

Original quantitative research

Shifts in medical cannabis use in Canada during the COVID-19 pandemic

Stephanie Lake, PhD (1,2); Ziva D. Cooper, PhD (1,2,3); Kaye Ong, BSc (4); Philippe Lucas, PhD (4,5)

This article has been peer reviewed.

 [Tweet this article](#)

Abstract

Introduction: The COVID-19 pandemic has had widespread secondary negative health impacts including loss of material security and exacerbation of mental illness in at-risk populations. While increases in the nonmedical use of certain substances, including cannabis, have been observed in samples of the Canadian population, no research has documented COVID-concurrent shifts in medical cannabis use in Canada.

Methods: Data were derived from the 2021 Canadian Cannabis Patient Survey, an online survey administered in May 2021 to people authorized to use medical cannabis recruited from one of two Canadian licensed medical cannabis producers. McNemar tests assessed for changes in past 3-month medical cannabis frequency from before to during the pandemic. We explored correlates of increasing frequency of cannabis use since before the pandemic in bivariable and multivariable logistic models.

Results: In total, 2697 respondents (49.1% women) completed the survey. Daily medical cannabis use increased slightly but significantly from before the pandemic (83.2%) to during the pandemic (90.3% at time of survey; $p < 0.001$). Factors significantly associated with increasing frequency of medical cannabis use included female gender, younger age, pandemic-related job loss, primary cannabis use to manage mental health, prescription drug use and nonmedical cannabis use ($p < 0.05$).

Conclusion: There were slight shifts towards higher frequency of medical cannabis use after the onset of the COVID-19 pandemic. While short- and long-term impacts of cannabis use on pandemic-related mental distress are unknown, clinicians working with patients who use medical cannabis should be aware of possible changes in use patterns during the pandemic.

Keywords: COVID-19, cannabis, medical cannabis, Canada, survey

Introduction

The COVID-19 pandemic and associated policy response measures have had widespread, long-lasting and compounding direct and indirect impacts on population health and quality of life around the world. In many settings, nonemergency medical procedures were deferred to focus health care resources on the COVID-19

response, and public health measures such as restrictions on in-person gatherings, travel and non-essential service operations were implemented to curb community transmission of the virus. While critical to reducing case rates, these abrupt changes spurred increased feelings of loneliness, boredom and isolation¹ in addition to rising material and income insecurity.²

Highlights

- We conducted a survey of Canadians authorized to use medical cannabis to learn whether and how their use changed during the COVID-19 pandemic.
- Daily medical cannabis use increased slightly and significantly after the onset of the pandemic.
- Increases in medical cannabis use were more common among women, younger people, people who lost their job during the pandemic and people who used cannabis to manage their mental health.

The disruption to everyday life, coupled with fears about contracting or transmitting SARS-CoV-2, became the source of substantial stress for many people.³⁻⁷ Indeed, early studies observed marked deteriorations in mental health in populations world-wide as well as exacerbated symptoms of anxiety, distress, depression, insomnia and posttraumatic stress disorder (PTSD).⁸⁻¹²

Secondary to these pandemic-induced shifts in social, economic and psychological health states have been changes to the contexts, motivations and patterns of substance use. For example, approximately 1 in 8 adults in a representative sample of the US population reported starting or increasing the use of a substance to cope with pandemic-related negative emotions alongside high rates of self-reported anxiety and/or depression (31%)

Author references:

1. UCLA Center for Cannabis and Cannabinoids, Jane and Terry Semel Institute for Neuroscience and Human Behavior, University of California, Los Angeles, California, USA
2. Department of Psychiatry, David Geffen School of Medicine, University of California, Los Angeles, California, USA
3. Department of Anesthesiology and Perioperative Medicine, David Geffen School of Medicine, University of California, Los Angeles, California, USA
4. Tilray Canada Ltd., Nanaimo, British Columbia, Canada
5. Social Dimensions of Health, University of Victoria, Victoria, British Columbia, Canada

Correspondence: Stephanie Lake, UCLA Center for Cannabis and Cannabinoids, 760 Westwood Plaza, Suite 38-418, Los Angeles, CA, USA 90095; Tel: 310-206-2104; Email: slake@mednet.ucla.edu

and trauma- and stress-related disorder symptoms (26%).¹³ Studies from Australia, Canada and the US have shown increased alcohol consumption among people experiencing elevated stress, anxiety and depression.¹⁴⁻¹⁹

In Canada, where cannabis has been legal and regulated since 2018, the prevalence of current (past-week) nonmedical cannabis use in the overall population does not appear to have shifted noticeably during the COVID-19 pandemic;²⁰ however, between 30% and 50% of people who used non-medical cannabis pre-pandemic increased their frequency of use during the pandemic;^{3,20-22} this estimate is even higher among those with depression, anxiety and/or suicidality.³

Surveys found that between 30% and 40% of people who use cannabis do so for both medical and nonmedical purposes.^{23,24} In Canada, clinicians can authorize medical cannabis for a wide range of conditions or symptoms, including pain, anxiety, depression, PTSD and sleep disorders.^{25,26} About 22% of people who use cannabis for medical purposes in Canada are authorized to do so by a health care professional.²⁷

Although many overlapping symptoms and conditions commonly managed with medical cannabis (e.g. chronic pain, anxiety, depression, PTSD, insomnia) are reported to have worsened in the population during the COVID-19 pandemic,^{28,29} studies investigating changes in medical cannabis use among Canadians authorized to use it are lacking. Annual data from the Canadian Cannabis Survey suggest that the prevalence of self-reported (i.e. not necessarily authorized) medical cannabis use has remained stable over 2019, 2020 and 2021.^{27,30} We are unaware of any study examining shifts in frequency of medical cannabis use over this time in a single sample of people who use medical cannabis.

Using information collected from a large sample of Canadian residents authorized to use medical cannabis, we sought to (1) document changes in the frequency of medical cannabis use; (2) explore concurrent changes in use of alcohol, tobacco, and prescription and unregulated drugs; and (3) identify independent correlates of increasing medical cannabis use during the COVID-19 pandemic.

Methods

Study sample

Data for this study were derived from the 2021 Canadian Cannabis Patient Survey. The survey was developed in consultation with academic partners at institutions across Canada and the United States and administered by Tilray, a Canadian licensed producer of medical cannabis.

