especially in states where medical cannabis laws have been passed (Hasin et al., 2017). The use of cannabis to treat medical issues and symptomology is also increasing in the US (Hill, 2015) and globally (Fitzcharles & Eisenberg, 2018), and the rates at which people are using medical cannabis have increased in states where medical cannabis laws have been passed (Cerda, Wall, Keyes, Galea, & Hasin, 2012). In California alone, which legalized medical cannabis in 1996, there were two million individuals in 2012 that were using cannabis medically (Ryan-Ibarra, Induni, & Ewing, 2015). There are also high rates of individuals self-medicating in locations without legalized medical cannabis (Park & Wu, 2017).

Corresponding Author: Claudia Salazar, Department of Psychiatry and Behavioral Sciences, Addiction Sciences Division, Medical University of South Carolina, 67 President St., MSC 861, Charleston, SC 29425, email: salazarc@musc.edu, phone: (843) 792-8207

As of February 2018, 29 states in the US, including the District of Columbia, permit the medical use of cannabis, and another 17 states permit limited access of low Δ9-tetrahydrocannnabinol (THC) and high-cannabidiol (CBD) products (National Conference of State Legislatures, 2018). In the southeastern US specifically, most of the legislation passed focuses on CBD products only and among states with passed legislation, many do not have operational systems of dissemination in place. There is a lack of data on medical cannabis use in states without passed legislation and especially within the southeastern US, which is a region where movement towards legal recreational and medical cannabis has not moved as quickly as in the western and northeastern US.

There is an increasing body of research on the potential medical benefits of THC/CBD products. Synthetic cannabinoid drugs (dronabinol and nabilone) have been approved in the US to treat symptoms associated with chemotherapy-induced nausea and vomiting (Todaro, 2012) and are frequently used in patients with HIV to prevent weight loss and increase appetite (Badowski & Perez, 2016). A recent summary of the evidence supporting the use of cannabis to treat medical disorders concluded that its use may be supported for certain conditions (i.e., chronic pain for adults, nausea and vomiting for chemotherapy patients, and for treatment of multiple sclerosis spasticity), but there is insufficient evidence to support its use for other conditions at this time (National Academies of Sciences, 2017).

Despite the lack of scientific evidence supporting the use of THC or CBD for certain conditions, many are using cannabis to treat a variety of medical symptomology. Cannabinoids have been proposed as a means to manage chronic pain and alleviate reliance on prescription opioids;(Choo, Feldstein Ewing, & Lovejoy, 2016; Lucas & Walsh, 2017; Sohler et al., 2018) however, double-blind, randomized clinical trials testing the efficacy of cannabinoid usage on reducing chronic pain have not been completed. Muscle-related pain and arthritis are frequently endorsed conditions that medical cannabis are used to treat (Park & Wu, 2017; Ryan-Ibarra et al., 2015; Ste-Marie et al., 2016), and cannabis users have self-reported that cannabis use is helpful in alleviating their psychological symptoms and social anxiety (Bonn-Miller, Babson, & Vandrey, 2014; Bonn-Miller, Boden, Bucossi, & Babson, 2014). However, there remains insufficient research on the short- and long-term health effects of THC and CBD products, especially in light of novel products and preparations that have higher percentages of THC.

In states with legal medical cannabis, 17% of cannabis users reported cannabis use for medical reasons, as recommended by a physician (Lin, Ilgen, Jannausch, & Bohnert, 2016). Though many patients experience benefits from medical cannabis use, they may be using it to treat conditions in an unapproved manner, without the recommendation of a physician, or in place of other, potentially efficacious treatment strategies. Even in states with medical cannabis dispensaries, not all advice being given by trained dispensary staff is consistently evidence-based or medically guided (Haug et al., 2016; Linares et al., 2016). In states where medical and recreational cannabis is not legal or is restricted, little is known about its medicinal uses, though data suggest that medical cannabis use is still prevalent regardless of legal status (Compton, Han, Hughes, Jones, & Blanco, 2017). Understanding medical cannabis use, especially in states where medical use is restricted and patients are likely self-medicating, is particularly necessary. This information may help inform physicians as to the conditions and symptoms underlying medical cannabis use and could lead to tailored education in states with limited medical cannabis or CBD availability.

In addition to understanding the reasons for medical cannabis use in states without wide-spread medical cannabis availability, it's also important to identify meaningful differences among those using cannabis for medical versus recreational reasons. Previous studies have found that those who used cannabis medically were more likely to report poorer health, more frequent daily use, lower levels of other drug use (Lin et al., 2016; Roy-Byrne et al., 2015), and less risky drug use (Richmond et al., 2015).

This cross-sectional survey aimed to examine the reasons for medical cannabis use among thirteen Southeastern US states. This region of the US has more restrictive medical cannabis legislation and limited distribution compared to other regions of the US, making it a generally understudied area for medical cannabis use. This

study had two aims: 1) compare differences in demographics and cannabis use characteristics in recreational and medical cannabis users, and 2) assess the reasons for medical cannabis use.

