



**SUBSTANCE USE & MISUSE**  
An International Interdisciplinary Forum

## Substance Use & Misuse

ISSN: 1082-6084 (Print) 1532-2491 (Online) Journal homepage: <https://www.tandfonline.com/loi/ism20>

# Mental Health and Medical Cannabis Use among Youth and Young Adults in Canada

Elle Wadsworth, Cesar Leos-Toro & David Hammond

To cite this article: Elle Wadsworth, Cesar Leos-Toro & David Hammond (2019): Mental Health and Medical Cannabis Use among Youth and Young Adults in Canada, Substance Use & Misuse, DOI: [10.1080/10826084.2019.1691594](https://doi.org/10.1080/10826084.2019.1691594)

To link to this article: <https://doi.org/10.1080/10826084.2019.1691594>



Published online: 20 Nov 2019.



Submit your article to this journal [↗](#)






View related articles [↗](#)



View Crossmark data [↗](#)

# Mental Health and Medical Cannabis Use among Youth and Young Adults in Canada

Elle Wadsworth , Cesar Leos-Toro , and David Hammond 

School of Public Health and Health Systems, University of Waterloo, Waterloo, Ontario, Canada

## ABSTRACT

**Background:** In October 2018, Canada became the second country to legalize non-medical cannabis. However, medical cannabis has been legally available in Canada since 2001 and, in 2015, approximately 800,000 Canadians reported using cannabis for medical purposes. Mental health is a common reason reported for using medical cannabis. **Objectives:** The current study examined perceived mental health among four groups: (1) Non/ex-users; (2) Recent non-medical users; (3) Recent unauthorized medical users; and (4) Recent authorized medical users. **Methods:** A total of 867 Canadian cannabis users and nonusers aged 16 to 30 were recruited through an online consumer panel in 2017, one year before non-medical cannabis legalization. Logistic and multinomial regression models were fitted to examine differences among cannabis use status and mental health measures. All estimates represent weighted data. **Results:** Self-reported emotional and mental health problems were higher among unauthorized (83.9%) and authorized medical cannabis users (83.2%) compared to non-medical users and non/ex-users (44.5% and 39.5%, respectively). Medical users were more likely to report using cannabis to manage or improve mental health problems than non-medical users ( $p < .001$ ). There were few differences between unauthorized and authorized medical users, and between non/ex-users and non-medical users. **Conclusions:** The findings highlight a discrepancy between the recommendation that individuals with some mental health problems should avoid cannabis and the widespread practice of using cannabis to manage mental health. Education and reduced stigma around using cannabis after legalization in Canada may help address users coming forwards regarding use of cannabis for mental health problems.

## KEYWORDS

Cannabis; marijuana; mental health; medical marijuana; young adult

## Introduction

Cannabis is the most widely used “illicit” substance in the world. The desired effects of cannabis include euphoria and relaxation, and for therapeutic reasons. However, cannabis can also produce undesirable effects. A common concern with cannabis is the adverse effects on mental health. Researchers have found associations between cannabis and mental health, notably psychosis, and to a lesser extent anxiety and depression (Degenhardt et al., 2013; Lev-Ran et al., 2014; National Academies of Sciences, Engineering and Medicine [NASEM], 2017). A meta-analysis on longitudinal studies of cannabis and depression found that heavy cannabis use may be associated with an increased risk of depression (Lev-Ran et al., 2014). Heavy cannabis use is also associated with an increased risk of psychosis (Moore et al., 2007; Semple, McIntosh & Lawrie, 2005; Volkow et al., 2016). In addition to a heightened risk of long-term health effects, users may experience acute adverse effects, such as psychotic experiences or anxiety (Hall & Weier, 2015), which could be the opposite of what users aim to achieve when using cannabis (Schofield et al., 2006; Walsh et al., 2013).

Despite evidence on the link between cannabis use and psychosis, mental health problems are a common reason for

using medical cannabis (Walsh et al., 2013, 2017). To date, there is relatively little research evidence on the impact of cannabis on anxiety, depression and post-traumatic stress disorder (PTSD) and are less robust than for physical conditions, notably pain and multiple sclerosis symptoms (Hill, 2015; NASEM, 2017; Whiting et al., 2015). Although evidence of its therapeutic benefit for mental health has yet to be established, many consumers report that cannabis has a positive impact on their mental health. In the Canadian Cannabis Survey, conducted on behalf of Health Canada, over half of participants reported positive effects of cannabis on their mental health, primarily with respect to anxiety and mood (Health Canada, 2017c). Self-medicating with cannabis—using cannabis to ease physical or psychological symptoms without direction or authorization from a licensed physician—is particularly common among young people (Bottorff, Johnson, Moffat & Mulvogue, 2009), and those with mental health problems (Walsh et al., 2017).

An increasing number of jurisdictions have legal access to medical cannabis or cannabis-based medicines, such as Canada, US states, and the majority of the European Union (European Monitoring Centre for Drugs and Drug Addiction (EMCDDA), 2018; Government of Canada, 2018a; NORML, 2019). In addition, an increasing number of

jurisdictions are liberalizing regulations surrounding non-medical cannabis. In October 2018, Canada became only the second country after Uruguay to legalize non-medical cannabis. Under the *Cannabis Act*, Canadians over 18 years can possess up to 30 grams of dried cannabis, or the equivalent in non-dried form, and access from private or government-run retail stores or online stores, or grow their own (dependent on varying provincial and territorial laws) (Government of Canada, 2018b).