All people authorized to use medical cannabis registered with Tilray and/or the licensed producer Aphria were emailed a password-protected link to complete the survey. The survey was available from 7 to 14 May 2021 on REDCap, a HIPAA- (in the USA) and PIPEDA- (in Canada) compliant electronic data capture system. Respondents provided informed consent prior to participating in the study and answered questions on demographics, the reasons they are using medical cannabis and their patterns of use of cannabis and other substances. People who completed the survey and provided a valid Tilray or Aphria patient number were entered into a draw for one of three CAD 1000 credits towards the purchase of medical cannabis from their licensed provider.

Ethics approval for this survey was granted by Advarra, an independent institutional review board (approval number: Pro00050772).

Measures

Medical cannabis use frequency

To explore patterns of medical cannabis use during the COVID-19 pandemic, we added a block of pandemic-related questions to the 2021 Canadian Cannabis Patient Survey.

First, we asked respondents to report their average frequency of medical cannabis use during three time periods that we defined in relation to the onset of the global pandemic: “pre-COVID” was the approximate 3-month period preceding the declaration of the COVID-19 pandemic (i.e. approximately 1 January 2020 to 15 March 2020); “Wave 1” was the initial period after the declaration of the pandemic during which new cases steadily increased, then decreased and remained relatively stable (i.e. approximately 15 March 2020 to 30 August 2020); and “Wave 2” was associated with much more rapid and higher surge of new cases (i.e.

approximately 1 October 2020 to the time of data collection).

For each pre-specified period, participants were asked how often they used medical cannabis. Consistent with the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST),³¹ the response categories were “never,” “once or twice,” “monthly,” “weekly” and “daily or almost daily.” In anticipation of high rates of daily use among this sample of medical users,²⁴ respondents authorized to use medical cannabis daily were further prompted to specify the approximate number of times they used cannabis per day: 1 to 2, 3 to 5, 6 to 10, or more than 10.

To obtain a measure corresponding to change and direction of change of medical cannabis use frequency during the COVID-19 pandemic, we ordered the original frequency categories on a scale from 0 to 7 (i.e. never [0] to >10 times/day [7]) and calculated a change from baseline (i.e. “pre-COVID”) score separately for Wave 1 and Wave 2 by subtracting the pre-COVID frequency from the Wave 1 and Wave 2 frequencies, respectively. Change scores of 1 or more, -1 or less and 0, respectively, corresponded to an increase, decrease or no change in medical cannabis use frequency for that period. A change score of 1 or more in either period was considered an increase from baseline; a change score of 1 or less in either period was considered a decrease from baseline.

Reasons for changing medical cannabis use

We asked respondents whether they perceived their medical cannabis use as having changed during the pandemic. Those who responded “yes” were prompted to identify the reason(s) underlying this change. The response categories included adjustment to medical cannabis authorization; change in access or availability of cannabis; cost; social distancing regulations; time at home; anxiety; sleep problems; isolation; loneliness; COVID-19 risk; COVID-19 symptom severity; and other (with a text box for additional responses).

Changes in other substance use

We asked respondents to report how their use of other substances, including alcohol, tobacco, prescription drugs (opioids and non-opioids) and unregulated drugs (cocaine or crack, methamphetamine, unregulated opioids) changed during the pandemic (i.e. after 15 March 2020).

Respondents could report an increase, decrease, no change or no use of that substance.

Statistical analysis

First, we examined the number and proportion of respondents who reported less than weekly, weekly and daily medical cannabis use in each assessment period. We used a McNemar-Bowker test to assess for overall within-group changes in frequency of use, and McNemar tests with Bonferroni correction to examine pairwise changes in frequency between assessment periods (e.g. less than weekly to weekly from pre-COVID to Wave 1, less than weekly to weekly from Wave 1 to Wave 2, etc.). We then descriptively examined the reasons given for increased or decreased frequency of use since the pre-COVID assessment period.

Next, we used Chi-square tests (or Fisher exact tests, as appropriate) to examine changes in secondary substance use during the pandemic (i.e. stable or decrease or increase in frequency), stratified by increased medical cannabis use during the pandemic (yes vs. no). We followed up significant ($p < 0.05$) results with post hoc pairwise Chi-square tests with Bonferroni correction.

Finally, we built exploratory bivariable and multivariable logistic regression models to examine sociodemographic, substance use and health-related correlates of increasing medical cannabis use during the COVID-19 pandemic. The analytic sample for the model was restricted to respondents who were eligible to increase their medical cannabis use frequency (i.e. those who used medical cannabis less than 10 times per day during the pre-COVID period).

We considered the following covariates: gender (female vs. male); age (per 5-year increase); household annual income (in CAD, <40 000, 40 000–99 999, 100 000–159 999, ≥160 000); employment status (part/full-time, unemployed/on disability, retired); lost employment during the pandemic (yes vs. no); community setting (urban/suburban vs. rural); nonmedical cannabis use (yes vs. no); alcohol use (yes vs. no); tobacco use (yes vs. no); use of cocaine/crack, illicit opioids (e.g. heroin) or methamphetamine (pooled together into a category for “unregulated drugs”; yes vs. no); prescription opioids, non-opioid

prescription drugs (pooled into a category for prescription drugs; yes vs. no); and primary symptom(s) treated with medical cannabis. The information about primary symptoms treated with medical cannabis was derived from a checklist of symptom categories including an option to describe additional symptoms.

We derived the following binary (yes vs. no) groupings from the predetermined and self-described symptoms: (1) pain, inflammation, nerve damage; (2) sleep problems; (3) anxiety, stress, hypersensitivity; (4) depression, low mood; (5) addiction, dependence, withdrawal; (6) attention deficit, memory loss; (7) nausea, appetite loss or gastrointestinal issues; (8) seizures, muscle spasms, tremors; and (9) other (responses that could not be reasonably re-categorized into any of the above groups).

We adopted a conservative multivariable model-building approach in which all these covariates with a bivariable significance level ($p < 0.20$) were included in multivariable analyses.

As some participants may have increased their medical cannabis use because they received medical authorization to do so, we conducted a sensitivity analysis. Participants whose sole underlying reason for their increased use of medical cannabis was a change to their medical cannabis authorization were recoded to 0 for the outcome.

