Received: 28 March 2022 | Revised: 13 June 2022 | Accepted: 31 July 2022

DOI: 10.1111/ajad.13323

RESEARCH ARTICLE

THE AMERICAN JOURNAL ON ADDICTIONS

Tobacco/nicotine use among individuals using cannabis for therapeutic purposes

Marc L. Steinberg PhD[1] | Rachel L. Rosen MS[2] | Benjamin Billingsley MS[2] | Drashya Shah[2] | Michele Bender PharmD[3] | Kyra Shargo MSW[1] | Affan Aamir PharmD[2] | Mary Barna Bridgeman PharmD[3]

[1]Department of Psychiatry, Rutgers Robert Wood Johnson Medical School, New Brunswick, New Jersey, USA

[2]Department of Psychology, Rutgers, The State University of New Jersey, Piscataway, New Jersey, USA

[3]Rutgers, Ernest Mario School of Pharmacy, The State University of New Jersey, Piscataway, New Jersey, USA

Correspondence
Marc L. Steinberg, PhD, Department of Psychiatry, Rutgers Robert Wood Johnson Medical School, 317 George St, Suite 105, New Brunswick, NJ 08901, USA.
Email: marc.steinberg@rutgers.edu

Abstract

Background and Objectives: While the relationship between recreational cannabis and nicotine use is well established, little is known about nicotine use among users of cannabis for therapeutic purposes (CTP).

Methods: Patients attending a medical marijuana dispensary ($N = 697$; 75.3% White; 60.0% male) completed a survey examining nicotine use, motivation to quit cigarette smoking, routes of administration of nicotine and cannabis, and CTP qualifying conditions.

Results: More than one-third (39.3%) of participants reported current nicotine use. Compared to exclusive cigarette smokers, e-cigarette users and non-users of nicotine were approximately four times more likely to vape, rather than to smoke, cannabis. Furthermore, 46.8% of cigarette smokers reported plans to quit smoking in the next 6 months (but not in the next month) and an additional 31.6% planned to quit in the next month. Having a psychiatric condition was associated with nicotine use and higher motivation to quit smoking.

Discussion and Conclusions: Users of CTP are more likely to use nicotine products than the general population and the route of administration of nicotine products is related to the route of administration of CTP. If aerosolized CTP is a less harmful route of administration than smoked CTP, dispensary staff should be aware of this relationship and take this into account when recommending a noncombustible route.

Scientific Significance: This study further characterizes nicotine use behaviors and motivation to quit smoking among users of CTP and may be among the first to examine nicotine use among patients of a medical marijuana dispensary.

INTRODUCTION

An estimated 5.4 million Americans participate in US state-legal medical cannabis programs.[1] Despite this, cannabis use is not legal at the federal level and remains the most commonly used illicit substance in the United States.[2] In 2019, 48.2 million Americans (17.5%) reported cannabis use in the past year, with an estimated 1.8 million 12–17-year-olds, 7.7 million 18–25-year-olds, and 22 million individuals aged 26 years or older reporting past 30-day use.

The legal and regulatory landscape of cannabis ("marijuana") use in the United States is rapidly evolving. At present, 37 states, District of Columbia, Guam, Puerto Rico, the Northern Mariana Islands, and the US Virgin Islands have comprehensive, publicly available medical cannabis access programs, with an additional 19 states, two territories, and the District of Columbia permitting adult-use ("recreational") cannabis.[3] The growth of "medical marijuana" programs in the United States is consistent with the increase of acceptability of cannabis use in the United States. Most American adults support cannabis legalization[4] with 59% endorsing that it should be legal for recreational and therapeutic purposes while an additional 32% endorse cannabis for therapeutic purposes (CTP) only. The literature is mixed regarding efficacy of cannabis for many therapeutic purposes, with the data being strongest for treatment of chronic pain in adults, as an antiemetic in patients undergoing chemotherapy, and as a treatment for spasticity symptoms in patients with Multiple Sclerosis. Individual states determine which medical and psychiatric conditions qualify for their states' medical marijuana program.