METHOD

Participants and Study Design

This was a one-time, cross-sectional, anonymous survey conducted on Amazon's Mechanical Turk (MTurk). MTurk is a crowdsourcing marketplace that has been a successful recruitment platform in past studies of substance use (Huhn, Tompkins, & Dunn, 2017; Peters, Rosenberry, Schauer, O'Grady, & Johnson, 2017; Strickland & Stoops, 2015). To recruit participants, an MTurk advertisement was posted and specifically asked if MTurk workers had ever used marijuana and other drugs (so to not disclose inclusion criteria). MTurk workers who were 18 years or older, had used cannabis on 20 of the past 30 days, and resided in South Atlantic region of the US were eligible to participate. As defined by the US census, states in the South Atlantic region include: Alabama, Delaware, District of Columbia, Florida, Georgia, Kentucky, Maryland, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia. At the time of survey administration (June through August 2017), the District of Columbia and Delaware had legalized recreational and medical cannabis, respectively. All other states either had medical cannabis legislation that had passed, but was not operational, was limited to a few specific medical conditions, or was CBD-specific.

Interested participants completed an eligibility screener through the web-based Research Electronic Data Capture (REDCap) (Harris et al., 2009). Participants who were eligible for the study were linked immediately to the full survey, which took approximately 20-30 minutes to complete. Participants were compensated $1.00 for survey completion and a $1.50 bonus if they answered attention check questions correctly. This compensation amount is appropriate for MTurk studies and is similar to another study that successfully recruited heavy cannabis users from this platform (Peters et al., 2017).

Of the workers who saw the advertisement, 10,175 workers completed the eligibility screener, and 472 (4.6%) were eligible. Among those responding to the eligibility survey, approximately 71% resided outside of the southeastern US and were not eligible. Additionally, 93% did not meet the eligibility criteria for heaviness of cannabis use (20 out of the past 30 days). Of the 472 participants who were deemed eligible, 50 (11%) participants were excluded due to incomplete responses or having incongruent answers between the screener and full survey. The final sample included 432 adult cannabis users. The vast majority of survey participants came from states without wide-spread medical cannabis access (428 out of 432). All study procedures were approved by the institutional review board at the author's academic institution.

Measures

Demographics. Demographic characteristics collected included age, gender, race, residing state, ethnicity, marital status, employment status, current annual household income, and level of education.

Cannabis and Tobacco Use. Participants were asked about their cannabis use, in terms of frequency, amount, different preparations of use, and cannabis use history. Participants completed the Cannabis Use Disorder Identification Test – Revised (CUDIT-R) (Adamson et al., 2010). To assess the reasons for cannabis use, participants were asked if they used the drug for medical reasons (i.e., to treat or decrease symptom(s) of a health condition), recreational/non-medical reasons (i.e., getting pleasure or satisfaction, to fit in with a group, or just for fun), or both medical and recreational reasons. If cannabis was endorsed for medical reasons, participants were asked to self-report the reason(s) for their use (open-ended text field). Participants had the ability to list as many medical conditions as they choose. The open-ended answers were categorized into general systems terms. When responses did not include sufficient detail, they were categorized in an "Other" category or in a "General" category within the broader system.

Table 1. *Demographics for the Overall Sample and Separated by Medical, Recreational, or Medical and Recreational Cannabis Use*

	Total Sample (*N*=432)	Med Cannabis Users (*n*=50)	Rec Cannabis Users (*n*=180)	Med & Rec Cannabis Users (*n*=202)	*p*-value
Age – Mean (SD)	32.9 (10.2)	33.8 (11.9)	32.4 (10.1)	33.1 (9.9)	0.643
Gender – N (%)					0.497
Male	170 (39.4)	20 (40.0)	76 (42.2)	74 (36.6)	
Female	260 (60.2)	30 (60.0)	104 (57.8)	126 (62.4)	
Other	2 (0.5)	0 (0)	0 (0)	2 (1.0)	
Race – N (%)					0.196
White/Caucasian	319 (73.8)	37 (74.0)	124 (68.9)	158 (78.2)	
Black/African American	71 (16.4)	6 (12.0)	40 (22.2)	25 (12.4)	
More than One Race	26 (6.0)	4 (8.0)	10 (5.6)	12 (5.9)	
Unknown/Other	16 (3.7)	3 (6.0)	6 (3.3)	7 (4.5)	
Hispanic/Latino – N (%)	43 (10.0)	5 (10.0)	18 (10.0)	20 (9.9)	0.999
Marital Status (%)					0.846
Married/Domestic Partnership	184 (42.6)	22 (44.0)	74 (41.1)	88 (43.6)	
Divorced/Separated/Widowed	52 (12.0)	6 (12.0)	19 (10.6)	27 (13.4)	
Never been married	196 (45.4)	22 (44.0)	87 (48.3)	87 (43.1)	
Employment – N (%)					***0.044***
Employed	310 (71.8)	33 (66.0)	138 (76.7)	139 (68.8)	
Unemployed	33 (7.6)	1 (2.0)	15 (8.3)	17 (8.4)	
Other	89 (20.6)	16 (32.0)	27 (15.0)	46 (22.8)	
Highest education– N (%)					0.361
Graduated high school or below	78 (18.1)	8 (16.0)	36 (20.0)	34 (16.8)	
Part college	158 (36.6)	22 (44.0)	56 (31.1)	80 (39.6)	
Graduated college (2 or 4 year), Post graduate	196 (45.4)	20 (40.0)	88 (48.9)	88 (43.6)	
Annual Household Income– N (%)					0.361
Under $20,000	89 (20.6)	10 (20.0)	35 (19.4)	44 (21.8)	
$20,000 - $39,999	177 (41.0)	27 (54.0)	70 (38.9)	80 (39.6)	
$40,000 - $74,999	110 (25.5)	7 (14.0)	47 (26.1)	56 (27.7)	
$75,000 or more	49 (11.3)	5 (10.0)	26 (14.4)	18 (8.9)	
Not sure	7 (1.6)	1 (2.0)	2 (1.1)	4 (2.0)	
State – N (%)					0.165
Florida†	137 (31.7)	12 (24.0)	65 (36.1)	60 (29.7)	
Georgia‡	63 (14.6)	6 (12.0)	27 (15.0)	30 (14.9)	
North Carolina‡	50 (11.6)	10 (20.0)	23 (12.8)	17 (8.4)	
Virginia‡	35 (8.1)	6 (12.0)	13 (7.2)	16 (7.9)	
All other states	147 (34.0)	16 (32.0)	52 (28.9)	79 (39.2)	