All analyses were conducted in R Version 1.4.1106 using RStudio (R Foundation for Statistical Computing, Vienna, AT). All p -values are two-sided.

Results

Of the 27 431 people registered with Tilray or Aphria (or both) and who were sent a link to the survey, 2697 (9.8%) provided complete responses. Of these, 1325 (49.1%) were women (mean [SD] age: 54.3 [14.0] years). Most respondents (91.3%) were White and living in central Canada or the Prairies (see Table 1).

The prevalence of daily medical cannabis use in the sample was 83.2% ($n = 2245$) during the pre-COVID period; 85.9% ($n = 2317$) during Wave 1; and 90.3% ($n = 2422$) during Wave 2 (see Table 2). A McNemar-Bowker test confirmed significant

changes in the frequency of medical cannabis use during the pandemic ($p < 0.001$), with pairwise post hoc tests showing a significant increase from less than weekly use to weekly and daily use between the pre-COVID period and Wave 1 (both adjusted $p < 0.001$), and a significant increase from less than weekly to daily use from Wave 1 to Wave 2 (adjusted $p < 0.001$; Table 2).

About 546 (18.4%) respondents increased their medical cannabis use frequency since the pre-COVID period. Common reasons for increasing use frequency included anxiety ($n = 280$ [51.3%]); sleep problems ($n = 206$ [37.7%]); social distancing regulations and/or more time at home ($n = 194$ [35.5%]); isolation and/or loneliness ($n = 149$ [27.3%]); and change to medical cannabis authorization ($n = 91$ [16.7%]; see Table 3).

Another 123 (18.4%) respondents decreased their use frequency. The top reasons given for changing use frequency were anxiety and sleep problems, reported by 18.7% ($n = 23$) and 21.1% ($n = 26$) of the group, respectively.

In total, 50 (9.2%) of the respondents who increased their use and 6 (4.9%) of those who decreased their use cited risk of COVID-19 infection or symptom severity as a reason for changing frequency (see Table 3 for reasons for changing frequency of medical cannabis use during the COVID-19 pandemic).

Significantly more respondents who increased their medical cannabis frequency during the pandemic reported an increase in alcohol use, while significantly more respondents who did not increase their medical cannabis frequency reported no change in alcohol use (both $p < 0.001$). The groups did not differ in terms of perceived reductions in alcohol consumption. Similar group differences were noted for perceived changes in tobacco consumption (see Table 4). Reported changes in consumption of prescription opioids, unregulated opioids, non-opioid prescription drugs, crack/cocaine and methamphetamine did not differ during the pandemic between the groups.

The odds of increasing medical cannabis use during the COVID-19 pandemic were significantly elevated among women (adjusted odds ratio [aOR] = 1.67; 95%

TABLE 1
Demographic characteristics of a sample of Canadian residents
authorized to use medical cannabis (n = 2697)

Characteristic	n	%
Mean age (SD), in years	54.3 (14.0)	
Gender		
Male	1352	50.1
Female	1325	49.1
Other ^a	10	0.4
Did not disclose	10	0.4
Race/ethnicity^b		
White	2463	91.3
Black	36	1.3
Hispanic	27	1.0
Asian	60	2.2
Indigenous	67	2.5
Métis	64	2.4
Other	70	2.6
Geographical region		
Atlantic Canada	251	9.3
Central Canada	1276	47.3
Prairies	930	34.5
West Coast	235	8.7
Northern Territories	5	0.2
Community setting		
Urban	2077	77.0
Rural	620	23.0
Annual household income, CAD		
<40 000	607	22.5
40 000–99 999	1281	47.5
100 000–159 999	599	22.2
≥160 000	210	7.8
Employment		
Full-time or part-time	1202	44.6
Unemployed	608	22.5
Retired	887	32.9
Nonmedical cannabis use		
Yes	923	34.2
No	1764	65.4

Abbreviation: SD, standard deviation.

^a Self-described genders listed under “Other” include nonbinary (n = 6), gender-fluid (n = 2), trans woman (n = 1) and gender-queer (n = 1).

^b Respondents could select multiple options to describe their race/ethnicity.

confidence interval [CI]: 1.36–2.05); respondents who lost their jobs during the pandemic (1.38; 1.06–1.80); those who use cannabis for nonmedical purposes (1.35; 1.09–1.68); those who use prescription drugs (1.24; 1.00–1.54); and those who reported anxiety/stress (1.43; 1.12–1.81) and/or depression/low mood (1.36;

1.05–1.76) as a primary symptom treated with medical cannabis (see Table 5).

For every 5-year increase in age, the odds of increasing medical cannabis use decreased by approximately 11% (aOR: 0.89; 95% CI: 0.85–0.94; Table 5). All significant findings remained after recoding

the outcome for 42 respondents whose only self-reported reason for increasing medical cannabis use was a change to medical cannabis authorization (data not shown).

Discussion

In this study of Canadian residents authorized to use medical cannabis, we sought to examine changes in frequency of medical cannabis use and identify correlates of increasing use during the first two waves of the COVID-19 pandemic. While other Canadian surveys have documented increases in nonmedical cannabis use during the pandemic,^{3,19–22} to our knowledge this is the first Canadian study to examine changes in authorized medical cannabis use.

Daily medical cannabis use increased by 7 percentage points, from 83.2% pre-pandemic to 90.3% in Wave 2. Given that prevalence of daily use pre-pandemic was already relatively high, the modest increase observed may reflect a ceiling effect. The magnitude of this change is similar to what we recently documented in a web-based sample of people who use cannabis for medical purposes in the United States, in which daily cannabis use increased from 16.2% pre-pandemic to 20.7% in the first few months of the pandemic.³² Our previous study's sample comprised people who self-reported using cannabis for therapeutic purposes.³² We suspect that the current study recorded a substantially higher prevalence of daily medical cannabis use because the sample consisted solely of people authorized to use cannabis for medical purposes.