Just as there are several potential qualifying conditions for CTP, there are also multiple routes of administration associated with the use of CTP (e.g., inhalation, oral, topical, rectal), with inhalation (e.g., smoking or aerosolized ("vaping")) being the most common.[5,6] Cannabis use via inhalation has a greater bioavailability compared to other routes and may confer greater convenience, ease of use, faster onset and relief of symptoms, greater dosing control, and lower dosing requirements for achieving the desired effect.[6,7] Vaping is gaining popularity among individuals utilizing CTP, as aerosolization provides similar advantages to smoking, with reduced toxicant exposure, faster onset, reduced cost, and ease of dose titration. Additionally, the use of handheld administration devices may offer flexible delivery timing and convenience in situations in which other routes cannot be used or will be conspicuous.[6,8]

Comorbid cannabis and combustible nicotine use is a growing concern[9–12] with epidemiological data illustrating that the prevalence of comorbid nicotine and cannabis use has drastically increased since 2003.[13] In 2004, Vermont legalized CTP and an analysis of the consequences of cannabis use demonstrated that individuals who used cannabis in the past 30 days were three times more likely to also report nicotine use.[14] Furthermore, in a study analyzing long-term opioid therapy and CTP, researchers[15] identified that those using CTP in combination with opioids for pain relief were significantly more likely to also report the use of nicotine compared to those who did not use CTP. Within the subset of individuals reporting nicotine use, individuals co-using CTP also smoked significantly more cigarettes per day and were more likely to smoke within 30 min of waking.[15] This is problematic because tobacco use remains the leading preventable cause of death in the United States.[16] The concern about the comorbid use of nicotine and CTP has also sparked questions about the demographic and mental health characteristics of users. Researchers[15] found that individuals who used CTP in combination with opioids for pain were more likely to be male and earn less than $30,000 per year and were less likely to be White.[15] There were no significant differences in age, education, mental health, or employment status between the two groups.[15]

Despite the growing prevalence and regulatory acceptance of CTP, and a growing literature on nicotine and cannabis in general, little is known regarding the use of nicotine among individuals using CTP. In this cross-sectional, descriptive analysis, investigators examined (1) the relationship between using vaped or smoked cannabis among users of CTP who also vape or smoke nicotine products, (2) the relationship between nicotine use and reasons for seeking CTP, and (3) motivation to quit nicotine products among users of CTP who also smoke or vape nicotine.

METHODS

Participants

Participants were recruited from one of the six licensed medical cannabis dispensaries in New Jersey. Research assistants approached adult patients in the dispensary waiting room and invited them to participate in a "short, confidential survey." The response rate was 59.5% with 705 individuals agreeing to participate out of 1185 who were approached. Eight potential participants did not provide usable data. All dispensary patients between the ages of 18–89 who could speak and read English and understand the consent form were eligible. Those who agreed were given an iPad to read the consent form and complete the survey. Participants were also provided with a hard copy of the consent form and were entered into a raffle for a 1 in 25 chance of winning a $25 gift card to amazon.com to compensate them for their time completing the survey. At the time of the study, cannabis was legal in New Jersey through the state's Medical Marijuana Program but was not legal for recreational purposes. The protocol was approved by the Institutional Review Board of Rutgers University.

Measures

Demographics

Most questions related to demographics were selected from the National Health and Nutrition Examination Survey (NHANES).

Cannabis use

We assessed quantity and frequency of cannabis use, route of administration (smoked, aerosolized (colloquially referred to as "vaped"), ate, drank, dabbed, or other), and the patients' Medical Marijuana Program qualifying condition. Each condition was coded as either a psychiatric (i.e., Anxiety Disorder, Opioid Use Disorder, Post Traumatic Stress Disorder, Tourette's Disorder) or a physical (i.e., Acquired immune deficiency syndrome (AIDS), amyotrophic lateral sclerosis (ALS), cancer (terminal or nonterminal), chronic pain (related to musculoskeletal disorders or of visceral origin), glaucoma, inflammatory bowel disease—including Crohn's disease, intractable

skeletal muscular spasticity, migraine, multiple sclerosis, muscular dystrophy, positive status for human immunodeficiency virus (HIV-positive), seizure disorder—including epilepsy, and terminal illness (other than cancer)) condition. The conditions coded as a psychiatric disorder were those listed in the DSM-5.[17]

Tobacco/nicotine use and cigarette dependence

Current smokers were defined as those who reported smoking at least 100 lifetime cigarettes and smoking within the last 30 days while current users of electronic nicotine delivery devices were defined as those who self-reported using e-cigarettes "some days" or "every day." In addition to assessing the route of administration of nicotine, we measured cigarette dependence via the Heaviness of Smoking Index,[18,19] which includes two items (number of cigarettes smoked per day and minutes until the first cigarette of the day), which, when summed, create a score from 0 to 6 with higher scores reflecting higher dependence.

