

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/344287870>

# The COVID-19 cannabis health study: Results from an epidemiologic assessment of adults who use cannabis for medicinal reasons in the United States

Article in *Journal of Addictive Diseases* · September 2020

DOI: 10.1080/10550887.2020.1811455

CITATIONS

50

READS

308

10 authors, including:



**Denise Vidot**

University of Miami

121 PUBLICATIONS 1,099 CITATIONS

SEE PROFILE



**Jessica Islam**

Moffitt Cancer Center

132 PUBLICATIONS 2,969 CITATIONS

SEE PROFILE



**Marlene Camacho-Rivera**

State University of New York Downstate Medical Center

75 PUBLICATIONS 1,077 CITATIONS

SEE PROFILE



**Wayway Hlaing**

University of Miami

76 PUBLICATIONS 802 CITATIONS

SEE PROFILE





# The COVID-19 cannabis health study: Results from an epidemiologic assessment of adults who use cannabis for medicinal reasons in the United States

Denise C. Vidot, Jessica Y. Islam, Marlene Camacho-Rivera, Melissa B. Harrell, Devika R. Rao, Jennifer V. Chavez, Lucas G. Ochoa, WayWay M. Hlaing, Michelle Weiner & Sarah E. Messiah


To cite this article: Denise C. Vidot, Jessica Y. Islam, Marlene Camacho-Rivera, Melissa B. Harrell, Devika R. Rao, Jennifer V. Chavez, Lucas G. Ochoa, WayWay M. Hlaing, Michelle Weiner & Sarah E. Messiah (2020) The COVID-19 cannabis health study: Results from an epidemiologic assessment of adults who use cannabis for medicinal reasons in the United States, *Journal of Addictive Diseases*, 39:1, 26-36, DOI: [10.1080/10550887.2020.1811455](https://doi.org/10.1080/10550887.2020.1811455)

To link to this article: <https://doi.org/10.1080/10550887.2020.1811455>

 [View supplementary material](#)


 Published online: 15 Sep 2020.

 [Submit your article to this journal](#)

 Article views: 4367






 [View related articles](#)

 [View Crossmark data](#)

 Citing articles: 4 [View citing articles](#)



## The COVID-19 cannabis health study: Results from an epidemiologic assessment of adults who use cannabis for medicinal reasons in the United States

Denise C. Vidot, PhD<sup>a,b</sup> , Jessica Y. Islam, PhD, MPH<sup>c</sup> , Marlene Camacho-Rivera, ScD, MPH<sup>d</sup> , Melissa B. Harrell, PhD, MPH<sup>e</sup> , Devika R. Rao, MD<sup>f</sup>, Jennifer V. Chavez, MPH, CPH<sup>a</sup>, Lucas G. Ochoa, MS<sup>a</sup>, WayWay M. Hlaing, PhD<sup>b</sup>, Michelle Weiner, DO<sup>g</sup> and Sarah E. Messiah, PhD, MPH<sup>h,i</sup> 

<sup>a</sup>School of Nursing and Health Studies, University of Miami, Coral Gables, FL, USA; <sup>b</sup>Miller School of Medicine, University of Miami, Miami, FL, USA; <sup>c</sup>Lineberger Cancer Center, University of North Carolina, Chapel Hill, NC, USA; <sup>d</sup>Downstate Medical Center, State University of New York, Brooklyn, NY, USA; <sup>e</sup>UTHealth, School of Public Health, Austin Campus, TX, USA; <sup>f</sup>Division of Respiratory Medicine, Department of Pediatrics, University of Texas Southwestern Medical Center, Dallas, TX, USA; <sup>g</sup>College of Osteopathic Medicine, Nova Southeastern University, Davie, FL, USA; <sup>h</sup>University of Texas Health Science Center School of Public Health, Dallas Campus, Dallas, TX, USA; <sup>i</sup>Center for Pediatric Population Health, UT Health School of Public Health and Children's Health System of Texas, Dallas, TX, USA

### ABSTRACT

**Background:** Clinical indications for medicinal cannabis include chronic conditions; thus users (MCUs) are at an increased risk of morbidity and mortality resulting from SARS-CoV-2 infection (COVID-19). The study aimed to provide data on cannabis use and self-reported behavioral changes among MCUs with preexisting chronic conditions in response to the pandemic.

**Methods:** An internet-based questionnaire was administered to adults  $\geq 18$  who self-reported medicinal cannabis use within the past year. Data are from respondents between March 21 and April 23, 2020; response rate was 83.3%. Health conditions and cannabis frequency, route, and patterns of use were assessed via the COVID-19 Cannabis Health Questionnaire (Vidot et al. 2020).

**Results:** Participants ( $N = 1202$ ) were predominantly non-Hispanic white (82.5%) and 52.0% male (mean age 47.2 years). Mental health (76.7%), pain (43.7%), cardiometabolic (32.9%), respiratory (16.8%), and autoimmune (12.2%) conditions were most reported. Those with mental health conditions reported increased medicinal cannabis use by 91% since COVID-19 was declared a pandemic compared to those with no mental health conditions (adjusted odds ratio: 1.91, 95% CI: 1.38–2.65). 6.8% reported suspected COVID-19 symptoms. Two percent (2.1%) have been tested for COVID-19 with only 1 positive test result. Some MCUs (16%) changed their route of cannabis administration, switching to nonsmoking forms.

**Conclusions:** The majority of MCUs reported at least one preexisting chronic health condition. Over half report fear of COVID-19 diagnosis and giving the virus to someone else; yet only some switched from smoking to nonsmoking forms of cannabis. Clinicians may consider asking about cannabis use among their patients, particularly those with chronic health conditions.