We also asked about perceived changes in other prescribed and non-prescribed substance use during the pandemic and observed a few differences according to concurrent changes in medical cannabis frequency. We found that significantly more respondents whose medical cannabis use increased also self-reported increases in alcohol and tobacco use during the pandemic. Studies exploring the impact of the COVID-19 pandemic on alcohol consumption suggest that boredom, loneliness, depression, stress and anxiety may be particularly pertinent to upwards shifts in individual usage trajectories.^{16–18,33,34} While we did not assess for motives for alcohol or tobacco use, respondents' reasons for shifting medical cannabis use reveals certain contexts that

TABLE 2
Frequency of medical cannabis use before and during the COVID-19 pandemic reported by a sample of Canadian residents authorized to use medical cannabis (n = 2697)

Frequency	n (%)		
	Pre-COVID ^a	Wave 1 ^b	Wave 2 ^c
<Weekly	294 (10.9)	243 (9.0)	135 (5.0)
Weekly	158 (5.9)	137 (5.1)	125 (4.7)
Daily	2245 (83.2)	2317 (85.9)	2422 (90.3)

Notes: McNemar–Bowker test for net change (pre-COVID–Wave 2): $p < 0.001$.

Significant pairwise post hoc comparisons (pre-COVID–Wave 1): <weekly–daily: adjusted $p < 0.001$; weekly–daily, adjusted $p < 0.001$.

Significant pairwise post hoc comparisons (Wave 1–Wave 2): <weekly–daily: adjusted $p < 0.001$.

^a Pre-COVID = 3-month period immediately preceding the declaration of the COVID-19 pandemic (approximately 1 January to 15 March 2020).

^b Wave 1 = Start of pandemic to end of summer 2020 (approximately 15 March to 30 August 2020).

^c Wave 2 = Fall 2020 and winter 2021 (approximately 1 October 2020 to 15 February 2021).

may trigger coping-oriented substance use, such as anxiety, isolation/loneliness and boredom (time at home). In contrast, approximately 20% of respondents reported reducing their use of alcohol and tobacco regardless of any shift in medical cannabis use frequency, possibly reflecting shared motive-related reductions in alcohol and

tobacco use across the increasing, stable and decreasing medical cannabis use groups. This will be an important area to monitor in longer-term evaluations of the impact of the pandemic on the mental health of vulnerable populations. We found no differences for use of prescription opioids, unregulated opioids, non-opioid

TABLE 3
Reasons for changing medical cannabis use, by direction of frequency change from baseline, given by a sample of Canadian residents authorized to use medical cannabis (n = 2697)

Reason for change from the pre-COVID period	n (%)	
	Increase (n = 546; 18.4%)	Decrease (n = 123; 4.6%)
Change to medical cannabis authorization	91 (16.7)	5 (4.1)
Change in access or availability	33 (6.0)	5 (4.1)
Cost	45 (8.2)	19 (15.4)
Social distancing regulations / time at home	194 (35.5)	19 (15.4)
Anxiety	280 (51.3)	23 (18.7)
Sleep problems	206 (37.7)	26 (21.1)
Isolation / loneliness	149 (27.3)	10 (8.1)
COVID-19 risk or symptom severity	50 (9.2)	6 (4.9)
Other		
Change in medical need	15 (2.7)	2 (1.6)
Stress	3 (0.6)	0
Started a different treatment	0	4 (3.3)
Self-guided experimentation	3 (0.5)	5 (4.1)
Not achieving desired effect	0	3 (1.6)
Negative side effects	0	5 (4.1)
Uncategorized other	2 (0.7) ^a	3 (3.3) ^b
Not reported ^c	155 (28.4)	49 (39.8)

^a Uncategorized other reasons for increased use: lack of counselling availability, restabilizing on medication after missing doses before COVID.

^b Uncategorized other reasons for decreased use: loss of interest, less free time, implementation of new work policies around medical cannabis use.

^c Respondents who did not report a change in their medical cannabis use during the COVID-19 pandemic were not asked to report a reason for a change.

prescription drugs, crack/cocaine or methamphetamine, but low numbers were recorded for unregulated opioids, crack/cocaine and methamphetamine, reducing power to detect a change in these substances.

Our exploratory multivariable model highlighted several markers of higher susceptibility to increasing medical cannabis use during the pandemic. First, women in our study had approximately 67% higher odds of increasing medical cannabis use than men, consistent with a growing number of studies documenting disproportionate effects of the pandemic on women's mental health and substance use,^{6,9-11,14,29,35} Research focussing on sex/gender-based health disparities has shown how reinforcement of gender roles during the pandemic likely contributed to increased stress among women,^{36,37} with increased household and childcare burdens resting disproportionately on women.^{38,39}

In our previous analysis of the US-based sample, the odds of increasing medical cannabis use for anxiety early in the pandemic approximately doubled among women.³² This current study examined medical cannabis use more broadly; although anxiety was the most common reason cited among those who increased their use (51.3% overall, and 52.3% among women), we cannot attribute the observed increases solely to mental health or stress reasons. More research is needed to further contextualize underlying drivers of sex differences in substance use and mental health changes during the pandemic.

In this current study, respondents who lost their jobs during the pandemic had higher odds of increasing their medical cannabis use. It is plausible that they used cannabis more often out of boredom and reduced work-related responsibilities. However, taking into account evidence linking income loss and material insecurity to increasing alcohol use during the pandemic,^{7,11,14,40} increased medical cannabis use in this group may also indicate a coping-related response to emergent stress, anxiety, depression and other health problems exacerbated by income instability.

Survey respondents who reported using cannabis to alleviate symptoms of anxiety and depression were more susceptible to increasing their medical cannabis use during the pandemic, aligning with a

TABLE 4
Changes in secondary substance use during the COVID-19 pandemic, stratified by medical cannabis use change (increase/no increase) reported by a sample of Canadian residents authorized to use medical cannabis (n = 2697)