Motivation to quit

We assessed motivation to quit cigarettes with the Contemplation Ladder,[20] a single item Likert-like scale from 0 to 10 with higher scores reflecting greater readiness to quit smoking. We also used a modified Stages of Change Algorithm[21] in those currently reporting nicotine use to assess 30-day and 6-month readiness to quit.

Data analytic plan

Descriptive statistics were used to characterize the sample. Multivariate logistic regression was used to examine the association between nicotine use category (i.e., smoke, vape, both, neither) and likelihood of vaping as the primary route of cannabis consumption. Based on age-related differences in vaping, age was included as a covariate in the model. Linear and logistic regression analyses were used to examine associations between qualifying condition (i.e., physical, psychiatric) and a) nicotine use (i.e., any current use, no current use) and b) motivation to quit smoking. For null hypothesis statistical testing, $p < .05$ was used to indicate statistical significance. Listwise deletion was used to handle missing data for all analyses.

RESULTS

Participant characteristics

Demographics

Participants were 697 adults between the ages of 18 and 86 ($M = 41.97$, $SD = 14.33$) and most (60.0%) identified as male. Additional demographic characteristics are displayed in Table 1.

TABLE 1 Participant characteristics

	% (*n*)	Mean (SD)
Age		41.97 (14.33)
Gender identity		
Male	59.9 (386)	
Female	39.0 (251)	
Transgender man/male	0.2 (1)	
Transgender woman/female	0.2 (1)	
Gender nonconforming	0.8 (5)	
Race		
White	75.3 (525)	
Black/African American	8.5 (59)	
American Indian/Alaska Native	2.4 (17)	
Asian	2.3 (16)	
None of the available options	1.3 (9)	
Native Hawaiian/Pacific Islander	0.7 (5)	
Ethnicity		
Hispanic, Latino, or Spanish	14.9 (93)	
Puerto Rican	46.2[a] (43)	
Central/South American	26.9[a] (25)	
Cuban/Cuban American	6.5[a] (6)	
Dominican	11.8[a] (11)	
Mexican/Mexican American	3.2[a] (3)	
Spanish	3.2[a] (3)	
Portuguese	1.1[a] (1)	
Colombian	1.1[a] (1)	
Marital status		
Never married	39.3 (253)	
Married	42.1 (271)	
Separated	2.6 (17)	
Divorced	10.9 (70)	
Other or unknown	5.1 (33)	
Education		
0–11th grade completed	3.6 (23)	
12th grade completed	26.3 (169)	
College or university/1st year completed	12.4 (80)	
College or university/2nd year completed	15.6 (100)	
College or university/3rd year completed	5.9 (38)	
College or university/4th year completed	18.7 (120)	

TABLE 1 (Continued)

	% (*n*)	Mean (SD)
College or university/5th+year completed	17.6 (113)	
Employment status		
Employed for wages	49.1 (316)	
Self-employed	14.0 (90)	
Out of work for 1 year or more	3.3 (21)	
Out of work for less than 1 year	2.3 (15)	
Homemaker	2.8 (18)	
Student	4.4 (28)	
Retired	8.4 (54)	
Unable to work	15.7 (101)	
Annual household income		
Less than $10,000	9.0 (58)	
Less than $15,000 ($10,000 to <$15,000)	3.9 (25)	
Less than $20,000 ($15,000 to <$20,000)	4.5 (29)	
Less than $25,000 ($20,000 to <$25,000)	4.8 (31)	
Less than $35,000 ($25,000 to <$35,000)	9.0 (58)	
Less than $50,000 ($35,000 to <$50,000)	10.6 (68)	
Less than $75,000 ($50,000 to <$75,000)	14.8 (95)	
$75,000 or more	43.4 (279)	

[a]Percent of individuals within category identifying as Hispanic, Latino, or Spanish.