Note. Other states of residence included Alabama (4.6%)‡, Delaware (0.5%)*, District of Columbia (0.5%)*, Kentucky (6.5%)‡, Maryland (6.5%)†, Mississippi (2.1%)‡, South Carolina (4.4%)‡, Tennessee (5.8%)‡, and West Virginia (3.2%)†. *Legal or Medical Cannabis (Operational at time of survey). †Medical Cannabis (Limited dispensing or was not operational at time of survey). ‡Medical Cannabis (Limited or Low THC/CBD products at time of survey)

Participants were also asked if they had a referral card for their medical cannabis use.

Tobacco co-use was also assessed. Current tobacco users were asked about frequency and amount, history with tobacco, and completed the Fagerström Test for Nicotine Dependence (Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991). Aside from the assessment of cannabis use disorder and nicotine dependence, assessments used in this study were either locally developed or came from another MTurk survey study focused on cannabis and tobacco co-use (Peters et al., 2017).

Statistical Analyses

Sample descriptive statistics were calculated and separated by 1) medical only, 2) recreational or medical and 3) recreational only cannabis use status. Chi-square analysis and one-way analysis of variance (ANOVA) were conducted to analyze differences between recreational only users, medical only users, and medical and recreational users for several demographic, cannabis, and tobacco use variables. When $p<0.05$, post-hoc comparisons were conducted among the three groups. The Bonferroni procedure (correction) was conducted for continuous variables given multiple comparisons. For ordinal/nominal variables, column proportions were compared between groups and z-scores were calculated, while adjusting p-values using the Bonferroni method. All analyses were conducted using IBM SPSS Statistics Version 22.0 and an alpha level of $p<0.05$ was used for all statistical analyses.

RESULTS

Medical and Recreational Cannabis Use

Demographic information for the overall sample is shown in Table 1 and is also separated by self-reported medical, recreational, or combined (medical and recreational) cannabis use. Among all study participants (N=432), 60.2% were female, 73.8% identified as Caucasian/White, and 16.4% identified as African American/Black. The mean age was 32.9 (*SD*=10.2; Range=18-76). There was sizeable representation from Florida (*n*=137; 31.7%), Georgia (*n*=63; 14.6%), and North Carolina (*n*=50; 11.6%). All other states were represented with a range of 2 to 35 participants. The majority of participants (*n*=249; 57.6%) lived in states with CBD-only legislation, while 181 (41.9%) lived in states that legalized medical cannabis (though dispensaries with either not operational or medical use was limited), and two participants (0.5%) lived in DC. Given low numbers of participants from DC and Delaware (*n*=4), those participants were retained in this analysis.

Fifty participants (11.6%) reported using cannabis in the past 30 days for medical reasons only, 180 (41.7%) reported recreational/non-medical reasons for use, and 202 (46.8%) reported using cannabis for both medical and recreational reasons. The only statistically significant demographic difference between the groups was on employment ($p=0.044$), in which higher numbers of medical only cannabis users endorsed "other" employment compared to other groups. The other category included; student, retired, stay at home parent, or unable to work and the difference is likely driven by those in the medical group who are unable to work (8% compared to 0.6% and 2% in the other groups).