### KEYWORDS


Covid-19; cannabis; marijuana; SARS; prevention; vape; chronic disease; mental health

## Introduction

Cannabis is legal for medicinal use for qualifying health conditions determined by state within the United States (U.S). Chronic health conditions, such as cancer, are common across states.<sup>1</sup> On March 11, 2020, the World Health Organization declared COVID-19, the disease caused by the severe acute respiratory syndrome coronavirus 2

(SARS-CoV-2), a pandemic.<sup>1</sup> The Centers for Disease Control and Prevention identified older adults and those with underlying medical conditions as those who are at increased risk for severe illness.<sup>2</sup> Such populations, which include a subpopulation of those who use cannabis for medicinal purposes (MCU), have been advised to take special precautions to avoid exposure; in part

**CONTACT** Denise C. Vidot, PhD  [Dvidot@miami.edu](mailto:Dvidot@miami.edu)  School of Nursing and Health Studies, University of Miami, Coral Gables, FL, USA

 Supplemental data for this article can be accessed at <https://doi.org/10.1080/10550887.2020.1811455>.

since the pandemic has disproportionately affected those with comorbidities.<sup>3-7</sup> Concurrent to physical health concerns, such vulnerable populations are also managing mental health amid the risk of losing income and health insurance tied to employment during historic unemployment rates due to the pandemic.<sup>8-10</sup> As such, those who use cannabis for medicinal purposes are a vulnerable population subgroup of concern during the pandemic that should be included in epidemiologic surveillance and assessments related to the COVID-19 pandemic.

It is unclear how the pandemic public health response (e.g., social distancing, self-isolation, lock downs, and quarantines) has impacted medicinal cannabis use patterns or stressors related to socioeconomic barriers. One particular behavior, sharing cannabis products (i.e., vaporizers), may potentially increase transmission of COVID-19 among adult MCUs for example. The World Health Organization (WHO)<sup>2</sup> and emerging evidence<sup>2,3</sup> indicates that the method of consumption (i.e., vaping or smoking) can increase susceptibility to COVID-19. Further, medicinal cannabis use patterns may change due to financial and physical access to medical cannabis. Adults MCUs may not have access to the cannabis they need for chronic health conditions that were diagnosed prior to the SARS-CoV-2 outbreak. Further, it is unclear whether adult MCUs are using more or less cannabis, for these reasons listed above, given this pandemic.

Studies show that the patterns of cannabis use behavior are heavily influenced by psychosocial stressors such as stressful life events,<sup>4</sup> the availability of coping resources<sup>5</sup> and social support,<sup>4</sup> which may exacerbate existing psychiatric conditions.<sup>6</sup> For many, in the absence of other coping mechanisms, cannabis may play a role in decreasing stress levels and negative affect,<sup>7</sup> particularly when there is a lower perceived ability to withstand the stressful situation or emotional distress.<sup>4</sup> Although the literature is divided when it comes to the type of role (negative or positive) cannabis can play in psychiatric conditions with supervised (medicinal) dosing, overuse of cannabis has been correlated with greater psychiatric symptomatology in anxiety,<sup>8,9</sup> depression,<sup>8</sup> post-

traumatic stress syndrome<sup>10</sup> and greater overall impairment. Several studies that investigate the role of major life events (e.g., natural disasters,<sup>11</sup> community violence,<sup>12</sup> trauma or abuse<sup>13</sup>) and stress,<sup>14</sup> have identified that individuals are likely to increase their substance use (including use of cannabis), in the period immediately following the disaster or traumatic event.<sup>15-18</sup> When analyzing cannabis use and stressful life events in pregnant women, Allen et al. (2020) found that women who experienced stressful life events the year prior to giving birth were more likely to use cannabis during the perinatal period.<sup>19</sup>

The purpose of the COVID-19 Cannabis Health Study is to provide data from an electronic self-report questionnaire to assess patterns and trends of possible SARS-CoV-2 exposure, behaviors that may be related to its transmission, and the prevalence of COVID-19 given testing among a group of adult MCUs. The objectives of this study were (1) to provide data on self-reported behavioral changes among adult MCUs since COVID-19 was declared a pandemic, characterized by preexisting chronic health conditions; and (2) to provide prevalence estimates of COVID-19 symptoms, testing, and infections among adult MCUs. We hypothesized that adults who use medicinal cannabis or MCUs will self-report an increase in cannabis use since COVID-19 was declared a pandemic and change the use behaviors (e.g., method of consumption, sharing devices) based on self-report.

## Methods

### Study overview

Cross-sectional data ( $N=1,202$ ) are from the ongoing COVID-19 Cannabis Health Study, a multisite collaborative study of clinical, epidemiological, and behavioral researchers. The study was designed to collect data on medicinal cannabis use patterns and related behaviors amid the rapidly evolving pandemic. These behaviors are considered within the context of preexisting chronic respiratory, autoimmune, cardiometabolic, mental health, and pain-related health conditions. The survey also included questions regarding COVID-19 symptoms, testing, and infections among adult

MCUs Study data are collected and managed using the REDCap electronic data capturing software hosted at the University of Miami.<sup>20</sup> This study was approved by the University of Miami Institutional Review Board. Informed consent was obtained electronically from all participants prior to data collection.

### **Participants and recruitment**

Recruitment began when the anonymous electronic survey became public on March 21, 2020. A flyer with the survey link and study details was distributed widely via social media platforms including Twitter, LinkedIn, Facebook, and/or Instagram at least twice a week between March 21, 2020 and April 20, 2020. Emails with the study flyer were sent to substance use research list serves, community advisory boards shared by past respondents, and clinic representatives to post and/or share with their networks digitally. No recruitment advertisements were purchased related to the study. Eligibility criteria for the study included adults 18 years of age or older who self-identified as a cannabis user. Data included for analyses include responses from participants residing in the U.S. with completed demographic information and the COVID-19 Cannabis Health Questionnaire<sup>11</sup> from March 21, 2020 to April 23, 2020. Duplicate responses were monitored via reCAPTCHA feature on REDCap, in addition to a data cleaning process to identify data inconsistencies for fraudulent responses (i.e., age and birthdate inconsistencies).<sup>12</sup> There were 11 potential duplicate or inconsistent respondents (less than 1% of sample).