Qualifying conditions

At the time of data collection (February–September 2019) there were 19 conditions that would qualify individuals for participation in the New Jersey Medical Marijuana Program. Approximately half (49.9%) of all participants reported more than one qualifying condition, with the most common being anxiety (61.0%), chronic pain related to musculoskeletal disorders (37.0%), and posttraumatic stress disorder (21.5%). Approximately a third (33.6%) of participants endorsed only physical qualifying conditions, 30.0% endorsed only psychiatric qualifying conditions, and 36.4% endorsed both physical and psychiatric qualifying conditions. The mean number of conditions reported was 1.85 (*SD* = 1.15).

Cannabis use

Participants reported using cannabis on 24.24 (*SD* = 9.78) days in the past 30 days, with 65% of participants reporting daily use. Nearly 80% of participants reported using cannabis on more than 15 out of the last 30 days. The majority (75.0%) reported smoking cannabis as their primary route of administration, 19.9% reported vaping cannabis, and 5.1% reported other primary routes of administration during the past 30 days, including eating (3.2%), drinking (0.5%), dabbing (0.9%), or using cannabis some other way (0.5%). Most participants (73.9%) reported using cannabis in the 30 days before receiving their Medical Marijuana Program card, and, on average, participants reported using cannabis on 22.76 (*SD* = 10.09) of those 30 days.

Tobacco/nicotine use

More than one-third (39.3%) of participants reported current use of nicotine products: 17.0% used combustible cigarette, 13.8% used electronic cigarettes, and 8.6% used both combustible and electronic cigarettes. Among those smoking combustible cigarettes in the past month (*n* = 176), 61.9% smoked daily and 38.1% smoked intermittently. Among those using e-cigarettes in the past month (*n* = 154), 39.6% reported using e-cigarettes daily and 60.4% reported using e-cigarettes intermittently.

Routes of administration

We detected a significant relationship between the mode of nicotine consumption and likelihood of vaping cannabis (as the primary route of cannabis consumption), controlling for age; $\chi^2(4) = 20.914$, $p < .000$. Compared to exclusive smokers, exclusive e-cigarette users were 4.02 times more likely to vape cannabis (odds ratio [*OR*] = 4.016 [95% confidence interval [CI]: 1.46, 11.05], $p = .007$), and non-users of nicotine were 3.81 times more likely to vape cannabis (*OR* = 3.807 [95% CI: 1.59, 9.13], $p = .003$). Due to low endorsement of other modes of cannabis consumption (i.e., drinking, eating, dabbing, other), this analysis excluded those who did not report smoking or vaping cannabis (*n* = 33).

Qualifying condition and tobacco/nicotine use status

We found that, compared to individuals with only physical qualifying conditions, individuals with only psychiatric qualifying conditions (*OR* = 1.80 [95% CI: 1.22, 2.65], $p = .003$) and individuals with both psychiatric and physical qualifying conditions (*OR* = 1.55 [95% CI: 1.07, 2.26], $p = .021$) were more likely to report current nicotine use. A follow-up logistic regression analysis revealed that, compared to individuals with both psychiatric and physical qualifying conditions, participants with psychiatric qualifying conditions only were no more likely to report current use of nicotine products ($p = .440$). See Table 2. In addition, those who currently used any nicotine products (*M* = 2.0, *SD* = 1.33) reported a greater number of qualifying conditions when compared to those who denied nicotine use (*M* = 1.74, *SD* = 0.95); $t(445.32) = -2.781$, $p = .006$ (Cohen's $d = 1.118$).

TABLE 2 Association between qualifying condition and nicotine use

Variable	B	SE	Wald	*p* value	Exp(*B*)	95% CI
Reference group = Physical condition only						
Psychiatric condition only	0.586	0.198	**8.702**	.003	**1.796**	**1.217–2.650**
Both physical and psychiatric conditions	0.439	0.191	**5.292**	.021	**1.552**	**1.067–2.256**
Reference group = Both physical and psychiatric condition						
Psychiatric condition only	0.146	0.189	0.597	.440	1.158	0.799–1.678
Physical condition only	−0.439	0.191	**5.292**	.021	**0.645**	**0.442–0.937**

Note: Boldface type indicates statistically significant at $p < 0.05$.
Abbreviation: CI, confidence interval.