Cannabis and tobacco use characteristics for the entire sample and separated by medical vs. recreational use are shown in Table 2. Overall, participants used cannabis an average of 27.3 (*SD*=3.6) out of the last 30 days and were using an average of 4.1 (*SD*=3.5) times per day. The primary method of cannabis use was to smoke it, though 5.6% reported vaporizer use primarily, and 2.8% reported using dabs (concentrated THC preparation). Statistically significant differences between groups are shown in Table 2. Generally, the medical only group appeared to vary in several ways from the recreational only group and the medical and recreational group. Groups

Table 2. *Cannabis and Tobacco Use Characteristics for the Overall Sample and Separated by Medical, Recreational, or Medical and Recreational Cannabis Users*

Cannabis Use Characteristics	Overall Sample (*N* =432)	Med Cannabis Users (*n*=50)	Rec Cannabis Users (*n*=180)	Med & Rec Cannabis Users (*n*=202)	*p*-value
Age of first cannabis use-M(SD)	16.5 (4.6)	18.5 (8.7)*	16.4 (3.6)†	16.1 (3.7)†	***.004***
Age of regular use-M(SD)	21.0 (6.7)	23.7 (9.8)*	20.6 (6.4)†	20.6 (5.8)†	***.010***
Days of cannabis use (past 30)-M(SD)	27.3 (3.6)	27.5 (3.4)	26.9 (3.9)	27.7 (3.4)	.141
Times used per day (past 30)-M(SD)	4.1 (3.5)	4.0 (4.0)	3.7 (3.0)	4.4 (3.8)	.113
Smoke within 30 minutes of waking-N(%)					.083
No	219 (50.7)	29 (58.0)	99 (55.0)	91 (45.0)	
Yes	213 (49.3)	21 (42.0)	81 (45.0)	111 (55.0)	
% THC last purchased-N(%)					***.023***
Don't know	321 (74.3)	28 (56.0)*	143 (79.4)†	150 (74.3)†	
1-10%	7 (1.6)	1 (2.0)	3 (1.7)	3 (1.5)	
11-20%	32 (7.4)	5 (10.0)	8 (4.4)	19 (9.4)	
21% or greater	72 (16.7)	16 (32.0)*	26 (14.4)†	30 (14.9)†	
Primary method of cannabis use-N(%)					***<.001***
Smoked	392 (90.7)	39 (78.0)*	167 (92.8)†	186 (92.1)†	
Vaporizer	24 (5.6)	9 (18.0)*	9 (5.0)†	6 (3.0)†	
Dabs[a]	12 (2.8)	2 (4.0)	1 (0.6)	9 (4.5)	
Edibles[a]	4 (0.9)	-	3 (1.7)	1 (0.5)	
	(n=343)	(n=35)	(n=129)	(n=179)	
Grams of cannabis per pipe/bowl-M(SD)[a]	0.79 (1.3)	1.17 (1.8)†	0.95 (1.7)†	0.60 (0.6)†	***.013***
CUDIT-R Total Score-M(SD)	12.3 (5.7)	10.5 (5.5)‡	12.7 (6.0)†	12.4 (5.5)†	***.046***
Concern about health effects of cannabis-N(%)					.589
Somewhat – Extremely concerned	47 (10.9)	4 (8.0)	20 (11.1)	23 (11.4)	
Neutral	53 (12.3)	6 (12.0)	27 (15.0)	20 (9.9)	
Only slightly – Not at all concerned	332 (76.9)	40 (80)	133 (73.9)	159 (78.7)	
Tobacco Use Status-N(%)					*.002*
Current daily smoker	134 (31.0)	8 (16.0)§	58 (32.2)†	68 (33.7)†	
Current non-daily smoker	48 (11.1)	5 (10.0)	16 (8.9)	27 (13.4)	
Former smoker	76 (17.6)	15 (30.0)†	20 (11.1)§	41 (20.3)†	
Never smoker	174 (40.3)	22 (44.0)†	86 (47.8)§	66 (32.7)†	
Tobacco Use Characteristics	**All Tobacco Co-Users (n=182)**	**Med Cannabis Users (*n*=13)**	**Rec Cannabis Users (*n*=74)**	**Med & Rec Cannabis Users (*n*=95)**	
Cigarettes per day (past 30)-M(SD)	11.4 (7.3)	8.9 (7.2)	12.7 (7.5)	10.6 (7.1)	.086
Days smoking cigarettes (past 30)-M(SD)	26.1 (8.0)	25.2 (8.5)	27.0 (6.9)	25.4 (8.7)	.396
Age started smoking-M(SD)	16.3 (3.8)	15.8 (3.3)	16.7 (4.8)	16.0 (3.0)	.494
Age of regular smoking-M(SD)	18.4 (4.3)	19.5 (5.0)	18.6 (4.7)	18.0 (3.9)	.433
Time smoking at current rate-N(%)					.559
Less than 1 year	24 (13.2)	3 (23.1)	8 (10.8)	13 (13.7)	
1-4 years	43 (23.6)	1 (7.7)	18 (24.3)	24 (25.3)	
5+ years	115 (63.2)	9 (69.2)	48 (64.9)	58 (61.1)	
FTND Total Score – M(SD)	3.8 (2.6)	3.2 (2.7)	4.1 (2.7)	3.7 (2.5)	.307