Canadians have had legal medical access to cannabis since 2001 (Health Canada, 2017b). In 2016, the Canadian government introduced the Access to Cannabis for Medical Purposes Regulations (ACMPR), which provided greater access to medical cannabis compared to the previous regulatory framework (Health Canada, 2016a). Under the ACMPR, those with authorization from a licensed physician could access cannabis from either a licensed producer, grow a personal amount, or designate someone else to grow their personal amount. There were relatively few licensed cannabis producers in Canada, although the number increased considerably following the announcement that Canada would legalize non-medical cannabis in 2018, and that there would be no distinction between the medical and non-medical markets (Health Canada, 2018a). However, Canadians can still pursue medical authorization after non-medical legalization. Before non-medical legalization, Canadians could access cannabis through a well-established illegal retail distribution system, including many retail outlets marketed as ‘medical dispensaries’ (Health Canada, 2017c). In 2015, 831,000 Canadians reported to use cannabis for medical purposes, yet only 39,668 had an active registration from Health Canada (Health Canada, 2017a, 2018b). There are several reasons why only a small proportion of Canadians who use cannabis for therapeutic reasons accessed the product through the legal ‘medical cannabis’ system, including stigma, easier access through the illicit market, as well as therapeutic reasons that don’t qualify for medical ‘authorization’ (Leos-Toro, Shiplo & Hammond, 2018).

The current study examined mental health measures across four groups, at a time when medical cannabis was legally available and Canada was at the early stages of planning for non-medical legalization (Watson, Hyshka, Bonato, & Rueda, 2019): (1) Non/ex-users—participants who have never tried cannabis and those who have not used in the past 12 months; (2) Recent non-medical users—participants who have used cannabis in the past-12 months but not for medical purposes; (3) Unauthorized medical users—participants who have used cannabis for medical purposes in the past-12 months without a physician’s authorization; and (4) Authorized medical users—participants who have used cannabis in the past-12 months for medical purposes with authorization from a physician. This study provides an exploratory look at the relationship of youth and young adults, self-reported mental health status, and cannabis use, at a time when cannabis policy in Canada was changing.

## Methods

### Study design

An online cross-sectional survey was conducted from October 10th to October 24th, 2017. The inclusion criteria were individuals aged 16 to 30 years of age with a Canadian IP address. Recruitment occurred by email through Léger’s consumer panel for web surveys consisting of approximately 400,000 active members, with half of respondents sampled using probability-based methods using the Canadian Census, along with other non-probability based methods, including commercial surveys (Hammond & Reid, 2018; Wiggers, Reid, White, & Hammond, 2017). Respondents were recruited across Canada directly, except for youth aged 16–17 in Quebec. Quebec youth were recruited through their parents (parental consent was obtained prior to youth accessing the survey) due to different provincial requirements for research studies. All the data provided by respondents were anonymous and confidential. Respondents were asked to provide consent before participating. Respondents received remuneration from Léger in accordance with their usual incentive structure, which includes both points-based and monetary rewards. The use of a self-administered online surveys for the current study provides several advantages, including greater anonymity to sensitive topics (e.g. cannabis use) compared to interviewer-assisted surveys, which can reduce social desirability biases when self-reporting substance use (Krumpal, 2013).

### Measures

#### Sample characteristics

Socio-demographic measures included sex at birth and age. Ethnicity was assessed using the Canadian census question, which was then recoded into “white” vs. “other”. Cannabis use status was assessed through questions answered within the survey. Non/ex-users were participants who answered “No” to “Have you ever tried cannabis?” and those who had not used cannabis in the past 12-months. Recent non-medical users were participants who used cannabis in the past-12months but not used cannabis for medical purposes in the past-12months or ever. Recent medical users without authorization were participants who had used cannabis for medical purposes in the past-12months but answered “No” and “Don’t know” to “Was your use of marijuana for medical purposes in the past-12 months authorized by a licensed physician”. Recent medical users with authorization were participants who answered “Yes” to “Was your use of marijuana for medical purposes in the past 12-months authorized by a licensed physician”. In all cases, participants had the option of selecting ‘Don’t Know’ or ‘Refused’, included the measures described below. ‘Refused’ responses were treated as missing.

#### Mental health and cannabis

All participants were asked: “Do you have a family history of significant emotional or mental health problems related

to any of the following?” (“Anxiety”/“Depression”/“PTSD”/“Psychosis”/“Drug or alcohol use”/“Other”/“Nobody in my family has experienced significant emotional or mental health problems”). “Don’t Know” was treated as “No”. Participants could select all that applied.

All participants were asked: “Have you ever experienced significant emotional or mental health problems related to any of the following?” (“Anxiety”/“Depression”/“PTSD”/“Psychosis”/“Drug or alcohol use”/“Other”/“I have not experienced significant emotional or mental health problems”). “Don’t Know” was treated as “No”. Participants could select all that applied.