TABLE 3 Association between qualifying condition and plans to quit smoking in the next 30 days

Variable	*B*	SE	Wald	*p* value	Exp(*B*)	95% CI
Reference group = Physical condition only						
Psychiatric condition only	0.729	0.461	2.504	0.114	2.073	0.840–5.112
Both physical and psychiatric conditions	0.764	0.432	3.133	0.077	2.148	0.921–5.007
Reference group = Both Physical and psychiatric condition						
Psychiatric condition only	−0.036	0.382	0.009	0.926	0.965	0.456–2.041
Physical condition only	−0.764	0.432	3.133	0.077	0.466	0.200–1.085

Motivation to quit using nicotine products

Mean motivation to quit smoking cigarettes as measured by the Contemplation Ladder was 6.86 ($SD = 3.2$), consistent with the belief that participants think they should quit but may not yet be starting to think about how to change their smoking patterns. Most (78.4%) cigarette smokers reported plans to quit smoking in the next 6 months with 31.6% planning to quit within the next 30 days and nearly half (46.8%) reporting plans to quit in the next 6 months (but not in the next 30 days). Those who used e-cigarettes exclusively were not asked about plans to quit in the future; however, almost a third of those reporting e-cigarette use (30.6%) and more than half (56.7%) of those reporting smoking combustible cigarettes reported stopping for 1 day or longer in the past year because they were trying to quit.

Qualifying condition and motivation to quit using tobacco

Separate regression analyses were used to examine the relationship between qualifying condition (i.e., physical, psychiatric), and Contemplation Ladder score. There was a significant association between having a psychiatric qualifying condition and motivation to quit smoking ($B = 1.28$, $SE = 0.55$, $p = .020$), such that having a psychiatric qualifying condition was associated with higher motivation to quit smoking. We did not observe a significant association between having a physical qualifying condition (vs. no physical qualifying condition) and motivation to quit smoking ($p = .675$).

We conducted separate logistic regression analyses to examine the relationship between qualifying conditions category and plans to quit smoking in the next 30 days and in the next 6 months (but not the next 30 days). No significant relationships emerged between qualifying condition categories and plans to quit in the next 6 months or in the next 30 days (all $p > .05$). Specifically, individuals with physical conditions only were no more likely to report plans to quit in the next 30 days or 6 months compared to individuals with psychiatric conditions only or both psychiatric and physical conditions. Individuals with psychiatric conditions only were no more likely than individuals with both psychiatric and physical conditions in the next 30 days or 6 months. See Tables 3 and 4.

DISCUSSION

In the general US population, 14.0% of adults smoke cigarettes and 4.5% use e-cigarettes.[22] In contrast, 39.3% of our sample of users of CTP reported nicotine use, representing a substantially larger proportion than in the general population. Importantly, we found a significant relationship between how nicotine was consumed and how cannabis was consumed, with vaping nicotine being associated with vaping cannabis. Specifically, patients who used e-cigarettes exclusively were four times more likely to vape, rather than smoke cannabis. Furthermore, those who did not use

TABLE 4 Association between qualifying condition plans to quit smoking in the next 6 months

Variable	*B*	SE	Wald	*p* value	Exp(*B*)	95% CI
Note: Reference group = Physical condition only						
Psychiatric condition only	0.285	0.403	0.499	0.480	1.330	0.603–2.931
Both physical and psychiatric conditions	−0.113	0.375	0.090	0.764	0.894	0.429–1.863
Reference group = Both Physical and Psychiatric condition						
Psychiatric condition only	0.397	0.368	1.167	0.280	1.488	0.732–3.060
Physical condition only	0.113	0.375	0.090	0.764	1.119	0.537–2.333

cigarettes or e-cigarettes were 3.8 times more likely to vape, rather than to smoke cannabis. Not using combustible cigarettes appears therefore to be associated with a greater likelihood of using aerosolized CTP.