Note. CUDIT-R: Cannabis Use Disorder Identification Test – Revised; FTND: Fagerström Test for Nicotine Dependence. [a]Pipe/bowl was the most common method of use. Outliers excluded from mean calculation (outliers were values three standard deviations away from the mean). *Indicates statistically

significantly different from other groups (Med only used as the comparator) †Not statistically different. ‡Different from recreational only, but not med + rec group. §Different from med + rec group

varied in terms of age of first cannabis use (p=0.004) and age of regular use (p=0.010) with the medical only group trying cannabis and initiating regular use at an older age than the other groups. The medical cannabis group had a higher proportion of participants knowing the percentage of THC in their last cannabis purchase and appeared to purchase higher potency cannabis (p=0.023). A greater proportion of medical users reported using a vaporizer as their primary method of cannabis use, compared to smoking cannabis (p<0.001). Grams of cannabis used per pipe/bowl (most common method of use) was higher among medical users (p=0.013). CUDIT-R scores tended to be lower among medical only users (p=0.046). Tobacco use status was statistically different between groups (p=0.002), with less current daily smoking occurring in the medical cannabis group, while no other tobacco characteristics were statistically different.

Reasons for Medical Cannabis Use

The number and type of medical conditions endorsed by participants who reported any medical cannabis use to treat or reduce symptoms is shown in Table 3 (by general terms). Among 252 participants (out of 432; 58%) endorsing cannabis for medical use, over 60 unique medical conditions were listed. The mean number of medical conditions listed among participants was 1.8 (*SD*=1.0; Median=1; Range=1-6) with a total of 445 conditions listed. The most commonly reported reason for medical cannabis use was for a psychiatric symptom or disorder (67.9%), followed by musculoskeletal and connective tissue disorders (29.4%), and gastrointestinal disorders (9.9%). A detailed list of specific conditions and their frequency of endorsement by participants is shown in the Appendix. The most commonly cited psychiatric disorders listed were anxiety (or anxiety-related conditions) and depression. Other common reasons for medical use included insomnia, post-traumatic stress disorder, pain, and headaches/migraine.

DISCUSSION

The results of this study found that within a region of the US where medical cannabis is not widely accessible, medical cannabis use is still occurring in a substantial portion of cannabis users. Of our sample, 11.6% of heavy cannabis users were using cannabis medically, and 46.8% endorsed using it for both medical and recreational reasons. Despite federal and state laws and sufficient scientific evidence to support the use of medical cannabis for certain conditions, some continue to use cannabis medically for a range of medical issues to alleviate their symptoms. While some participants have most likely attempted to treat

Table 3. *Participant Self-Reported Medical Conditions that were Endorsed as Reasons for Medical Cannabis Use*

Medical Condition Endorsed (General Terms)	N=252	%
Psychiatric	171	67.9
Musculoskeletal and connective tissue	74	29.4
Gastrointestinal	25	9.9
Nervous system/Neurological	25	9.9
Reproductive and breast	13	5.2
Metabolism and nutrition	6	2.4
Cancer (and related symptoms)	4	1.6
Immune system	2	0.8
Endocrine	2	0.8
Respiratory, thoracic and mediastinal	2	0.8
Eye, ear, nose, and throat	1	0.4
Renal	1	0.4
Other/Unknown/Insufficient detail	11	4.4

Note. Participants were able to endorse more than one medical condition, and as such, the last column does not add up to 100%.

their conditions with other strategies or under a physician's care, it is likely that some in this group have not sought medical care for their condition and may not experience long-term benefit from their medical cannabis use. This is an important area of future research to determine if medical cannabis users are generally seeking other treatment options first or if they are not utilizing healthcare services in favor of cannabis use. Self-medicating with cannabis is an important topic for future research and a recent study found differences among those who are licensed vs. unlicensed users of medical cannabis (Sznitman, 2017).

The self-reported reasons for medical cannabis use were largely due to psychiatric conditions or symptoms, with anxiety being the most common condition listed by participants. This is consistent with past literature finding similar reasons for medical use among dispensary consumers (Bonn-Miller, Babson, et al., 2014; Bonn-Miller, Boden, et al., 2014). Another study showed that medical cannabis users are more likely to report psychiatric comorbidity compared to recreational cannabis users (Martins et al., 2015). The range of other conditions listed in this study is of interest, especially given that many of these have insufficient or no evidence to support the use of medical cannabis as a treatment strategy.

The results of the current study found few demographic differences between medical and recreational users, which is consistent with previous research (Lin et al., 2016), though our study also found few differences regarding current cannabis frequency between groups of users. Medical cannabis users did tend to differ from the recreational group and the medical/recreational group in terms of later age of cannabis use, more knowledge about THC content in recent purchases, more vaporizer use as their primary method, lower reported problematic cannabis use as determined by the CUDIT-R, and lower rates of current and ever tobacco use.