Participants who had selected at least one mental health problem were asked: “Have you ever, seen or talked to a health professional about your emotional or mental health for any of the following?” (“Anxiety”/“Depression”/“PTSD”/“Psychosis”/“Substance use disorder”/“Other”/“I have not experienced significant emotional or mental health problems”). “Don’t Know” was treated as “No”. Participants could select all that applied.

Participants who had used cannabis were asked: “For what general condition(s) did you use marijuana for?” (“Physical”/“Mental”). Participants who had authorized use of cannabis were asked: “For what general condition(s) did your physician authorize the use of marijuana?” (“Physical”/“Mental”). This question was combined with the previous question.

Participants who had used cannabis and had selected at least one mental health problem were asked: “Have you ever used marijuana to manage or improve emotional or mental health problems?” (“Yes”/“No”). “Don’t Know” was treated as “No”.

Participants who had used cannabis were asked: “Overall, how has marijuana use affected your mental health?” (“Improved my mental health”/“Worsened my mental health”/“No effect on my mental health”). “Don’t Know” was treated as “No effect on my mental health”.

### Statistical analysis

A total of 1045 respondents completed the survey. Due to missing data on core measures of cannabis use, as well as the data integrity questions, 175 respondents were deleted. In addition, three participants did not provide data on sample characteristics, thus, a total of 867 were retained for analysis. Respondents were excluded from analyses on a case-wise basis for measures with missing data. All analyses were conducted using SAS 9.4.

Sample data were weighted for analysis. Post-stratification sample weights (range: 0.5–5.0) were constructed based on 2017 population estimates from Statistics Canada’s post-census CANSIM tables (Statistics Canada, 2019). For each age by sex by region group, weights were calculated as the population proportion divided by the sample proportion, ensuring the weighted sample aligned with known population proportions. Post-stratification weights calibrate the sample to be more representative of the population, allowing estimates to be corrected for bias in the sample (Groves

et al., 2009). Estimates reported are weighted unless otherwise specified. First, sample characteristics were examined, and chi-squared tests were used to assess differences among cannabis use status. Second, binary logistic regressions were fitted to examine any differences between cannabis use status and mental health measures. Finally, a multinomial logistic regression was fitted to examine differences between cannabis use status and the perceived effect of cannabis on mental health. In all cases, adjusted odds ratios (AORs) are reported with 95% confidence intervals (95% CIs) from models adjusted for age, sex, and ethnicity.

### Ethics

The study was reviewed by and received ethics clearance from the Office of Research Ethics at the University of Waterloo (ORE# 22392).

### Results

#### Sample characteristics

Table 1 presents participants sample characteristics. Significant differences were observed across cannabis users and non/ex-users in sex, ( $\chi^2 = 12.0$ ,  $p = .007$ ), age ( $\chi^2 = 20.4$ ,  $p = .002$ ) and ethnicity ( $\chi^2 = 12.7$ ,  $p = .005$ ).

#### Mental health

Table 2 presents emotional and mental health experiences of all the participants. Overall, the majority of medical users, both unauthorized and authorized, reported a family history of significant emotional or mental health problems (81.8% and 75.4%, respectively), compared to approximately half of non-medical users (52.0%) and a minority of non/ex-users (44.9%). Unauthorized medical users were significantly more likely to report a family history of emotional or mental health problems than non/ex-users (AOR = 5.2, 95% CI: 3.1,8.7,  $p < .001$ ) and non-medical users (AOR = 4.0, 95% CI: 2.3,7.0,  $p < .001$ ). Authorized medical users were significantly more likely to report a family history of emotional or mental health problems than non/ex-users (AOR = 4.3, 95% CI: 1.8,10.3,  $p = .001$ ) and non-medical users (AOR = 3.3, 95% CI: 1.3,8.1,  $p < .001$ ). No significant differences were observed between non/ex-users and non-medical users, and between unauthorized and authorized medical users.

The majority of both unauthorized and authorized medical users reported experiencing significant emotional or mental health problems (83.9% and 83.8%, respectively), compared to a minority of both non-medical users and non/ex-users (44.5% and 39.9% respectively). Unauthorized medical users were significantly more likely to report experiencing significant emotional or mental health problems than non/ex-users (AOR = 7.6, 95% CI: 4.4,13.2,  $p < .001$ ) and non-medical users (AOR = 6.3, 95% CI: 3.5,11.1,  $p < .001$ ). Authorized medical users were significantly more likely to report experiencing significant emotional or mental health problems than non/ex-users (AOR = 9.2, 95% CI: 3.3,25.4,

Table 1. Sample characteristics for youth and young adults in Canada by cannabis use status ( $n = 867$ ).