The finding that route of nicotine administration is related to route of cannabis administration is consistent with epidemiological data from 8,255 cannabis users in which odds of vaping cannabis were lower for adults who smoked cigarettes.[23] Vaping cannabis was also associated with using e-cigarettes in those aged 25–54, but not in those aged 18–24.[23] This is important because while medical cannabis dispensaries may recommend vaping rather than smoking cannabis due to the health concerns associated with the self-administration of combustible products,[24] our data suggest that this message to use aerosolized cannabis, rather than smoked cannabis may influence e-cigarette users and non-nicotine users, but not current cigarette smokers. Indeed, in contrast to findings from Canada,[6] the majority of the current participants reported smoking, rather than vaping, cannabis. Increasing the proportion of users of CTP who vape, rather than smoke, will require additional efforts. Targeted information for current cigarette smokers on the risks of combustible cannabis formulations and specific information on the use of noncombustible cannabis preparations for medical use may be warranted, as may interventions such as motivational interviewing.[25]

Approximately equal proportions of participants reported a physical qualifying condition only (33.6%), a psychiatric qualifying condition only (30.0%), and both physical and psychiatric qualifying conditions (36.4%). Almost half reported more than one qualifying condition with those reporting nicotine use endorsing a larger number of qualifying conditions as compared to those who did not use nicotine. Furthermore, consistent with the established relationship between nicotine use and psychiatric comorbidity/psychological distress,[22,26,27] those endorsing a psychiatric qualifying condition (exclusively or in combination with a physical qualifying condition) were more likely to report current use of nicotine products than were those without psychiatric conditions. The driver of this relationship appears to be the psychiatric condition. While not entirely surprising, given the aforementioned known relationship between nicotine use and psychiatric comorbidity, there is also an established relationship between nicotine use and medical conditions such as chronic pain.[28] It is possible (but unknowable from the current data set) that those with qualifying physical conditions, especially conditions that are likely to be exacerbated by continued tobacco use (e.g., Irritable Bowel Disease, cancer) were successfully counseled by their physicians to quit by the time of this survey. Alternatively, the influence of psychiatric comorbidity may be stronger than the influence of physical condition comorbidity on nicotine use.

Participants who smoked cigarettes reported moderate levels of motivation to quit smoking based on Contemplation Ladder[20] scores; however, most (78.4%) planned to quit in the next 6 months. Furthermore, almost a third of users of e-cigarettes and more than half of users of cigarettes reported a 24-h quit attempt in the past year, suggesting ongoing thoughts of quitting nicotine use. It is notable that reporting a psychiatric qualifying condition was associated with higher motivation to quit smoking cigarettes. It is possible that those without psychiatric qualifying conditions (and therefore having a physical qualifying condition) were more likely to be counseled by their physicians to quit because of an association between their physical condition and tobacco use. Those who were motivated by this may have quit, thus leaving only those who are less motivated to quit among the current cigarette users with physical health qualifying conditions.

Between the higher rates of nicotine use in those using CTP, the relationship between mode of nicotine administration and mode of cannabis administration, and the apparent motivation to quit using nicotine, medical marijuana dispensaries should consider tobacco control messaging at the point-of-sale to encourage cigarette smokers to quit. In addition to reducing tobacco-related morbidity, this strategy could increase the chances that a user of CTP would use a less harmful route of administration (as compared to smoking) such as vaping. Messaging could include information about telephone quitlines or other available cessation services.

This study adds to the literature by helping to characterize a new and growing population (i.e., users of CTP) and, to the best of our knowledge, is the first to examine nicotine use among patients of a medical marijuana dispensary. Nevertheless, these data should be understood in the context of several limitations. We recruited from a single dispensary (though in an ethnically and racially diverse geographic area) and were unable to invite every consecutive patient entering the dispensary to participate and there may be meaningful differences between those who agreed to complete the survey and

those who declined. Additionally, because participants completed a single survey at one point in time, we do not know which substance was used first among those who reported comorbid use of nicotine and cannabis. While we assessed for dual use of nicotine and tobacco, we did not assess for simultaneous use (at the same time—e.g., blunts, spliffs). Finally, while some participants may have been new patients, most are likely to have been returning patients, so we do not know the extent of overlap between the assessment of the past 30 days of cannabis and nicotine use and the 30 days before receiving their Medical Marijuana Program card.