This study had several limitations. First, data were self-reported, so validity may have been compromised if participants over or under estimated cannabis use, had difficulty with retrospection, or otherwise were poor reporters. Those using for medical reasons may have wanted to avoid any indication of dependence or problems associated with use, which could have affected responses. Also, there is no way of confirming diagnosis of the medical conditions listed by participants, which may not have been formal diagnoses. Second, the sample used in this study was majority female (60.2%). Rates of cannabis use tend to be higher among men in the US (Substance Abuse and Mental Health Services Administration, 2014). Having more representation among female cannabis users may be a limitation, but when compared to previous cannabis studies, it contributes to a better understanding of traditionally underrepresented participants.

Overall, despite similar frequency of cannabis use, medical only cannabis users, at least per their own report, appeared to be a lower risk group since they reported fewer dependence symptoms, were less susceptible to harms from smoked cannabis, started using cannabis at a later age, and did not engage as frequently in co-occurring tobacco use. In fact, avoiding combustible cannabis and the use of cannabis in adolescence are two recommended ways to reduce risk associated with cannabis use (Fischer et al., 2017). In contrast, medical only users tended to report use of higher THC products (when the percentage of THC purchased was known), which is thought to be a riskier practice (Fischer et al., 2017).

As cannabis use increases, particularly medical cannabis use, it will become essential that our measures of problematic and/or hazardous use accurately distinguish between problematic, non-problematic, and therapeutic use (Sznitman & Room, 2018). For example, it may be difficult to disentangle symptoms of withdrawal from a return to an impaired pre-cannabis functioning state. Further, treatments for cannabis use disorder will need to take into account an individual's real and perceived benefits of cannabis. If participants perceive medical benefit from their cannabis use, it is unlikely that they will be motivated to quit or even reduce. Instead, it may be beneficial to implement the aforementioned harm reduction efforts with these individuals through information delivered via healthcare providers or dispensary staff. The issue of medical cannabis is clearly complicated and requires a great deal of further research to provide clarity on health benefits, harms, and education for healthcare providers, patients, and legislators.

REFERENCES

Adamson, S. J., Kay-Lambkin, F. J., Baker, A. L., Lewin, T. J., Thornton, L., Kelly, B. J., & Sellman, J. D. (2010). An improved brief measure of cannabis misuse: The Cannabis Use Disorders Identification Test-Revised (CUDIT-R). *Drug and Alcohol Dependence, 110*(1-2), 137-143. doi: 10.1016/j.drugalcdep.2010.02.017

Badowski, M. E., & Perez, S. E. (2016). Clinical utility of dronabinol in the treatment of weight loss associated with HIV and AIDS. *HIV/AIDS (Auckland, N.Z.), 8*, 37-45. doi: 10.2147/hiv.s81420

Bonn-Miller, M. O., Babson, K. A., & Vandrey, R. (2014). Using cannabis to help you sleep: Heightened frequency of medical cannabis use among those with PTSD. *Drug and Alcohol Dependence, 136*, 162-165. doi: 10.1016/j.drugalcdep.2013.12.008

Bonn-Miller, M. O., Boden, M. T., Bucossi, M. M., & Babson, K. A. (2014). Self-reported cannabis use characteristics, patterns and helpfulness among medical cannabis users. *American Journal of Drug and Alcohol Abuse, 40*(1), 23-30. doi: 10.3109/00952990.2013.821477

Cerda, M., Wall, M., Keyes, K. M., Galea, S., & Hasin, D. (2012). Medical marijuana laws in 50 states: investigating the relationship between state legalization of medical marijuana and marijuana use, abuse and dependence. *Drug and Alcohol Dependence, 120*(1-3), 22-27. doi: 10.1016/j.drugalcdep.2011.06.011

Choo, E. K., Feldstein Ewing, S. W., & Lovejoy, T. I. (2016). Opioids out, cannabis in: Negotiating the unknowns in patient care for chronic pain. *JAMA, 316*(17), 1763-1764. doi: 10.1001/jama.2016.13677

Compton, W. M., Han, B., Hughes, A., Jones, C. M., & Blanco, C. (2017). Use of marijuana for medical purposes among adults in the United States. *JAMA, 317*(2), 209-211. doi: 10.1001/jama.2016.18900

Fischer, B., Russell, C., Sabioni, P., van den Brink, W., Le Foll, B., Hall, W., . . . Room, R. (2017). Lower-risk cannabis use guidelines: A comprehensive update of evidence and recommendations. *American Journal of Public Health, 107*(8), e1-e12. doi: 10.2105/AJPH.2017.303818a

Fitzcharles, M. A., & Eisenberg, E. (2018). Medical cannabis: A forward vision for the clinician. *European Journal of Pain, 22*(3), 485-491. doi: 10.1002/ejp.1185

Harris, P. A., Taylor, R., Thielke, R., Payne, J., Gonzalez, N., & Conde, J. G. (2009). Research electronic data capture (REDCap)--A metadata-driven methodology and workflow process for providing translational research informatics support. *Journal of Biomedical Informatics, 42*(2), 377-381. doi: 10.1016/j.jbi.2008.08.010

Hasin, D. S., Sarvet, A. L., Cerda, M., Keyes, K. M., Stohl, M., Galea, S., & Wall, M. M. (2017). US adult illicit cannabis use, cannabis use disorder, and medical marijuana laws: 1991-1992 to 2012-2013. *JAMA Psychiatry, 74*(6), 579-588. doi: 10.1001/jamapsychiatry.2017.0724

Haug, N. A., Kieschnick, D., Sottile, J. E., Babson, K. A., Vandrey, R., & Bonn-Miller, M. O. (2016). Training and practices of cannabis dispensary staff. *Cannabis and Cannabinoid Research, 1*(1), 244-251. doi: 10.1089/can.2016.0024

Heatherton, T. F., Kozlowski, L. T., Frecker, R. C., & Fagerstrom, K. O. (1991). The Fagerstrom Test for Nicotine Dependence: A revision of the Fagerstrom Tolerance Questionnaire. *British Journal of Addiction, 86*(9), 1119-1127.