	UNWEIGHTED % (n)				WEIGHTED % (n)				$\chi^2$ , $p$ -value
	Non/ex-user % $n = 534$	Non-medical user % $n = 202$	Medical user (unauthorized) % $n = 103$	Medical user (authorized) % $n = 28$	Non/ex-user % $n = 501$	Nonmedical user % $n = 227$	Medical user (unauthorized) % $n = 110$	Medical user (authorized) % $n = 29$	
Sex									
Female	53.4 (285)	49.0 (99)	58.3 (60)	28.6 (8)	51.0 (256)	44.4 (101)	57.0 (63)	25.3 (7)	11.99, $p = .007$
Male	46.6 (249)	51.0 (103)	41.8 (43)	71.4 (20)	49.0 (245)	55.6 (126)	43.0 (47)	74.7 (21)	
Age									
16-18	30.7 (164)	19.3 (39)	13.6 (14)	7.1 (2)	21.6 (108)	12.2 (28)	9.8 (11)	5.0 (1)	20.43, $p = .002$
19-24	27.3 (146)	36.1 (73)	35.9 (37)	32.1 (9)	36.6 (183)	46.5 (106)	42.5 (47)	43.1 (12)	
25-30	42.0 (224)	44.6 (90)	50.5 (52)	60.7 (17)	41.9 (210)	41.3 (94)	47.8 (52)	51.9 (15)	
Ethnicity									
White	61.2 (327)	68.8 (139)	73.8 (76)	64.3 (18)	60.1 (301)	70.8 (161)	74.1 (81)	61.4 (18)	12.73, $p = .005$
Other	38.8 (207)	31.2 (63)	26.2 (27)	35.7 (10)	39.9 (200)	29.2 (66)	25.9 (28)	38.7 (11)	

$p < .001$ ) and non-medical users (AOR = 7.5, 95% CI: 2.7,21.1,  $p < .001$ ). No significant differences were observed between non/ex-users and non-medical users, and between unauthorized and authorized medical users.

The majority of unauthorized and authorized medical users reported seeing or talking to a health professional about their emotional or mental health (60.9%, 58.6%, respectively) compared to a minority of non/ex-users (22.2%) and non-medical users (28.2%). Unauthorized medical users were significantly more likely to report seeing or talking to a health professional about their mental health than non/ex-users (AOR = 5.4, 95% CI: 3.4,8.4,  $p < .001$ ) and non-medical users (AOR = 3.9, 95% CI: 2.4,6.3,  $p < .001$ ). Authorized medical users were significantly more likely to report seeing or talking to a health professional about their mental health than non/ex-users (AOR = 6.0, 95% CI: 2.7,13.1,  $p < .001$ ) and non-medical users (AOR = 4.3, 95% CI: 1.9,9.6,  $p < .001$ ). No significant differences were observed between non/ex-users and non-medical users, and between unauthorized and authorized medical users.

### Cannabis use and mental health

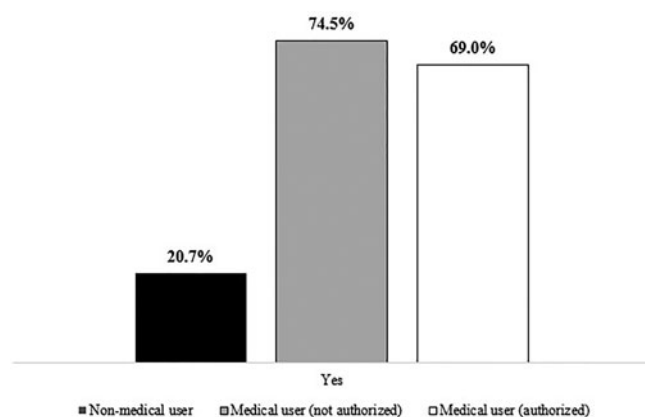
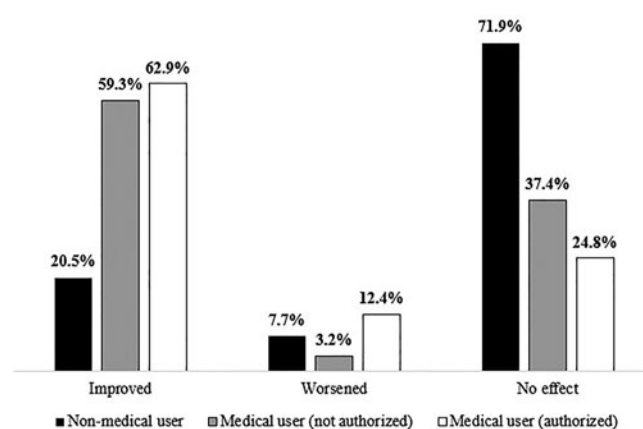
Of cannabis users who had experienced a mental health problem, a minority of non-medical users reported using cannabis to manage or improve their emotional or mental health (46.1%), whereas most unauthorized and authorized medical users had (88.2% and 81.9%, respectively) (Figure 1). Medical users, both unauthorized (AOR = 9.3, 95% CI: 4.3,19.8,  $p < .001$ ) and authorized (AOR = 4.9, 95% CI: 1.6,15.3,  $p < .006$ ) were significantly more likely to report using cannabis to manage or improve their mental health than non-medical users. No significant differences were observed between unauthorized and authorized medical users.

The proportion of respondents who reported using cannabis for a physical or mental condition did not differ by authorization status of medical cannabis.