Secondary substance ^a	Increased medical cannabis use ^b n (%)		p value
	Yes	No	
Prescription opioids (n = 364)	79 (21.7)	285 (78.3)	0.199
Stable	53 (67.1)	203 (71.2)	
Decrease	14 (17.7)	58 (20.4)	
Increase	12 (15.2)	24 (8.4)	
Unregulated opioids (n = 49)	13 (26.5)	36 (73.5)	0.086 ^c
Stable	8 (61.5)	29 (80.6)	
Decrease	2 (15.4)	0 (0.0)	
Increase	3 (23.1)	7 (19.4)	
Non-opioid prescription drugs (n = 1017)	223 (21.9)	794 (78.1)	0.119
Stable	174 (78.0)	666 (83.8)	
Decrease	29 (13.0)	71 (8.9)	
Increase	20 (9.0)	57 (7.2)	
Crack or cocaine (n = 46)	15 (32.6)	31 (67.4)	1.000 ^c
Stable	9 (60.0)	20 (64.5)	
Decrease	3 (20.0)	5 (16.1)	
Increase	3 (20.0)	6 (19.4)	
Methamphetamine (n = 42)	10 (23.8)	32 (76.2)	0.391
Stable	8 (80.0)	24 (75.0)	
Decrease	1 (10.0)	1 (3.1)	
Increase	1 (10.0)	7 (21.9)	
Alcohol (n = 1538)	339 (22.0)	1199 (78.0)	<0.001
Stable	182 (53.7)	853 (71.1)	<0.001
Decrease	77 (22.7)	208 (17.3)	0.149
Increase	80 (23.6)	138 (11.5)	<0.001
Tobacco (n = 471)	116 (24.6)	355 (75.4)	<0.001
Stable	55 (47.4)	246 (69.3)	<0.001
Decrease	29 (25.0)	65 (18.3)	0.705
Increase	32 (27.6)	44 (12.4)	<0.001

^a We derived non-cannabis substance use changes from a question assessing self-perceived change/direction of change during the COVID-19 pandemic.

^b Increased medical cannabis use frequency from self-reported data corresponding with three time periods (one preceding the COVID-19 pandemic, two during the pandemic).

^c Fisher test for group comparisons, with Bonferroni correction for post hoc pairwise tests (alcohol and tobacco).

previously documented association in an online sample of 1200 self-identified medical cannabis users in the United States.⁴¹ Considering the well-documented effects of the pandemic on mental health more broadly, this finding is not surprising. While survey research involving people who use medical cannabis shows a high level of consensus that cannabis is an effective treatment for anxiety and depression,⁴² more experimental research is needed to confirm the therapeutic

potential of cannabis in these areas.⁴³ As our study did not track symptom relief due to cannabis use in response to increased mental health challenges, future research should seek to understand potential long-term therapeutic and/or adverse health outcomes.

For health care providers, the results of this study should serve as a reminder to check in with patient-clients who are using cannabis about potential shifts in

their use in response to changes and stresses induced by the pandemic. Of note, given that respondents could report symptom management with medical cannabis for conditions secondary to their primary reason for authorization, clinicians should be aware that usage may have also increased among those who were not initially authorized to use cannabis for anxiety or depression.

We also observed a significant association with increasing medical cannabis use among respondents who were taking concurrent prescription drugs, possibly signifying complex morbidity, heavier disease burden or worsening of disease over time. This indicated susceptibility to increasing intensity of medical cannabis use. Further research will be required to understand whether those taking medical cannabis concurrently with prescription medications were differentially impacted by the COVID-19 pandemic (e.g. through increased symptom flare-ups, managed with cannabis).

Finally, younger age and nonmedical use of cannabis was significantly associated with increasing medical cannabis use during the pandemic, reflecting the high degree of overlap between medical and nonmedical use, particularly among younger people and those using medical cannabis for mental health needs.²⁴ Although shifting frequency of use of cannabis for medical purposes was the focus of the current analysis, given that one-third of our sample reported at least some use of cannabis for nonmedical purposes (see Table 1), additional research is needed to understand the overlap with medical cannabis changes during the pandemic.

Strengths and limitations

The inclusion of almost 3000 people authorized to access regulated cannabis for medical purposes is a major strength of this study, but our findings should be interpreted in light of certain limitations. First, respondents were a self-selected group of authorized medical cannabis users who were registered with two medical cannabis companies. Although the respondents lived in Canada, generalizability is limited as the sample does not represent all registered medical cannabis users across the provinces and territories.

TABLE 5
Characteristics associated with increasing medical cannabis use during the COVID-19 pandemic in a sample of Canadian residents eligible to increase their medical cannabis use (n = 2622)^a

Characteristic	Bivariable		Multivariable	
	OR (95% CI)	<i>p</i> value	aOR (95% CI)	<i>p</i> value
Sociodemographic characteristics				
Gender^b				
Male	1.00 (Reference)		1.00 (Reference)	
Female	1.54 (1.27–1.85)	<0.001	1.67 (1.36–2.05)	<0.001
Age				
Per 5-year increase	0.85 (0.82–0.88)	<0.001	0.89 (0.85–0.94)	<0.001
Household income, CAD				
<40 000	1.20 (0.91–1.60)	0.189	NA	
40 000–99 999	1.06 (0.84–1.36)	0.604	NA	
100 000–159 999	1.00 (Reference)		NA	
≥160 000	0.94 (0.63–1.42)	0.785	NA	
Employment				
Part-/full-time	1.00 (Reference)		1.00 (Reference)	
Unemployed	1.15 (0.91–1.45)	0.235	1.13 (0.87–1.45)	0.361
Retired	0.54 (0.43–0.68)	<0.001	1.10 (0.80–1.51)	0.553
Lost job during the pandemic				
No	1.00 (Reference)		1.00 (Reference)	
Yes	1.64 (1.28–2.11)	<0.001	1.38 (1.06–1.80)	0.017
Community setting				
Urban / suburban	1.00 (Reference)		1.00 (Reference)	
Rural	0.80 (0.63–1.01)	0.052	0.81 (0.63–1.03)	0.086
Substance use				
Nonmedical cannabis use^c				
No	1.00 (Reference)		1.00 (Reference)	
Yes	1.76 (1.45–2.14)	<0.001	1.35 (1.09–1.68)	0.007
Alcohol use				
No	1.00 (Reference)		1.00 (Reference)	
Yes	1.26 (1.04–1.53)	0.016	1.22 (0.99–1.49)	0.061
Tobacco use				
No	1.00 (Reference)		1.00 (Reference)	
Yes	1.43 (1.13–1.81)	0.004	1.24 (0.96–1.59)	0.105
Unregulated drug use				
No	1.00 (Reference)		NA	
Yes	1.19 (0.66–2.15)	0.561	NA	
Prescription drug use				
No	1.00 (Reference)		1.00 (Reference)	
Yes	1.21 (1.10–1.47)	0.048	1.24 (1.00–1.54)	0.047
Primary symptoms treated with medical cannabis (yes vs. no)				
Pain, inflammation, nerve damage	0.75 (0.61–0.92)	0.007	0.88 (0.70–1.10)	0.254
Sleep problems	1.41 (1.17–1.72)	<0.001	0.94 (0.75–1.17)	0.553
Anxiety, stress, hypersensitivity	2.20 (1.82–2.66)	<0.001	1.43 (1.12–1.81)	0.004
Depression, low mood	2.18 (1.77–2.69)	<0.001	1.36 (1.05–1.76)	0.020
Addiction, dependence, withdrawal	1.74 (0.82–3.70)	0.043	0.83 (0.36–1.92)	0.662