Increasingly widespread acceptance and adoption of CTP and recreational cannabis policies have far-reaching implications for public health and safety. As policies surrounding CTP evolve, including increasingly expanded commercialization and access, the health effects of such policies require further evaluation. Comorbid nicotine use, as well as the desire to quit using nicotine products among individuals utilizing CTP, may represent opportunities for patient education and counseling on dosage form selection and an offer of smoking cessation services at the point of dispensing.

ACKNOWLEDGMENTS

The authors wish to thank the staff and leadership of Garden State Dispensary for allowing us to collect data on-site.

CONFLICT OF INTEREST

The authors declare that there are no conflict of interests.

ORCID

Marc L. Steinberg http://orcid.org/0000-0001-8180-8682

REFERENCES

1. Marijuana Policy Project. Medical Marijuana Patient Numbers. Marijuana Policy Project (MPP). 2021. Accessed June 13, 2022. https://www.mpp.org/issues/medical-marijuana/state-by-state-medical-marijuana-laws/medical-marijuana-patient-numbers/
2. NIDA. Most commonly used addictive drugs: marijuana. Most commonly used addictive drugs: Marijuana. June 25, 2020. Accessed August 26, 2021. https://www.drugabuse.gov/publications/media-guide/most-commonly-used-addictive-drugs
3. National Conference of State Legislatures. State medical marijuana laws. May 27, 2022. Accessed June 13, 2022. https://www.ncsl.org/research/health/state-medical-marijuana-laws.aspx
4. Daniller A. Two-thirds of Americans support marijuana legalization. Pew Research Center. November 14, 2019. Accessed December 4, 2021 file:///Users/steinbml/Zotero/storage/RP6M2DNF/americans-support-marijuana-legalization.html
5. Russell C, Rueda S, Room R, Tyndall M, Fischer B. Routes of administration for cannabis use—basic prevalence and related health outcomes: a scoping review and synthesis. *Int J Drug Policy*. 2018;52:87-96. doi:10.1016/j.drugpo.2017.11.008
6. Shiplo S, Asbridge M, Leatherdale ST, Hammond D. Medical cannabis use in Canada: vapourization and modes of delivery. *Harm Reduct J*. 2016;13:30. doi:10.1186/s12954-016-0119-9
7. Corroon J, Sexton M, Bradley R. Indications and administration practices amongst medical cannabis healthcare providers: a cross-sectional survey. *BMC Fam Pract*. 2019;20(1):174. doi:10.1186/s12875-019-1059-8
8. Aston ER, Scott B, Farris SG. A qualitative analysis of cannabis vaporization among medical users. *Exp Clin Psychopharmacol*. 2019;27(4):301-308. doi:10.1037/pha0000279
9. Agrawal A, Budney AJ, Lynskey MT. The co-occurring use and misuse of cannabis and tobacco: a review: cannabis and tobacco review. *Addiction*. 2012;107(7):1221-1233. doi:10.1111/j.1360-0443.2012.03837.x
10. Belanger RE, Akre C, Kuntsche E, Gmel G, Suris JC. Adding tobacco to cannabis—its frequency and likely implications. *Nicotine Tob Res*. 2011;13(8):746-750. doi:10.1093/ntr/ntr043
11. Ramo DE, Liu H, Prochaska JJ. Tobacco and marijuana use among adolescents and young adults: a systematic review of their co-use. *Clin Psychol Rev*. 2012;32(2):105-121. doi:10.1016/j.cpr.2011.12.002
12. Weinberger AH, Platt J, Zhu J, Levin J, Ganz O, Goodwin RD. Cigarette use and cannabis use disorder onset, persistence, and relapse: longitudinal data from a representative sample of US adults. *J Clin Psychiatry*. 2021;82(4):20m13713. doi:10.4088/JCP.20m13713
13. Schauer GL, Peters EN, Rosenberry Z, Kim H. Trends in and characteristics of marijuana and menthol cigarette use among current cigarette smokers, 2005-2014. *Nicotine Tob Res*. 2017;20:ntw394. doi:10.1093/ntr/ntw394
14. Caulkins JP, Kilmer B. Considering marijuana legalization carefully: insights for other jurisdictions from analysis for vermont. *Addiction*. 2016;111(12):2082-2089. doi:10.1111/add.13289
15. Nugent SM, Yarborough BJ, Smith NX, et al. Patterns and correlates of medical cannabis use for pain among patients prescribed long-term opioid therapy. *Gen Hosp Psychiatry*. 2018;50:104-110. doi:10.1016/j.genhosppsych.2017.11.001
16. US Department of Health and Human Services. *The Health Consequences of Smoking: 50 Years of Progress. A Report of the Surgeon General*. US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2014. http://www.cdc.gov/tobacco
17. American Psychiatric Association, ed. *Diagnostic and Statistical Manual of Mental Disorders: DSM-5*. 5th ed. American Psychiatric Association; 2013.
18. Borland R, Yong HH, O'Connor RJ, Hyland A, Thompson ME. The reliability and predictive validity of the heaviness of smoking index and its two components: findings from the international tobacco control four country study. *Nicotine Tob Res*. 2010;12(suppl 1):S45-S50. doi:10.1093/ntr/ntq038
19. Heatherton TF, Kozlowski LT, Frecker RC, Rickert W, Robinson J. Measuring the heaviness of smoking: using self-reported time to the first cigarette of the day and number of cigarettes smoked per day. *Addiction*. 1989;84(7):791-800. doi:10.1111/j.1360-0443.1989.tb03059.x
20. Biener L, Abrams DB. The contemplation ladder: validation of a measure of readiness to consider smoking cessation. *Health Psychol*. 1991;10(5):360-365. doi:10.1037/0278-6133.10.5.360
21. Diclemente CC, Prochaska JO, Fairhurst S, Velicer WF, Rossi JS, Velasquez M. The process of smoking cessation: an analysis of precontemplation, contemplation and contemplation/action. *J Consult Clin Psychol*. 1991;59:295-304.
22. Cornelius ME, Wang TW, Jamal A, Loretan CG, Neff LJ. Tobacco product use among adults—United States, 2019. *MMWR Morb Mortal Wkly Rep*. 2020;69(46):1736-1742. doi:10.15585/mmwr.mm6946a4
23. Baldassarri SR, Camenga DR, Fiellin DA, Friedman AS. Marijuana vaping in U.S. adults: evidence from the behavioral risk factor surveillance system. *Am J Prev Med*. 2020;59(3):449-454. doi:10.1016/j.amepre.2020.03.014
24. Loflin M, Earleywine M. No smoke, no fire: what the initial literature suggests regarding vapourized cannabis and respiratory risk. *Can J Respir Ther*. 2015;51(1):7-9.