The majority of non-medical users reported that cannabis had “no effect” on their mental health (71.9%; Figure 2). The majority of medical users (unauthorized and authorized) reported that cannabis use had improved their mental health (59.3% and 62.9%, respectively). Non-medical users were significantly less likely to report that cannabis had improved their mental health (vs. ‘no effect’) than unauthorized (AOR = 0.2, 95% CI: 0.1,0.3,  $p < .001$ ) and authorized medical users (AOR = 0.1, 95% CI: 0.1,0.3,  $p < .001$ ). No significant differences were observed between unauthorized and authorized medical users regarding improved mental health (vs. ‘no effect’). Non-medical users were significantly less likely to report that cannabis had worsened their mental health (vs. ‘no effect’) than authorized medical users (AOR = 0.2, 95% CI: 0.1,0.9,  $p < .03$ ). No significant differences were observed between unauthorized and authorized medical users, and between unauthorized and non-medical users, regarding worsened mental health (vs. ‘no effect’).

**Table 2.** Self-reported mental health by cannabis use status among youth and young adults in Canada ( $n = 867$ ).

	Non/ex-user % $n = 501$	Non-medical user % $n = 227$	Medical user (unauthorized) % $n = 110$	Medical user (authorized) % $n = 29$
<b>Do you have a family history of significant emotional or mental health problems related to any of the following?</b>				
Yes	44.7 (224)	52.0 (118)	81.8 (90)	75.4 (22)
Anxiety	26.4 (132)	29.0 (66)	67.1 (67)	56.1 (16)
Depression	28.6 (143)	30.0 (68)	53.9 (59)	40.7 (12)
PTSD	6.2 (31)	5.6 (13)	10.9 (12)	11.8 (3)
Psychosis	5.8 (29)	5.6 (13)	11.8 (13)	13.2 (4)
Drug or alcohol use	18.3 (92)	24.9 (57)	45.8 (50)	42.9 (12)
Other	4.9 (25)	5.8 (13)	13.2 (14)	17.4 (5)
<b>Have you ever experienced significant emotional or mental health problems related to any of the following?</b>				
Yes	39.5 (198)	44.5 (101)	83.9 (92)	83.8 (24)
Anxiety	28.9 (145)	30.7 (70)	74.8 (82)	66.3 (19)
Depression	24.8 (124)	28.9 (66)	62.8 (69)	66.7 (19)
PTSD	4.1 (21)	3.4 (8)	13.6 (15)	34.4 (10)
Psychosis	1.3 (6)	2.1 (5)	3.6 (4)	9.9 (3)
Drug or alcohol use	2.2 (11)	5.5 (13)	16.6 (18)	19.6 (6)
Other	2.7 (14)	1.2 (3)	6.9 (8)	13.1 (4)
<b>Have you ever, seen or talked to a health professional about your emotional or mental health for any of the following?</b>				
Yes	22.2 (111)	28.2 (64)	60.9 (67)	58.6 (17)
Anxiety	16.2 (81)	19.4 (44)	56.4 (62)	48.3 (14)
Depression	14.6 (73)	19.8 (45)	42.7 (47)	31.0 (9)
PTSD	2.8 (14)	1.4 (7)	11.8 (13)	24.1 (7)
Psychosis	0.8 (4)	1.0 (5)	3.6 (4)	3.4 (1)
Substance Use Disorder	0.2 (1)	1.4 (7)	6.4 (7)	10.3 (3)
Other	0.8 (4)	0.4 (1)	3.6 (4)	10.3 (3)

**Figure 1.** Prevalence of cannabis use to manage or improve emotional or mental health problems among recent cannabis users ( $n = 367$ ).**Figure 2.** Perceived effect of cannabis on overall self-reported mental health among recent cannabis users ( $n = 367$ ).

## Discussion

The current study highlights the strong association between mental health status and medical cannabis use. First, medical cannabis users were more likely to report significant emotional or mental health problems, with a consistent pattern of difference for anxiety, depression, psychosis, PTSD and alcohol and other drug problems. Likewise, medical cannabis users were more likely to discuss their mental health with a health professional, which serves as a general proxy measure of severity. These findings are consistent with previous research indicating a strong relationship between mental

health problems and cannabis, including anxiety and depression (Lev-Ran et al., 2014; NASEM, 2017).

The current study is cross-sectional and does not indicate the direction of this association, in terms of whether young people suffering from depression are more likely to use cannabis or whether cannabis use may exacerbate the risk of depression. However, when asked to report reasons for their cannabis use, medical users were more likely to report using cannabis to manage or improve their mental health than non-medical users. Mental health conditions, such as anxiety and depression, are commonly found in literature as reasons