Continued on the following page

TABLE 5 (continued)
Characteristics associated with increasing medical cannabis use during the COVID-19 pandemic in a sample of Canadian residents eligible to increase their medical cannabis use (n = 2622)^a

Characteristic	Bivariable		Multivariable	
	OR (95% CI)	p value	aOR (95% CI)	p value
Attention deficit, memory loss	1.85 (1.29–2.64)	0.001	1.09 (0.73–1.64)	0.678
Nausea, appetite loss, gastrointestinal issues	1.88 (1.49–2.38)	<0.001	1.18 (0.89–1.54)	0.246
Seizures, muscle spasms, tremors	1.21 (0.87–1.68)	0.265	N/A	–
Other symptoms	1.20 (0.48–3.03)	0.700	NA	–

Abbreviations: aOR, adjusted odds ratio; CI, confidence interval; OR, odds ratio.

^a 75 respondents were removed from the original sample as they were at the highest frequency of medical cannabis use in the pre-COVID period.

^b 20 respondents did not identify as male or female and were excluded from the bivariable model for gender and the multivariable model.

^c 9 respondents had missing data for nonmedical cannabis use and were excluded from the bivariable model for nonmedical cannabis use and the multivariable model.

Second, the pandemic was a shared experience across the whole sample; while respondents could indicate whether they perceived that the pandemic affected their medical cannabis use, we cannot rule out the possibility of observing similar changes in use outside of the pandemic. However, it is worth noting that previous longitudinal studies of medical cannabis use show relatively stable frequency and dosage patterns over 6- to 12-month periods.⁴⁴⁻⁴⁶

Third, the study relied on respondents self-reporting frequency patterns, introducing the possibility of recall deficiencies—particularly for the pre-pandemic and Wave 1 periods. Frequency of medical cannabis use in each period was captured on a categorical scale. As these categories are not linearly equidistant, we created a binary outcome that corresponds with any frequency increase, and this approach does not reflect the magnitude of increase. In addition, incremental increases within each ASSIST category (e.g. from 2 to 4 times per week) could not be measured.

Our use of a predetermined set of reasons for changing frequency of medical cannabis use during the COVID-19 pandemic may have missed some important factors, including possible shifts to nonmedical sources for ease of accessibility; however, we tried to mitigate these oversights by including a free-form text box for participants to add more information if they thought their reasons were not accurately represented by the pre-determined categories. Not all respondents for whom we detected a change in medical cannabis use frequency during the pandemic self-perceived a change in their use. Accordingly,

28% (n = 155) of those who increased and 40% (n = 49) of those who decreased medical cannabis use did not provide a reason for the change (see Table 3). The reasons provided, expressed as the proportion of respondents who increased or decreased their medical cannabis use frequency, may be underestimated and are only meant to generate hypotheses, not confirm underlying connections. Nonmedical use of cannabis was not captured in the question assessing secondary substance shifts since the onset of the pandemic. Nonmedical use of cannabis deserves detailed consideration in future research of pandemic-concurrent trends in this population.

Finally, the current findings represent self-reported changes that occurred early in the pandemic. Further research is needed to characterize ongoing shifts in medical cannabis use later in the pandemic and associated long-term impacts.

Conclusions

We documented modest but significant and persistent increases in the frequency of medical cannabis use early in the COVID-19 pandemic in this sample of authorized medical cannabis users in Canada. We observed increased use of alcohol and tobacco more often among those who increased their medical cannabis use frequency. Women, younger people, those who lost employment during the pandemic, those who used nonmedical cannabis and prescription drugs and those who used medical cannabis to manage depression and anxiety had greater odds of increasing their medical cannabis use during the pandemic.

Our findings highlight a subset of the people authorized to use medical cannabis who may be particularly vulnerable to increased substance use and adverse mental health outcomes during the pandemic, underscoring the need for clinicians to check in with patients who use medical cannabis.

Acknowledgements

The authors would like to thank the respondents who shared their time and experiences with us via the Canadian Cannabis Patient Survey; Tilray for providing the primary funding for the study; and Broadstreet Health Economics & Outcomes Research for the initial data cleaning, coding and analysis.

Portions of this study were funded by National Institute on Drug Abuse grant DA047296 and the Semel Charitable Foundation.

Conflicts of interest

The Canadian Cannabis Patient Survey was sponsored by Tilray, a licensed producer of medical cannabis. At the time of data collection, KO was Clinical Research Manager and PL was Vice-President, Global Patient Research and Access at Tilray. Over the past 12 months, ZDC reports receiving honorariums from Canopy Growth Corporation.

Authors' contributions and statement

SL – Conceptualization, Investigation, Methodology, Formal analysis, Data curation, Writing – Original draft

ZDC – Methodology, Writing – Review and Editing

KO – Software, Resources, Project Administration, Writing – Review and Editing

PL – Conceptualization, Investigation, Methodology, Administration, Writing – Review and Editing

The content and views expressed in this article are those of the authors and do not necessarily reflect those of the Government of Canada.