Hill, K. P. (2015). Medical marijuana for treatment of chronic pain and other medical and psychiatric problems: A clinical review. *JAMA, 313*(24), 2474-2483. doi: 10.1001/jama.2015.6199

Huhn, A. S., Tompkins, D. A., & Dunn, K. E. (2017). The relationship between treatment accessibility and preference amongst out-of-treatment individuals who engage in non-medical prescription opioid use. *Drug and Alcohol Dependence, 180*, 279-285. doi: 10.1016/j.drugalcdep.2017.08.019

Lin, L. A., Ilgen, M. A., Jannausch, M., & Bohnert, K. M. (2016). Comparing adults who use cannabis medically with those who use recreationally: Results from a national sample. *Addictive Behaviors, 61*, 99-103. doi: 10.1016/j.addbeh.2016.05.015

Linares, R., Choi-Nurvitadhi, J., Cooper, S., Ham, Y., Ishmael, J. E., & Zweber, A. (2016). Personnel training and patient education in medical marijuana dispensaries in Oregon. *Journal of the American Pharmacists Association (2003), 56*(3), 270-273.e272. doi: 10.1016/j.japh.2015.12.015

Lucas, P., & Walsh, Z. (2017). Medical cannabis access, use, and substitution for prescription opioids and other substances: A survey of authorized medical cannabis patients. *International Journal of Drug Policy, 42*, 30-35. doi: 10.1016/j.drugpo.2017.01.011

Martins, S. S., Santaella, J., Pacek, L. R., Keyes, K., Cerda, M., Hasin, D. S., & Galea, S. (2015). Are medical marijuana users different than recreational marijuana users? *Drug and Alcohol Dependence, 156*, e141. doi: https://doi.org/10.1016/j.drugalcdep.2015.07.385

National Academies of Sciences, Engineering, and Medicine. (2017). *The health effects of cannabis and cannabinoids: Current state of evidence and recommendations for research*. Washington (DC): National Academies Press (US).

National Conference of State Legislatures. (2018, February 15, 2018). State medical marijuana laws Retrieved February 3, 2018, from http://www.ncsl.org/research/health/state-medical-marijuana-laws.aspx

Park, J. Y., & Wu, L. T. (2017). Prevalence, reasons, perceived effects, and correlates of medical marijuana use: A review. *Drug and Alcohol Dependence, 177*, 1-13. doi: 10.1016/j.drugalcdep.2017.03.009

Peters, E. N., Rosenberry, Z. R., Schauer, G. L., O'Grady, K. E., & Johnson, P. S. (2017). Marijuana and tobacco cigarettes: Estimating their behavioral economic relationship using purchasing tasks. *Experimental and Clinical Psychopharmacology, 25*(3), 208-215. doi: 10.1037/pha0000122

Richmond, M. K., Pampel, F. C., Rivera, L. S., Broderick, K. B., Reimann, B., & Fischer, L. (2015). Frequency and risk of marijuana use among substance-using health care patients in Colorado with and without access to state legalized medical marijuana. *Journal of Psychoactive Drugs, 47*(1), 1-9. doi: 10.1080/02791072.2014.991008

Roy-Byrne, P., Maynard, C., Bumgardner, K., Krupski, A., Dunn, C., West, II, . . . Ries, R. (2015). Are medical marijuana users different from recreational users? The view from primary care. *American Journal on Addictions, 24*(7), 599-606. doi: 10.1111/ajad.12270

Ryan-Ibarra, S., Induni, M., & Ewing, D. (2015). Prevalence of medical marijuana use in California, 2012. *Drug and Alcohol Review, 34*(2), 141-146. doi: 10.1111/dar.12207

Sohler, N. L., Starrels, J. L., Khalid, L., Bachhuber, M. A., Arnsten, J. H., Nahvi, S., . . . Cunningham, C. O. (2018). Cannabis use is associated with lower odds of prescription opioid analgesic use among HIV-infected individuals with chronic pain. *Substance Use and Misuse*, 1-6. doi: 10.1080/10826084.2017.1416408

Ste-Marie, P. A., Shir, Y., Rampakakis, E., Sampalis, J. S., Karellis, A., Cohen, M., . . . Fitzcharles, M. A. (2016). Survey of herbal cannabis (marijuana) use in rheumatology clinic attenders with a rheumatologist confirmed diagnosis. *Pain, 157*(12), 2792-2797. doi: 10.1097/j.pain.0000000000000706

Strickland, J. C., & Stoops, W. W. (2015). Perceptions of research risk and undue influence: Implications for ethics of research conducted with cocaine users. *Drug and Alcohol Dependence, 156*, 304-310. doi: 10.1016/j.drugalcdep.2015.09.029

Substance Abuse and Mental Health Services Administration. (2014). *Results from the 2013 National Survey on Drug Use and Health: Summary of National Findings,* NSDUH Series H-48, HHS Publication No. (SMA) 14-4863. Rockville, MD: Substance Abuse and Mental Health Services Administration.