### **Measures**

Demographic characteristics were collected via self-report and included: age, gender, race/ethnicity, education, total household income, employment status, and veteran status. The COVID-19 Cannabis Health Questionnaire (CCHQ; Vidot, Messiah, Gattamorta) was then administered. The CCHQ is a 25 item measure to assess cannabis use patterns, health risk behavior, and physical and mental health effects of the COVID-19 pandemic among medicinal and recreational

cannabis users.<sup>21</sup> Details of the CCHQ are located in RTI International's PhenX Toolkit (<https://www.phenxtoolkit.org/covid19/>), a catalog of recommended measurement protocols. Self-identified adults MCUs were determined via the question: "Have you used cannabis in the last 30 days? Those who responded either "Yes, only for medical reasons" or "Yes, both for recreational and medicinal use" were categorized as MCUs.

Some states include non-chronic disease qualifying conditions (i.e., help with sleep)<sup>13</sup> for use of cannabis for medicinal cannabis; therefore, respondents were asked "Do you use cannabis to treat or manage a chronic health condition?". Adults who responded in the affirmative were prompted to answer questions related to their medicinal cannabis supply, use, and health access. The response rate (83.3%) was calculated as follows: number of completed surveys divided by the number of clicks on the survey (completed and non-completed) over the period of March 21, 2020 to April 23, 2020.

### **Data analysis**

Descriptive statistics were used to estimate means, standard deviations, and frequencies across all survey variables. Means are presented for continuous variables, and prevalence estimates for categorical variables. Chi-squared tests were used for univariate comparison of categorical variables including sex, race/ethnicity, education level, cannabis use patterns, and comorbidities. Logistic regression was used to calculate the odds ratios and 95% confidence intervals associated with reporting increased medicinal use (versus no increase) by the following: respiratory health conditions (respiratory illness, asthma), cardiometabolic health conditions (obesity, diabetes, high blood pressure, heart disease), autoimmune health conditions (cancer, HIV/AIDS, lupus, and other autoimmune), mental health conditions (anxiety and depression), and chronic pain. The following dependent variables were also evaluated: fear of COVID diagnosis, fear of transmitting COVID to others, isolated from others due to COVID, current COVID symptoms, and worry about not affording medication. Covariates

**Table 1.** Characteristics of adults using medicinal cannabis in the United States (N = 1202).

	n (%)
Age, M (Standard Deviation)	47.2 (15.2)
Gender	
Female	564 (46.9)
Male	625 (52.0)
Transgender	12 (1.1)
No Response	1 (0.1)
Race/Ethnicity	
Non-Hispanic White	987 (82.5)
Non-Hispanic Black	42 (3.5)
Hispanic/Latino	104 (8.7)
Other*	69 (5.7)
Education	
High school or less	137 (11.4)
Bachelor's degree or some college	842 (70.1)
Master's degree or higher	222 (18.5)
No Response	1 (0.1)
Total household income	
<\$30,000	216 (17.9)
\$30,000–\$50,000	193 (16.1)
>\$50,000–\$100,000	241 (20.1)
>\$100,000	173 (14.9)
No response	378 (31.5)
Veteran	156 (12.9)
Unemployed due to pandemic	153 (12.7)
Unemployed prior to pandemic	94 (7.8)
Has at least one chronic health condition	851 (70.8)
Preexisting chronic conditions	
Pain	525 (43.7)
Anxiety	498 (41.4)
Depression	424 (35.3)
High blood pressure	166 (13.8)
Autoimmune disease	146 (12.2)
Asthma	140 (11.7)
Obesity	133 (9.4)
Respiratory disease	61 (5.1)
Diabetes	61 (5.1)
Heart disease	55 (4.6)
Cancer	38 (3.2)
Lupus	10 (0.8)
HIV/AIDS	6 (0.5)

\*Other: Asian (n=9), Native Hawaiian and Pacific Islander (n=5), American Indian and Alaskan Native (n=14), Mixed race (n=35).

included gender, race/ethnicity (non-Hispanic white vs. all others), and education status (bachelor's degree and above versus all others). Statistical analysis was performed using SAS v9.4 (SAS Institute, Cary, NC). The Type I error was maintained at 5%.

## Results

### Sample characteristics

Table 1 describes the demographic and relevant characteristics of the analytic sample. The analytical sample consisted of 1,202 adult MCUs (52.0% male, 82.5% Non-Hispanic White). The mean age was 47.2 years (SD: 15.2) and about 13% were military veterans. About a third (34%) reported an annual household income of \$50,000

or less, 12.7% were unemployed due to the pandemic, and 7.8% were unemployed prior to the pandemic. Preexisting chronic conditions were reported by 70.8% of adult MCUs. The most prevalent chronic health conditions were mental health-related (n=559; 65.7%); chronic pain (n=525; 43.7%), and cardiometabolic-related (n=268; 31.4%). The prevalence of autoimmune-related conditions was 22.1% (n=188); and 21.4% (n=182) reported a respiratory-related condition.

### COVID-19 cannabis health questionnaire

#### COVID-19 pandemic-related cannabis use

All participants reported cannabis use in the past 30 days. About 39% reported smoking via pipe/bowl, followed by vaporizing devices (24.1%) and smoking in a joint (18.8%) as the most common route of cannabis administration. Table 2 describes cannabis use and related behaviors among these adult MCUs. Since COVID-19 was declared a pandemic, 38.4% reported an increase in dose, 8.8% reported a decrease in dose, and 47.9% reported no change in dose. About 16% reported a change in route of cannabis administration. Among those who reported a change in route: before COVID-19 was declared a pandemic, smoking [via pipe/bowl (36.3%), joint (18.4%), or blunt (5.8%)] and vaping (27.9%) were among the most common; since COVID-19 was declared a pandemic, nonsmoking routes of administration [edibles in food or drink (31.4%), tinctures (10.9%), pill (4.2%)] were the most prevalent. Since the start of the COVID-19 pandemic, 59.2% of electronic cigarettes/vaporizing device users did not share these devices with others (see Figure 1). Thirty-seven percent (36.9%) of cannabis joint or blunt users stopped sharing since COVID-19 was declared a pandemic.