for using medical cannabis (Kosiba, Maisto, & Ditte, 2019; Walsh et al., 2013, 2017). In a systematic review examining the use of medical cannabis for mental health, limited evidence suggested anxiolytic effects for anxiety, and the potential for medical cannabis to reduce PTSD symptoms (Walsh et al., 2017). However, the efficacy using cannabis to manage mental health problems is less robust than the evidence for some physical health conditions, such as chronic pain, epilepsy, and multiple sclerosis symptoms (Hill, 2015; Stockings et al., 2018; Whiting et al., 2015). In 2018, Health Canada's list of conditions for which medical cannabis may be helpful refers to only one mental health condition: depressed mood associated *with* chronic diseases (Health Canada, 2016b). Furthermore, the recent National Academies of Science, Engineering, and Medicine's review of the literature concluded that there was only limited evidence that cannabis is effective for anxiety, depression and PTSD (NASEM, 2017). Unauthorized and authorized medical users were more likely to report that cannabis use had improved their mental health than non-medical users. The Canadian Cannabis Survey reported a similar positive effect on mental health; however, this survey did not distinguish between recent non-medical and medical users (Health Canada, 2017c). The lower percentages of cannabis users who reported that cannabis had worsened their mental health is reassuring, as evidence suggests that there are possibilities of increased risk for mental health conditions from heavy cannabis use, such as depression and psychosis (NASEM, 2017). Overall, irrespective of the fact that cannabis is not widely recommended or authorized in Canada for mental health issues, the current findings demonstrate that many Canadians are self-medicating for their mental health conditions and report experiencing positive outcomes.

The current study presents a lack of differences between unauthorized and authorized medical users, regarding their emotional or mental health. Obtaining authorization to access legal medical cannabis may have been a barrier for some unauthorized respondents due to stigma, easier access through the illicit market or for conditions that do not qualify for authorization (Leos-Toro et al., 2018). Although Canadians can still pursue medical authorization post-legalization in Canada, the barriers to access legal cannabis will be substantially reduced. It will be interesting to explore the differences between unauthorized and authorized medical users post-legalization, when medical users no longer need authorization to legally access cannabis (Government of Canada, 2016). The widespread availability of cannabis including in illegal markets, of both non-medical and medical cannabis, may further blur the lines between medical and non-medical users (Pacula, Jacobson & Maksabedian, 2016). Therefore, understanding the ways in which medical users differ from non-medical users remains relevant and timely, even under a regulated framework. The findings have potential policy implications, including for public education campaigns. For example, Canada recently revised one its six primary warnings on cannabis products with new messaging on cannabis use and mental health (Government of Canada, 2019a). It is also important for physicians and

other health professionals to understand motivations for using cannabis, particularly when these motivations may run counter to recommendations.

### Limitations

This study has several limitations. Self-report data are subject to memory recall, and this survey required specific memory recall of family and personal mental health problems. The survey required self-reported mental health problems without the use of validated measures and was reliant on subjectively of own classification. For example, rates of depression reported in the current study were higher than estimates from other population-based surveys (Findlay, 2017). At the time of the study, non-medical cannabis use was illegal in Canada; therefore, patterns of cannabis use may be under-reported. The sample sizes across the four groups differ; however, the proportions could be expected from the small numbers using authorized medical cannabis nationally. Notably, this study cannot examine whether the nature of the association between cannabis and mental health is causal, and if so, which direction. It is possible that early cannabis use and potentially other substances may have preceded and increased the risk of mental health problems, rather than individuals deciding to use cannabis to address mental health problems. Perhaps both could be driven by a third factor, such as chronic disease. Nonetheless, the current study is not intended to address or untangle these associations. Finally, respondents were recruited from a consumer panel; however, methods were standardized, and weights were used to adjust for sociodemographic differences.

### Conclusions

Self-reported mental health problems, notably anxiety and depression, were higher among recent medical cannabis users, and high proportions of medical users had used cannabis to manage those mental health problems. The findings highlight a discrepancy between the recommendation that individuals with some mental health problems should avoid cannabis and the widespread practices of using cannabis to manage mental health. The use of cannabis among those with greater mental health problems warrants additional research (Huestis, 2007). Future research should also examine potential differences by strain or 'strength'. Whereas high THC content may be problematic for those at greater risk to psychosis (Murray, Quigley, Quattrone, Englund & Di Forti, 2016), evidence suggests that cannabis with higher levels of CBD may have therapeutic effects (Niesink & van Laar, 2013). Future population-based surveys should examine whether the types and strains of cannabis products differ among those who report using to manage mental health problems, and which mental health problems in particular, especially when edibles, concentrates and oils enter the Canadian market in December 2019 (Government of Canada, 2019b). Finally, education and reduced stigma around using cannabis after legalization in Canada may help

address users coming forwards regarding use of cannabis for mental health problems.

## Declaration of interest statement

The authors declare that they have no conflict of interest. The authors alone are responsible for the content and writing of the article.

## Funding

Funding for this study was provided by a Canadian Institutes of Health Research—Project Bridge Grant (Marijuana legalization: Impact on prevalence and risk behaviors among youth and young adults in Canada). Additional support was provided by a CIHR-Public Health Agency of Canada Applied Chair in Public Health, and a Vanier Canada Graduate Scholarship. The funders had no involvement in project implementation, data analysis or reporting.