Substance Abuse and Mental Health Services Administration. (2017). *Key substance use and mental health indicators in the United States: Results from the 2016 National Survey on Drug Use and Health* (HHS Publication No. SMA 17-5044, NSDUH Series H-52). Rockville, MD: Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration. Retrieved March 6, 2018, from http://www.samhsa.gov/data

Sznitman, S. R. (2017). Do recreational cannabis users, unlicensed and licensed medical cannabis users form distinct groups? *International Journal on Drug Policy, 42*, 15-21. doi: 10.1016/j.drugpo.2016.11.010

Sznitman, S. R., & Room, R. (2018). Rethinking indicators of problematic cannabis use in the era of medical cannabis legalization. *Addictive Behaviors, 77*, 100-101. doi: 10.1016/j.addbeh.2017.09.026

Todaro, B. (2012). Cannabinoids in the treatment of chemotherapy-induced nausea and vomiting. *Journal of the National Comprehensive Cancer Network, 10*(4), 487-492.

Funding: We would like to thank the funding sources that allowed for conduct of this study and effort in writing the manuscript. Funding to support this study was provided by the National Institute on Drug Abuse (NIDA) Clinical Trials Network (CTN) Southern Consortium Node (UG1 DA 013727). Effort was supported by the following grants: NIDA K01 DA036739 (PI: McClure), NIAAA K23AA025399 (PI: Squeglia), NIDA R01 DA 042114 (PI: Gray) and U01 DA031779 (PI: Gray). Survey administration and data collection was possible through REDCap, which is provided and maintained by the Biomedical Informatics Center (BMIC) grant support at MUSC (NIH/NCATS UL1 TR001450). The funding sources had no role in the development of this manuscript or analysis of results.

Acknowledgments: The authors would like to thank the following individuals for their assistance in study development, survey administration, MTurk expertise, data collection and cleaning: Matthew Carpenter, Justin Strickland, Kelly Dunn, Zachary Rosenberry, Erica Peters, Kennede Duncan, Daniel Onyekwere, Kayla McAvoy, Jade Tuttle, and Breanna Tuck.

Appendix. Medical condition or symptom endorsed as a reason for medical cannabis use

Medical Condition or Symptom	Total conditions listed (N=445)
Psychiatric conditions	272 (61.1%)
Anxiety (or anxiety-related conditions)	126
Depression	56
Insomnia	33
Post-traumatic stress disorder	24
Bi-polar disorder	13
Eating disorder	5
Obsessive compulsive disorder	5
Irritability/anger management	3
Attention-deficit/hyperactivity disorder	2
Mood disorder	1
Personality disorder	1
Substance use disorder	1
General (not otherwise specified)	2
Musculoskeletal and connective tissue conditions	79 (17.7%)
Pain	62
Arthritis	9
Fibromyalgia	2
Carpal tunnel	1
Degenerative disc disease	1
Sciatica	1
Scoliosis	1
Spinal osteoarthritis	1
General (not otherwise specified)	1
Gastrointestinal conditions	26 (5.8%)
Nausea	11
Gastroparesis	3
Irritable bowel syndrome	3
Acid reflux/Gerd	2
Crohns disease	2
Gastrointestinal cancer	1
Pancreatitis	1
Ulcerative colitis	1
General (not otherwise specified)	2
Nervous system conditions/Neurological	25 (5.6%)
Headache/migraine	13
Neuropathy	4
Epilepsy	3
Restless leg syndrome	2
Seizures	2

Multiple sclerosis	1
Reproductive and breast conditions	13 (2.9%)
Menstrual discomfort	5
Endometriosis	2
Premenstrual dysphoric disorder	2
Premenstrual syndrome	2
Polycystic ovary syndrome	1
Reproductive issues (not otherwise specified)	1
Metabolism and nutrition conditions	6 (1.3%)
Low appetite/Appetite enhancement	6
Cancer (not otherwise specified)	4 (0.8%)
Immune system conditions	3 (0.6%)
Lupus	1
General (not otherwise specified)	2
Endocrine	2 (0.4%)
Diabetes	2
Respiratory, thoracic and mediastinal conditions	2 (0.4%)
Asthma	2
Eye, ear, nose, and throat conditions	1 (0.2%)
Uveitis	1
Renal conditions	1 (0.2%)
Kidney disease	1
Other/Unknown/Insufficient detail provided to categorize	11 (2.5%)