Most (65.3%) of these adult MCUs reported being under the influence of psychoactive cannabis for 6 or more hours daily or almost daily. When asked about the dominant cannabinoid (i.e., THC, CBD, CBN) in their medicinal cannabis, 58.7% reported THC as the dominant cannabinoid, followed by a CBD and THC ratio (26.0%). Since COVID-19 has been declared a pandemic, 47.5% of respondents are worried about not being able to pay for their cannabis

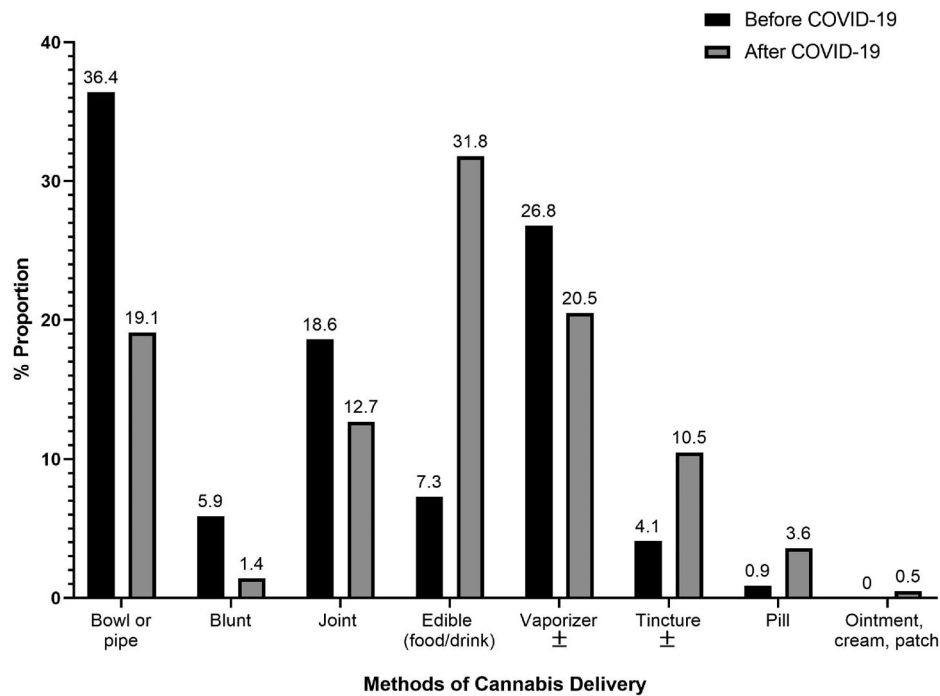


**Table 2.** COVID-19 Cannabis Use among Adults who use medicinal cannabis, *COVID-19 Cannabis Health Questionnaire Results*, March 21, 2020 to April 21, 2020 (*N* = 1202).

	n (%)
Since COVID-19 has been declared a pandemic, how has the dose of your medical cannabis use changed?	
The amount used has increased	461 (38.4)
The amount used has decreased	106 (8.8)
The amount used has stayed the same	576 (47.9)
No response	59 (4.9)
Since COVID-19 has been declared a pandemic, has the method you use cannabis changed?	
Yes	191 (15.9)
No	951 (79.1)
No response	60 (5.0)
What is your dominant cannabinoid (i.e., THC, CBD, CBN)?	
CBD dominant	35 (2.9)
THC dominant	705 (58.7)
CBD and THC ratio	313 (26.0)
Other cannabinoid dominant	5 (0.4)
Unsure	70 (5.8)
No response	74 (6.2)
Since COVID-19 has been declared a pandemic, are you (or were you) worried about not being able to pay for your cannabis?	
Yes	571 (47.5)
No	573 (47.7)
No response	58 (4.8)
Since COVID-19 has been declared a pandemic, have you gotten advance supply of your medical cannabis?	
Yes	574 (47.8)
No	568 (47.3)
No response	60 (5.0)
How long will the advance supply of cannabis last you? (n = 574)*	
1 week	45 (7.8)
2 weeks	146 (25.4)
3 weeks	74 (13.0)
1 month	163 (28.5)
2 months	80 (14.0)
3 months	28 (5.0)
More than 3 months	36 (6.3)
Before COVID-19 has been declared a pandemic, which method of cannabis delivery did you use the most? (n = 191)†	
Smoked it in a pipe/bowl	69 (36.3)
Vaporizer	53 (27.9)
Smoked it in a joint	35 (18.4)
Edible (in food or drink)	12 (6.3)
Smoked it in a blunt (rolled in tobacco leaf)	11 (5.8)
Tincture	8 (4.2)
Pill	2 (1.1)
Since COVID-19 has been declared a pandemic, which method of delivery do you use the most? (n = 191)†	
Edible (in food or drink)	60 (31.4)
Vaporizer	38 (19.9)
Smoked it in a pipe/bowl	37 (19.4)
Smoked it in a joint	23 (12.0)
Tincture	21 (10.9)
Smoked it in a blunt (rolled in tobacco leaf)	3 (1.6)
Ointment, cream, patch	1 (0.5)
Pill	8 (4.2)
Since COVID-19 has been declared a pandemic, do you share electronic vaporizing devices?	
No, I do/did not share devices	711 (59.2)
No, I do/did not use devices	367 (30.5)
Yes, devices containing cannabis	94 (7.8)
Yes, devices containing cannabis and nicotine	21 (1.8)
Yes, devices containing nicotine	8 (0.7)
Since COVID-19 has been declared a pandemic, do you share joints, blunts, or spliffs?	
No, I did not share before COVID-19	506 (42.1)
No, I stopped	444 (36.9)
Yes, less than usual	113 (9.4)
Yes, the same as usual	76 (6.3)
Yes, more than usual	4 (0.3)
No response	59 (4.9)
How often were you under the influence of psychoactive cannabis for 6 or more hours?	
Daily/Almost daily	785 (65.3)
Weekly	200 (16.6)
Never	99 (8.2)
Less than monthly	64 (5.3)
Monthly	45 (3.7)
No response	9 (0.8)

\*Question only asked to those who responded "Yes" and confirmed they have an advance supply of medical cannabis.