## ORCID

Elle Wadsworth  <http://orcid.org/0000-0003-0797-8493>

Cesar Leos-Toro  <http://orcid.org/0000-0001-9987-6587>

David Hammond  <http://orcid.org/0000-0001-8197-6010>

## References

- Bottorff, J. L., Johnson, J. L., Moffat, B. M., & Mulvogue, T. (2009). Relief-oriented use of marijuana by teens. *Substance Abuse Treatment Prevention and Policy*, 4(1), 7. doi:10.1186/1747-597X-4-7
- Degenhardt, L., Coffey, C., Romaniuk, H., Swift, W., Carlin, J. B., Hall, W. D., & Patton, G. C. (2013). The persistence of the association between adolescent cannabis use and common mental disorders into young adulthood. *Addiction*, 108(1), 124–133. doi:10.1111/j.1360-0443.2012.04015.x
- European Monitoring Centre for Drugs and Drug Addiction. (2018). *Medical use of cannabis and cannabinoids: Questions and answers for policymaking*. Luxembourg: Publications Office of the European Union.
- Findlay, L. (2017). Health reports: Depression and suicidal ideation among Canadians aged 15 to 24. Retrieved from <https://www150.statcan.gc.ca/n1/pub/82-003-x/2017001/article/14697-eng.htm>. Accessed 28 July 2018.
- Government of Canada. (2016). A framework for the legalization and regulation of cannabis in Canada: The final report of the task force on cannabis legalization and regulation. Retrieved from <https://www.canada.ca/en/health-canada/services/drugs-medication/cannabis/laws-regulations/task-force-cannabis-legalization-regulation/framework-legalization-regulation-cannabis-in-canada.html#a5>.
- Government of Canada. (2018a). Cannabis for medical purposes under the Cannabis Act: Information and improvements. Retrieved from <https://www.canada.ca/en/health-canada/services/drugs-medication/cannabis/medical-use-cannabis.html>.
- Government of Canada. (2018b). Cannabis Act (S.C. 2018, c.16) Ottawa, ON. Retrieved from <https://laws-lois.justice.gc.ca/eng/acts/c-24.5/>.
- Government of Canada. (2019a). Cannabis health warning messages: Updates for October 2019. Retrieved from <https://www.canada.ca/en/health-canada/services/drugs-medication/cannabis/laws-regulations-support-cannabis-act/health-warning-messages.html>.
- Government of Canada. (2019b). Regulations amending the cannabis regulations (New classes of cannabis): SOR/2019-206. Retrieved from <http://www.gazette.gc.ca/rp-pr/p2/2019/2019-06-26/html/sor-dors206-eng.html>.
- Groves, R. M., Fowler, F. J., Couper, M. P., Lepkowski, J. M., Singer, E., & Tourangeau, R. (2009). *Survey methodology* (2nd ed.). Hoboken, NJ: Wiley.
- Hall, W., & Weier, M. (2015). Assessing the public health impacts of legalizing recreational cannabis use in the USA. *Clinical Pharmacology & Therapeutics*, 97(6), 607–615. doi:10.1002/cpt.110
- Hammond, D., & Reid, J. L. (2018). Exposure and perceptions of marketing for caffeinated energy drinks among young Canadians. *Public Health Nutrition*, 21(03), 535–542. doi:10.1017/S1368980017002890
- Health Canada. (2016a). Understanding the new access to cannabis for medical purposes regulations. Retrieved from <https://www.canada.ca/en/health-canada/services/publications/drugs-health-products/understanding-new-access-to-cannabis-for-medical-purposes-regulations.html>.
- Health Canada. (2016b). Consumer information—Cannabis (Marihuana, Marijuana). Retrieved from <https://www.canada.ca/en/health-canada/services/drugs-medication/cannabis/licensed-producers/consumer-information-cannabis.html>.
- Health Canada. (2017a). Canadian tobacco alcohol and drugs survey 2015. Retrieved from <https://www.canada.ca/en/health-canada/services/canadian-tobacco-alcohol-drugs-survey/2015-supplementary-tables.html>.
- Health Canada. (2017b). Proposed approach to the regulation of cannabis. Retrieved from <https://www.canada.ca/en/health-canada/programs/consultation-proposed-approach-regulation-cannabis/proposed-approach-regulation-cannabis.html>.
- Health Canada. (2017c). Canadian cannabis survey 2017. Retrieved from <https://www.canada.ca/en/health-canada/services/publications/drugs-health-products/canadian-cannabis-survey-2017-summary.html>.
- Health Canada. (2018a). Authorized licensed producers of cannabis for medical purposes. Retrieved from <https://www.canada.ca/en/health-canada/services/drugs-medication/cannabis/licensed-producers/authorized-licensed-producers-medical-purposes.html>.
- Health Canada. (2018b). Licensed producers: Market data. Retrieved from <https://www.canada.ca/en/health-canada/services/drugs-medication/cannabis/licensed-producers/market-data.html>.
- Hill, K. P. (2015). Medical marijuana for treatment of chronic pain and other medical and psychiatric problems: A clinical review. *JAMA Psychiatry*, 313(24), 2474–2483. doi:10.1001/jama.2015.6199
- Huestis, M. A. (2007). Human cannabinoid pharmacokinetics. *Chemistry & Biodiversity*, 4(8), 1770–1804. doi:10.1002/cbdv.200790152
- Kosiba, J. D., Maisto, S. A., & Ditte, J. W. (2019). Patient-reported use of medical cannabis for pain, anxiety, and depression symptoms: Systematic review and meta-analysis. *Social Science & Medicine*, 233, 181–192. doi:10.1016/j.socscimed.2019.06.005
- Krumpal, I. (2013). Determinants of social desirability bias in sensitive surveys: A literature review. *Quality & Quantity*, 47, 2025–2047. doi:10.1007/s11135-011-9640-9
- Leos-Toro, C., Shiplo, S., & Hammond, D. (2018). Perceived support for medical cannabis use among approved medical cannabis users in Canada. *Drug and Alcohol Review*, 37(5), 627–636. doi:10.1111/dar.12823
- Lev-Ran, S., Roerecke, M., Le Foll, B., George, T. P., McKenzie, K., & Rehm, J. (2014). The association between cannabis use and depression: A systematic review and meta-analysis of longitudinal studies. *Psychological Medicine*, 44(4), 797–810. doi:10.1017/S0033291713001438
- Moore, T. H., Zammit, S., Lingford-Hughes, A., Barnes, T. R., Jones, P. B., Burke, M., & Lewis, G. (2007). Cannabis use and risk of psychotic or affective mental health outcomes: A systematic review. *The Lancet*, 370(9584), 319–328. doi:10.1016/S0140-6736(07)61162-3
- Murray, R. M., Quigley, H., Quattrone, D., Englund, A., & Di Forti, M. (2016). Traditional marijuana, high-potency cannabis and synthetic cannabinoids: Increasing risk for psychosis. *World Psychiatry*, 15(3), 195–204. doi:10.1002/wps.20341
- National Academies of Sciences, Engineering, and Medicine. (2017). *The health effects of cannabis and cannabinoids: The current state of evidence and recommendations for research*. Washington, DC: The National Academies Press.
- Niesink, R. J., & van Laar, M. W. (2013). Does cannabidiol protect against adverse psychological effects of THC? *Frontiers in Psychiatry*, 4, 130. doi:10.3389/fpsy.2013.00130
- NORML. (2019). State laws: Medical marijuana. Retrieved from <https://norml.org/legal/medical-marijuana-2>.