References

1. Savage RD, Wu W, Li J, et al. Loneliness among older adults in the community during COVID-19: a cross-sectional survey in Canada. *BMJ Open*. 2021;11(4):e044517. <https://doi.org/10.1136/bmjopen-2020-044517>
2. Kirzinger A, Kearney A, Hamel L, et al. KFF Health Tracking Poll - Early April 2020: the impact of coronavirus on life in America [Internet]. San Francisco (CA): KFF; 2020 [cited 2022 July 21]. Available from: <https://www.kff.org/health-reform/report/kff-health-tracking-poll-early-april-2020>
3. Canadian Centre on Substance Use and Addiction. Mental health and substance use during COVID-19. 2020. Available from: <https://www.ccsa.ca/mental-health-and-substance-use-during-covid-19>
4. Hologue C, Kalb LG, Riehm KE, et al. Mental distress in the United States at the beginning of the COVID-19 pandemic. *Am J Public Health*. 2020;110(11):1628-34. <https://doi.org/10.2105/ajph.2020.305857>
5. Kim HH, Laurence J. COVID-19 restrictions and mental distress among American adults: evidence from Corona Impact Survey (W1 and W2). *J Public Health (Oxf)*. 2020;42(4):704-11. <https://doi.org/10.1093/pubmed/fdaa148>
6. Turna J, Zhang J, Lamberti N, et al. Anxiety, depression and stress during the COVID-19 pandemic: results from a cross-sectional survey. *J Psychiatr Res*. 2021;137:96-103. <https://doi.org/10.1016/j.jpsychires.2021.02.059>
7. Oh H, Marinovich C, Rajkumar R, et al. COVID-19 dimensions are related to depression and anxiety among US college students: findings from the Healthy Minds Survey 2020. *J Affect Disord*. 2021;292:270-5. <https://doi.org/10.1016/j.jad.2021.05.121>
8. Prata Ribeiro H, Ponte A, Raimundo M, Reis Marques T. Mental health risk factors during the first wave of the COVID-19 pandemic. *BJPsych Open*. 2021;7(6):e195. <https://doi.org/10.1192/bjo.2021.1031>
9. Rossi R, Socci V, Talevi D, et al. COVID-19 pandemic and lockdown measures impact on mental health among the general population in Italy. *Front Psychiatry*. 2020;11:790. <https://doi.org/10.3389/fpsy.2020.00790>
10. Pierce M, Hope H, Ford T, et al. Mental health before and during the COVID-19 pandemic: a longitudinal probability sample survey of the UK population. *Lancet Psychiatry*. 2020;7(10):883-92. [https://doi.org/10.1016/S2215-0366\(20\)30308-4](https://doi.org/10.1016/S2215-0366(20)30308-4)
11. Pieh C, Budimir S, Probst T. The effect of age, gender, income, work, and physical activity on mental health during coronavirus disease (COVID-19) lockdown in Austria. *J Psychosom Res*. 2020;136:110186. <https://doi.org/10.1016/j.jpsychores.2020.110186>
12. Raina P, Wolfson C, Griffith L, et al. A longitudinal analysis of the impact of the COVID-19 pandemic on the mental health of middle-aged and older adults from the Canadian Longitudinal Study on Aging. *Nat Aging*. 2021;1:1137-47. <https://doi.org/10.1038/s43587-021-00128-1>
13. Czeisler MÉ, Lane RI, Petrosky E, et al. Mental health, substance use, and suicidal ideation during the COVID-19 pandemic - United States, June 24-30, 2020. *MMWR Morb Mortal Wkly Rep*. 2020;69(32):1049-57. <https://doi.org/10.15585/mmwr.mm6932a1>
14. Nesoff ED, Gutkind S, Sirota S, McKowen AL, Veldhuis CB. Mental health and economic stressors associated with high-risk drinking and increased alcohol consumption early in the COVID-19 pandemic in the United States. *Prev Med*. 2021;153:106854. <https://doi.org/10.1016/j.ypmed.2021.106854>
15. Jackson KM, Merrill JE, Stevens AK, Hayes KL, White HR. Changes in alcohol use and drinking context due to the COVID-19 pandemic: a multi-method study of college student drinkers. *Alcohol Clin Exp Res*. 2021;45(4):752-64. <https://doi.org/10.1111/acer.14574>
16. Lechner WV, Laurene KR, Patel S, Anderson M, Grega C, Kenne DR. Changes in alcohol use as a function of psychological distress and social support following COVID-19 related university closings. *Addict Behav*. 2020;110:106527. <https://doi.org/10.1016/j.addbeh.2020.106527>
17. Sallie SN, Ritou V, Bowden-Jones H, Voon V. Assessing international alcohol consumption patterns during isolation from the COVID-19 pandemic using an online survey: highlighting negative emotionality mechanisms. *BMJ Open*. 2020;10(11):e044276. <https://doi.org/10.1136/bmjopen-2020-044276>
18. Tran TD, Hammarberg K, Kirkman M, Nguyen HT, Fisher J. Alcohol use and mental health status during the first months of COVID-19 pandemic in Australia. *J Affect Disord*. 2020;277:810-3. <https://doi.org/10.1016/j.jad.2020.09.012>
19. Varin M, Hill MacEachern K, Hussain N, Baker MM. Measuring self-reported change in alcohol and cannabis consumption during the second wave of the COVID-19 pandemic in Canada. *Health Promot Chronic Dis Prev Can*. 2021;41(11):325-30. <https://doi.org/10.24095/hpcdp.41.11.02>
20. Imtiaz S, Wells S, Rehm J, et al. Cannabis use during the COVID-19 pandemic in Canada: a repeated cross-sectional study. *J Addict Med*. 2020;15(6):484-90. <https://doi.org/10.1097/adm.0000000000000798>
21. Dozois DJ. Anxiety and depression in Canada during the COVID-19 pandemic: a national survey. *Can Psychol*. 2021;62(1):136-42. <https://doi.org/10.1037/cap0000251>