†Question only asked to those who responded "Yes" and reported their method of cannabis delivery used most often has changed.



±Significant Exact Test P-Value ( $p < 0.05$ )

**Figure 1.** Change in method of cannabis delivery after the COVID-19 pandemic among adults who confirmed their cannabis use method changed ( $n = 220$ ).

and 47.8% obtained an advanced supply of cannabis. Of these 574 respondents with an advanced supply of cannabis, 33.2% have a two-week or less supply, 28.4% have a month supply, and 25.2% have a two-month or more supply.

#### **COVID-19 symptoms, testing, infection, and prevention**

As noted in Table 3, 6.8% of these adult MCUs reported suspected COVID-19 symptoms. Two percent (2.1%) of the sample have been tested for SARS-CoV-2 (COVID-19) and one reported a positive test result. The positive test result was reported from an MCU that endorsed smoking via blunt (cannabis rolled into a tobacco leaf to smoke) as most common route of cannabis use. Over half of MCUs fear giving COVID-19 to someone else (52.5%) and fear being diagnosed (56.7%) with COVID-19. A majority (86.7%) have isolated themselves from others due to COVID-19.

#### **COVID-19 pandemic impact on those with chronic health conditions**

Participants with respiratory- and immune-related chronic conditions were more likely to be

afraid of being diagnosed with COVID-19 and more likely to isolate themselves from others due to COVID-19 compared to those without those chronic conditions (both  $p = 0.01$ ; see online supplemental Figure A). Those with mental health-related chronic conditions ( $p = 0.002$ ), chronic pain ( $p = 0.01$ ), and cardiometabolic-related conditions ( $p = 0.02$ ) were more likely to fear giving COVID-19 to someone else than those without the aforementioned conditions. Finally, participants with respiratory-related condition ( $p = 0.02$ ), mental health-related condition ( $p = 0.02$ ), and chronic pain ( $p = 0.001$ ) were more likely to report currently having COVID-19 symptoms.

After adjusting for sex, education, and race/ethnicity, those with respiratory-related and mental health-related chronic conditions, and chronic pain were more likely to report currently having COVID-19 symptoms (aOR: 1.91, 95% CI: 1.12–3.25; aOR: 1.94, 95% CI: 1.07–3.52; aOR: 2.07, 95% CI: 1.30–3.29, respectively, see Figure 2). Respondents with mental health-related conditions were also almost twice as likely to be fearful of transmitting the infection to others versus those without mental health-related conditions



**Table 3.** COVID-19 Symptoms, Testing, Infection, and Prevention, *COVID-19 Cannabis Health Questionnaire Results*, March 21, 2020 to April 23, 2020 ( $N = 1,202$ ).

	n (%)
Do you currently have COVID-19 symptoms?	
Yes	82 (6.8)
No	1118 (93.0)
No response	2 (0.2)
Since COVID-19 has been declared a pandemic, did a health professional recommend you use cannabis to manage COVID-19 or the coronavirus?	
Yes	53 (4.4)
No	1148 (95.5)
No response	1 (0.1)
Since COVID-19 has been declared a pandemic, did a health professional recommend you to get an advance supply of your cannabis?	
Yes	102 (8.5)
No	750 (62.4)
No response	350 (29.1)
Have you been tested for COVID-19?	
Yes	25 (2.1)
No	1174 (97.7)
No response	3 (0.3)
Have you tested positive for COVID-19? (n = 23)*	
Yes	1 (0.1)
No	22 (1.8)
Do you fear giving COVID-19 to someone else?	
Yes	631 (52.5)
No	563 (46.8)
No response	8 (0.7)
Do you fear being diagnosed with COVID-19?	
Yes	682 (56.7)
No	515 (42.9)
No response	5 (0.4)
Have you isolated yourself from others due to COVID-19?	
Yes	1042 (86.7)
No	156 (12.9)
No response	4 (0.3)

\* Question only asked to those who reported being tested for COVID-19 (i.e., SARS-CoV-2).