25. Miller WR, Rollnick S. *Motivational Interviewing: Helping People Change*. 3rd ed. Guilford Press; 2013.
26. Streck JM, Weinberger AH, Pacek LR, Gbedemah M, Goodwin RD. Cigarette smoking quit rates among persons with serious psychological distress in the United States from 2008 to 2016: are mental health disparities in cigarette use increasing. *Nicotine Tob Res*. 2020;22(1):130-134. doi:10.1093/ntr/nty227
27. Weinberger AH, Zhu J, Barrington-Trimis JL, Wyka K, Goodwin RD. Cigarette use, e-cigarette use, and dual product use is higher among adults with serious psychological distress in the United States: 2014–2017. *Nicotine Tob Res*. 2020;22:1875-1882. doi:10.1093/ntr/ntaa061
28. Ditre JW, Heckman BW, LaRowe LR, Powers JM. Pain status as a predictor of smoking cessation initiation, lapse, and relapse. *Nicotine Tob Res*. 2021;23(1):186-194. doi:10.1093/ntr/ntaa111

How to cite this article: Steinberg ML, Rosen RL, Billingsley B, et al. Tobacco/nicotine use among individuals using cannabis for therapeutic purposes. *Am J Addict*. 2022;31:486-493. doi:10.1111/ajad.13323