22. Bartel SJ, Sherry SB, Stewart SH. Pandemic-related changes in alcohol and cannabis use: comparing retrospective reports and prospective data. *Int J Ment Health Addict*. 2021;1-7. <https://doi.org/10.1007/s11469-021-00708-7>
23. Statistics Canada. National Cannabis Survey, second quarter 2019 [Internet]. Ottawa (ON): Statistics Canada; 2019 Aug 15; modified 2019 Aug 15; cited 2022 July 21]. Available from: <https://www150.statcan.gc.ca/n1/daily-quotidien/190815/dq190815a-eng.htm>
24. Turna J, Balodis I, Munn C, Van Ameringen M, Busse J, MacKillop J. Overlapping patterns of recreational and medical cannabis use in a large community sample of cannabis users. *Compr Psychiatry*. 2020;102:152188. <https://doi.org/10.1016/j.comppsy.2020.152188>
25. Cahill SP, Lunn SE, Diaz P, Page JE. Evaluation of patient reported safety and efficacy of cannabis from a survey of medical cannabis patients in Canada. *Front Public Health*. 2021;9:626853. <https://doi.org/10.3389/fpubh.2021.626853>
26. Walsh Z, Callaway R, Belle-Isle L, et al. Cannabis for therapeutic purposes: patient characteristics, access, and reasons for use. *Int J Drug Policy*. 2013;24(6):511-6. <https://doi.org/10.1016/j.drugpo.2013.08.010>
27. Government of Canada. Canadian Cannabis Survey 2021: summary. Cannabis for medical purposes [Internet]. Ottawa (ON): Government of Canada; 2021 [modified 2021 Dec 23; cited 2022 July 21]. Available from: <https://www.canada.ca/en/health-canada/services/drugs-medication/cannabis/research-data/canadian-cannabis-survey-2021-summary.html#a2.5>
28. Xiong J, Lipsitz O, Nasri F, et al. Impact of COVID-19 pandemic on mental health in the general population: a systematic review. *J Affect Disord*. 2020;277:55-64. <https://doi.org/10.1016/j.jad.2020.08.001>
29. Santomauro DF, Mantilla Herrera AM, Shadid J, et al.; COVID-19 Mental Disorders Collaborators. Global prevalence and burden of depressive and anxiety disorders in 204 countries and territories in 2020 due to the COVID-19 pandemic. *Lancet*. 2021;398(10312):1700-12. [https://doi.org/10.1016/S0140-6736\(21\)02143-7](https://doi.org/10.1016/S0140-6736(21)02143-7)
30. Government of Canada. Canadian Cannabis Survey 2020: Summary [Internet]. 2021 [modified 2021 Aug 12; cited 2021 Mar 01]. Available from: <https://www.canada.ca/en/health-canada/services/drugs-medication/cannabis/research-data/canadian-cannabis-survey-2020-summary.html#a6-01>
31. WHO ASSIST Working Group. The Alcohol, Smoking and Substance Involvement Screening Test (ASSIST): Development, reliability and feasibility. *Addiction*. 2002;97(9):1183-94. <https://doi.org/10.1046/j.1360-0443.2002.00185.x>
32. Lake S, Assaf RD, Gorbach PM, Cooper ZD. Selective changes in medical cannabis use early in the COVID-19 pandemic: findings from a web-based sample of adults in the United States. *Cannabis Cannabinoid Res*. 2022:Epub ahead of print. <https://doi.org/10.1089/can.2021.0115>
33. Wardell JD, Kempe T, Rapinda KK, et al. Drinking to cope during COVID-19 pandemic: The role of external and internal factors in coping motive pathways to alcohol use, solitary drinking, and alcohol problems. *Alcohol Clin Exp Res*. 2020;44(10):2073-83. <https://doi.org/10.1111/acer.14425>
34. Koopmann A, Georgiadou E, Kiefer F, Hillemacher T. Did the general population in Germany drink more alcohol during the COVID-19 pandemic lockdown? *Alcohol Alcohol*. 2020;55(6):698-9. <https://doi.org/10.1093/alcac/agaa058>
35. Moghanibashi-Mansourieh A. Assessing the anxiety level of Iranian general population during COVID-19 outbreak. *Asian J Psychiatr*. 2020;51:102076. <https://doi.org/10.1016/j.ajp.2020.102076>
36. Connor J, Madhavan S, Mokashi M, et al. Health risks and outcomes that disproportionately affect women during the Covid-19 pandemic: a review. *Soc Sci Med*. 2020;266:113364. <https://doi.org/10.1016/j.socscimed.2020.113364>
37. Almeida M, Shrestha AD, Stojanac D, Miller LJ. The impact of the COVID-19 pandemic on women's mental health. *Arch Women Ment Health*. 2020;23(6):741-8. <https://doi.org/10.1007/s00737-020-01092-2>
38. Zamarro G, Prados MJ. Gender differences in couples' division of childcare, work and mental health during COVID-19. *Rev Econ Househ*. 2021;19(1):11-40. <https://doi.org/10.1007/s11150-020-09534-7>
39. Xue B, McMunn A. Gender differences in unpaid care work and psychological distress in the UK Covid-19 lockdown. *PLoS One*. 2021;16(3):e0247959. <https://doi.org/10.1371/journal.pone.0247959>
40. Jones HE, Manze M, Ngo V, Lamberson P, Freudenberg N. The impact of the COVID-19 pandemic on college students' health and financial stability in New York City: findings from a population-based sample of City University of New York (CUNY) students. *J Urban Health*. 2021;98(2):187-96. <https://doi.org/10.1007/s11524-020-00506-x>
41. Vidot DC, Islam JY, Marlene C-R, et al. The COVID-19 cannabis health study: results from an epidemiologic assessment of adults who use cannabis for medicinal reasons in the United States. *J Addict Dis*. 2020;39(1):26-36. <https://doi.org/10.1080/10550887.2020.1811455>
42. Walsh Z, Gonzalez R, Crosby K, Thiessen MS, Carroll C, Bonn-Miller MO. Medical cannabis and mental health: a guided systematic review. *Clin Psychol Rev*. 2017;51:15-29. <https://doi.org/10.1016/j.cpr.2016.10.002>
43. National Academies of Sciences, Engineering, and Medicine. The health effects of cannabis and cannabinoids: the current state of evidence and recommendations for research. Washington (DC): National Academies Press; 2017 [cited 2022 June 01]. Available from: <http://nationalacademies.org/hmd/reports/2017/health-effects-of-cannabis-and-cannabinoids.aspx>

-
44. Meng H, Page MG, Ajrawat P, et al. Patient-reported outcomes in those consuming medical cannabis: a prospective longitudinal observational study in chronic pain patients. *Can J Anaesth.* 2021;68(5):633-44. <https://doi.org/10.1007/s12630-020-01903-1>
 45. Sagar KA, Dahlgren MK, Lambros AM, Smith RT, El-Abboud C, Gruber SA. An observational, longitudinal study of cognition in medical cannabis patients over the course of 12 months of treatment: preliminary results. *J Int Neuropsychol Soc.* 2021; 27(6):648-60. <https://doi.org/10.1017/S1355617721000114>
 46. Lucas P, Boyd S, Milloy MJ, Walsh Z. Cannabis significantly reduces the use of prescription opioids and improves quality of life in authorized patients: results of a large prospective study. *Pain Med.* 2021;22(3):727-39. <https://doi.org/10.1093/pm/pnaa396>