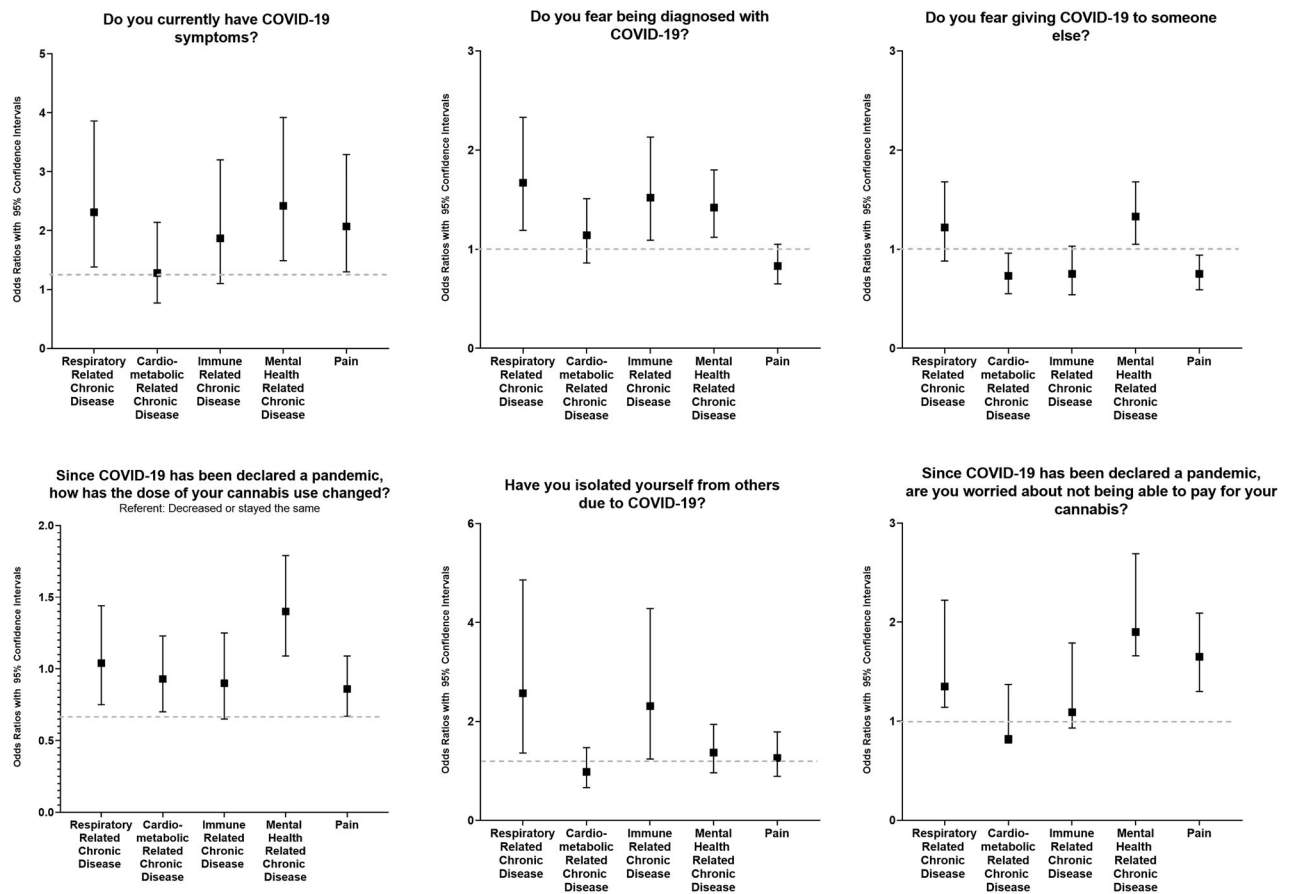
(aOR: 1.62, 95% CI: 1.21–2.16). Those with respiratory (aOR: 2.42, 95% CI: 1.26–4.65) and autoimmune disease (aOR: 2.25, 95% CI: 1.19–4.24) were more likely to report isolating themselves due to COVID-19 versus those without these health conditions. Additionally, those with mental health-related conditions (i.e., anxiety and/or depression) reported a 97% increase in medicinal cannabis use compared to medicinal users without mental health conditions (aOR: 1.97, 95% CI: 1.44–2.68).

## Discussion

To our knowledge, this study is the first to observe differences in use patterns by preexisting chronic health conditions among adult MCUs during the COVID-19 pandemic. A majority of adult MCUs reported having at least one chronic health condition, with mental health, cardiometabolic, and respiratory conditions most commonly reported among those with chronic diseases. Over 40% of adults MCUs reported an increase

in cannabis consumption since COVID-19 was declared a pandemic. Those with mental health conditions (e.g., anxiety, depression) had the highest odds of self-reported increased medicinal cannabis use. Over half of adults who use medicinal cannabis in our study reported fear of giving COVID-19 to someone else or fear of being diagnosed. These findings have implications for clinical care of adult medicinal cannabis patients, especially for those with anxiety and depression who may be in greater need of mental health services.<sup>22</sup>

In our study, over one-third of adults who use cannabis report increased use of cannabis after the COVID-19 pandemic started. More specifically, we observed that those with mental health conditions including anxiety and depression, were most likely to report an increased use of cannabis. The increased use of medicinal cannabis use may be attributable to heightened anxiety and depression symptoms due to the pandemic. Several factors may be attributable to this increase in mental-health related symptoms:



Disease categories: Respiratory-related = asthma and respiratory disease; Cardiometabolic-related = High blood pressure, diabetes, obesity, and heart disease; Immune-related = Lupus, autoimmune disease, cancer, HIV/AIDS; Mental health-related = anxiety, depression

**Figure 2.** Odds Ratios and 95% Confidence Intervals Evaluating the Impact of COVID-19 Pandemic on Adults who use medicinal cannabis with Chronic Disease Compared to No Chronic Disease.

Multivariable results showed that those with mental health conditions, including anxiety and depression, experienced fear of transmitting COVID-19 to others but did not express similar fears of being diagnosed with COVID-19 themselves. Additionally, those with mental health conditions reported that they were less likely to self-isolate; however, the current study did not collect data on reasons participants did or did not self-isolate. A potential reason such respondents were unable to self-isolate may be due to employment in essential service sectors; however, data on reasons were not collected in this study. Providers may consider continuing and/or beginning virtual and telephone-based services aimed to alleviate anxiety of isolation. Adults with anxiety or depression may be unable to self-isolate due to their condition and follow the CDC recommendations to reduce transmission.<sup>23</sup> A recent commentary shed light on this issue and called

for the US mental health system to prepare for inevitable challenges those with mental health conditions may face due to the COVID-19 pandemic, including increases in isolation, boredom and frustration, and potential for increased conflict in the household.<sup>22</sup> Emergency psychological crisis interventions should be recommended in the United States, specifically for this vulnerable population, as carried out by other countries during the pandemic.<sup>24,25</sup>

Adults reported an increased use of edible and tincture consumption among the 16.2% of adults who use medicinal cannabis who changed the route of cannabis use. Although motives for changing consumption method were not collected, this change may have been motivated by a fear of developing COVID-19; several reports<sup>26</sup> have associated smoking and/or vaping with increased susceptibility for contracting COVID-19 and/or increased likelihood of complications

in individuals who smoke or vape.<sup>2,3</sup> A switch to edibles also occurred during the H1N1 Swine Flu Pandemic in 2009;<sup>27</sup> data-driven decisions from past may help inform our respondents in the present. Concurrently, several (unofficial)<sup>28</sup> reports urged cannabis users to change their method of consumption to edibles, particularly those that suffered from respiratory diseases like asthma, as smoking may further compromise lung function.<sup>29</sup> Further research exploring COVID-19 among those with underlying respiratory conditions is needed to support this claim.