- Pacula, R., Jacobson, M., & Maksabedian, E. (2016). In the weeds: A baseline view of cannabis use among legalizing states and their neighbours. *Addiction*, *111*(6), 973. doi:10.1111/add.13282
- Schofield, D., Tennant, C., Nash, L., Degenhardt, L., Cornish, A., Hobbs, C., & Brennan, G. (2006). Reasons for cannabis use in psychosis. *Australian and New Zealand Journal of Psychiatry*, *40*(6–7), 570–574. doi:10.1080/j.1440-1614.2006.01840.x
- Semple, D. M., McIntosh, A. M., & Lawrie, S. M. (2005). Cannabis as a risk factor for psychosis: Systematic review. *Journal of Psychopharmacology*, *19*(2), 187–194. doi:10.1177/0269881105049040
- Statistics Canada. (2019). Table 17-10-0005-01. Population estimates on July 1st, by age and sex, 2017. Retrieved from <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1710000501>.
- Stockings, E., Zagic, D., Campbell, G., Weier, M., Hall, W. D., Nielsen, S., ... Degenhardt, L. (2018). Evidence for cannabis and cannabinoids for epilepsy: A systematic review of controlled and observational evidence. *Journal of Neurology, Neurosurgery & Psychiatry*, *89*(7), 741–753. doi:10.1136/jnnp-2017-317168
- Volkow, N. D., Swanson, J. M., Evins, A. E., DeLisi, L. E., Meier, M. H., Gonzalez, R., ... Baler, R. (2016). Effects of cannabis use on human behavior, including cognition, motivation, and psychosis: A review. *JAMA Psychiatry*, *73*(3), 292–297. doi:10.1001/jamapsychiatry.2015.3278
- Walsh, Z., Callaway, R., Belle-Isle, L., Capler, R., Kay, R., Lucas, P., & Holtzman, S. (2013). Cannabis for therapeutic purposes: Patient characteristics, access, and reasons for use. *International Journal of Drug Policy*, *24*(6), 511–516. doi:10.1016/j.drugpo.2013.08.010
- Walsh, Z., Gonzalez, R., Crosby, K., Thiessen, M. S., Carroll, C., & Bonn-Miller, M. O. (2017). Medical cannabis and mental health: A guided systematic review. *Clinical Psychology Review*, *51*, 15–29. doi:10.1016/j.cpr.2016.10.002
- Watson, T., Hyshka, E., Bonato, S., & Rueda, S. (2019). Early-stage cannabis regulatory policy planning across Canada's four largest provinces: A descriptive overview. *Substance Use and Misuse*, *54*(10), 1690–1704.
- Wiggers, D., Reid, J. L., White, C. M., & Hammond, D. (2017). Use and perceptions of caffeinated energy drinks and energy shots in Canada. *American Journal of Preventive Medicine*, *53*(6), 866–871. doi:10.1016/j.amepre.2017.05.021
- Whiting, P. F., Wolff, R. F., Deshpande, S., Di Nisio, M., Duffy, S., Hernandez, A. V., ... Kleijnen, J. (2015). Cannabinoids for medical use: A systematic review and meta-analysis. *Journal of American Medical Association*, *313*(24), 2456–2473. doi:10.1001/jama.2015.6358