Additionally, the CDC has reported that the novel coronavirus can be spread from person to person through respiratory droplets<sup>30</sup> and via contaminated surfaces.<sup>31</sup> This is of concern given that some (26.3%) adult MCUs in our sample continued to engage in cannabis sharing behavior across this period (March 21–April 23, 2020), which may increase their risk of infection. Moreover, 27.9% of adults who use medicinal cannabis reported use of electronic cigarettes, which can potentially aerosolize viral particles infecting close contacts. Future research should examine whether those who engage in these types of behaviors have an increased risk of infection and/or hospitalization due to this virus.

### **Study limitations and strengths**

Results should be interpreted within the context of study limitations. First, causation and temporality cannot be determined due to the cross-sectional study design at one assessment point. Due to anonymity, there may be repeat responses. There were no monetary or other incentives provided; thus, reduced likelihood of intentional repeated responses. Data quality assurance and cleaning methods were employed prior to analyses. The electronic nature of the survey provides opportunity for survey bias, particularly by exclusion of those without access to internet. Furthermore, all data were self-reported which provides opportunity for recall bias and a potential impact on calculated prevalence estimates. Medicinal cannabis use was self-reported based on medicinal motive for use without medical record or prescription confirmation. There may

be opportunity for misclassification bias of medicinal and non-medicinal cannabis consumers.

Despite limitations, the study has notable strengths. The anonymity of responses may have increased likelihood of MCUs responding to survey in addition to reducing inaccurate responses. The present study is among the first to provide insight into adults who use medicinal cannabis as a specific vulnerable population for COVID-19. Additionally, the insight gained offers an opportunity to understand cannabis use behaviors among individuals with chronic disease(s) since the declaration of the COVID-19 pandemic. MSUs reported increased use and concern for access to medical cannabis after the start of the COVID-19 pandemic.

### **Clinical implications**

Clinicians should consider asking about cannabis use among their patients, particularly those with chronic health conditions. Results here identified anxiety and depression (mental health-related) as the most prevalent chronic health conditions managed by medicinal cannabis among respondents. Studies prior to the COVID-19 crisis have identified chronic pain<sup>28</sup> and respiratory-related<sup>29</sup> disease as highly prevalent chronic conditions. Current indications for medicinal cannabis do not include anxiety or depression in most states with legalized medicinal cannabis. Further research is needed to investigate the potential positive and/or negative implications cannabis use may have on SARS-CoV-2 exposure, transmission, morbidity, and mortality.

### **Acknowledgements**

We would like to first extend our gratitude to all volunteer respondents and to the student volunteers in the Vidot Cannabis Health and Fitness Research Laboratory. Author contributions are as follows: Vidot, Islam, Camacho-Rivera, and Messiah had full access to the anonymous data and take responsibility for the integrity of the data and the accuracy of the data analysis. *Concept and design:* Vidot, Islam, Camacho-Rivera, Harrell, Rao, Chavez, Ochoa, Hlaing, Weiner, and Messiah. *Acquisition, analysis, or interpretation of data:* Vidot, Islam, Camacho-Rivera, Harrell, Rao, Chavez, Ochoa, Hlaing, Weiner, and Messiah. *Drafting of the manuscript:* Vidot, Islam, Camacho-Rivera, Chavez, Ochoa, and Messiah. *Critical revision of the manuscript for*

*important intellectual content:* Vidot, Islam, Camacho-Rivera, Harrell, Rao, Hlaing, Weiner, and Messiah. *Statistical analysis:* Islam, Ochoa, and Chavez (GIS only).

## ORCID

Denise C. Vidot  <http://orcid.org/0000-0001-8254-6928>

Jessica Y. Islam  <http://orcid.org/0000-0002-3690-3848>

Marlene Camacho-Rivera  <http://orcid.org/0000-0003-2343-2941>

Melissa B. Harrell  <http://orcid.org/0000-0003-3285-0870>

Sarah E. Messiah  <http://orcid.org/0000-0001-6685-2175>

## References

1. Organization WH. Rolling updates on coronavirus disease (COVID-19). World Health Organization; 2020 [accessed 2020 Apr 4]. <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen>.
2. Organization WH. Q&A on smoking and COVID-19. World Health Organization; 2020 [accessed 2020 Apr 5]. <https://www.who.int/news-room/q-a-detail/q-a-on-smoking-and-covid-19>.
3. Sohrabi C, Alsafi Z, O'Neill N, Khan M, Kerwan A, Al-Jabir A, Iosifidis C, Agha R. World Health Organization declares global emergency: a review of the 2019 novel coronavirus (COVID-19). *Int J Surg*. 2020;76:71–6. doi:10.1016/j.ijssu.2020.02.034.
4. Brook JS, Lee JY, Finch SJ, Koppel J, Brook DW. Psychosocial factors related to cannabis use disorders. *Subst Abus*. 2011;32(4):242–51. doi:10.1080/08897077.2011.605696.
5. Wills TA, Sandy JM, Yaeger AM, Cleary SD, Shinar O. Coping dimensions, life stress, and adolescent substance use: a latent growth analysis. *J Abnorm Psychol*. 2001;110(2):309–23. doi:10.1037/0021-843X.110.2.309.
6. Bahorik AL, Leibowitz A, Sterling SA, Travis A, Weisner C, Satre DD. Patterns of marijuana use among psychiatry patients with depression and its impact on recovery. *J Affect Disord*. 2017;213(C):168–71. doi:10.1016/j.jad.2017.02.016.
7. Glodosky NC, Cuttler C. Motives matter: cannabis use motives moderate the associations between stress and negative affect. *Addict Behav*. 2020;102:106188. doi:10.1016/j.addbeh.2019.106188.
8. Lai HM, Cleary M, Sitharthan T, Hunt GE. Prevalence of comorbid substance use, anxiety and mood disorders in epidemiological surveys, 1990–2014: a systematic review and meta-analysis. *Drug Alcohol Depend*. 2015;154:1–13. doi:10.1016/j.drugalcdep.2015.05.031.
9. Temple EC, Driver M, Brown RF. Cannabis use and anxiety: is stress the missing piece of the puzzle? *Front Psychiatry*. 2014;5:168. doi:10.3389/fpsy.2014.00168.
10. Khoury L, Tang YL, Bradley B, Cubells JF, Ressler KJ. Substance use, childhood traumatic experience, and posttraumatic stress disorder in an urban civilian population. *Depress Anxiety*. 2010;27(12):1077–86. doi:10.1002/da.20751.
11. Vetter S, Rossegger A, Rossler W, Bisson JI, Endrass J. Exposure to the tsunami disaster, PTSD symptoms and increased substance use - an internet based survey of male and female residents of Switzerland. *BMC Public Health*. 2008;8:92. doi:10.1186/1471-2458-8-92.
12. Kilpatrick DG, Ruggiero KJ, Acierno R, Saunders BE, Resnick HS, Best CL. Violence and risk of PTSD, major depression, substance abuse/dependence, and comorbidity: results from the National Survey of Adolescents. *J Consult Clin Psychol*. 2003;71(4):692–700. doi:10.1037/0022-006x.71.4.692.
13. Kilpatrick DG, Acierno R, Saunders B, Resnick HS, Best CL, Schnurr PP. Risk factors for adolescent substance abuse and dependence: data from a national sample. *J Consult Clin Psychol*. 2000;68(1):19–30. doi:10.1037/0022-006X.68.1.19.
14. Hyman SM, Sinha R. Stress-related factors in cannabis use and misuse: implications for prevention and treatment. *J Subst Abuse Treat*. 2009;36(4):400–13. doi:10.1016/j.jsat.2008.08.005.
15. Schiff M, Fang L. Adolescents' exposure to disasters and substance use. *Curr Psychiatry Rep*. 2016;18(6):57. doi:10.1007/s11920-016-0693-2.
16. Maclean JC, Popovici I, French MT. Are natural disasters in early childhood associated with mental health and substance use disorders as an adult? *Soc Sci Med*. 2016;151:78–91. doi:10.1016/j.socscimed.2016.01.006.
17. Wagner KD, Brief DJ, Vielhauer MJ, Sussman S, Keane TM, Malow R. The potential for PTSD, substance use, and HIV risk behavior among adolescents exposed to Hurricane Katrina. *Subst Use Misuse*. 2009;44(12):1749–67. doi:10.3109/10826080902963472.
18. Rohrbach LA, Grana R, Vernberg E, Sussman S, Sun P. Impact of hurricane Rita on adolescent substance use. *Psychiatry*. 2009;72(3):222–37. doi:10.1521/psyc.2009.72.3.222.
19. Allen AM, Jung AM, Alexander AC, Allen SS, Ward KD, Al'Absi M. Cannabis use and stressful life events during the perinatal period: cross-sectional results from pregnancy risk assessment monitoring system (PRAMS) data, 2016. *Addiction*. 2020;115(9):1707–16. doi:10.1111/add.15003.
20. Harris P, Taylor R, Thielke R, Payne J, Gonzalez N, Conde J. Research electronic data capture (REDCap)-a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform*. 2009;42(2):377–81. doi:10.1016/j.jbi.2008.08.010.

21. Vidot DC, Messiah SE, Gattamorta K. COVID-19 Cannabis Health Questionnaire (CCHQ). El Centro Measures Library. <https://elcentro.sonhs.miami.edu/research/measures-library/cchq/index.html>. Accessed August 26, 2020.
22. Pfefferbaum B, North CS. Mental health and the Covid-19 pandemic. *N Engl J Med.* 2020;383(6):510–2. doi:10.1056/NEJMp2008017.
23. Prevention CfDCa. Social distancing; 2020 [accessed 2020 Apr 29]. <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/social-distancing.html>.
24. Li W, Yang Y, Liu Z-H, Zhao Y-J, Zhang Q, Zhang L, Cheung T, Xiang Y-T. Progression of mental health services during the COVID-19 outbreak in China. *Int J Biol Sci.* 2020;16(10):1732–8. doi:10.7150/ijbs.45120.
25. Brooks SK, Webster RK, Smith LE, Woodland L, Wessely S, Greenberg N, Rubin GJ. The psychological impact of quarantine and how to reduce it: rapid review of the evidence. *Lancet.* 2020;395(10227):912–20. doi:10.1016/S0140-6736(20)30460-8.
26. Volkow ND. Collision of the COVID-19 and Addiction Epidemics. *Ann Intern Med.* 2020;173(1):61–62. doi:10.7326/M20-1212
27. Power CA, Van Heerden PV, Moxon D, Martindale G, Roberts B. Extracorporeal membrane oxygenation for critically ill patients with influenza A (H1N1) 2009: a case series. *Crit Care Resusc.* 2011;13(1):38–43.
28. Hutchison C. Company tables medical marijuana for swine flu. ABC News; 2009 [accessed 2020 Apr 12]. <https://abcnews.go.com/Health/SwineFluNews/company-tables-medical-marijuana-swine-flu/story?id=8214468>.
29. Prevention CfDCa. Patients with asthma: considerations for clinicians regarding 2009 H1N1 influenza virus. Centers for Disease Control and Prevention, Atlanta, GA; 2009.
30. Prevention CfDCa. Coronavirus disease 2019 (COVID-19); 2020 [accessed 2020 Apr 4]. [https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-at-higher-risk.html?CDC\\_AA\\_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fspecific-groups%2Fhigh-risk-complications.html](https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-at-higher-risk.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fspecific-groups%2Fhigh-risk-complications.html).
31. van Doremalen N, Bushmaker T, Morris DH, et al. Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1. *N Engl J Med.* 2020;382(16):1564–1567. doi:10.1056/NEJMc2004973