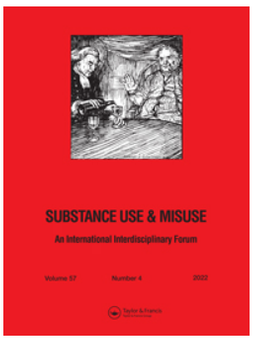

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Cannabis and Mental Health: Adverse Outcomes and Self-Reported Impact of Cannabis Use by Mental Health Status

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ABSTRACT

Background: Cannabis can induce negative outcomes among consumers with mental health conditions. This study examined medical help-seeking behavior, patterns of adverse effects, and perceived impacts of cannabis among consumers with and without mental health conditions. *Methods:* Data came from the International Cannabis Policy Study, via online surveys conducted in 2018. Respondents included 6,413 past 12-month cannabis consumers aged 16–65, recruited from commercial panels in Canada and the US. Regression models examined differences in adverse health effects and perceived impact of cannabis among those with and without self-reported past 12-month experience of anxiety, depression, PTSD, bipolar disorder, psychosis. *Results:* Overall, 7% of past 12-month consumers reported seeking medical help for adverse effects of cannabis, including panic, dizziness, nausea. Help-seeking was greater for those with psychosis (13.8%: AOR = 1.78; 1.11–2.87), depression (8.9%: AOR = 1.57; 1.28–1.93), and bipolar disorder (10.1%: AOR = 1.53; 1.44–2.74). Additionally, 54.1% reported using cannabis to manage symptoms of mental health, with higher rates among those with bipolar (90.8%) and PTSD (90.7%). Consumers reporting >1 condition were more likely to perceive positive impacts on friendships, physical/mental health, family life, work, studies, quality of life (all $p < .001$). Consumers with psychosis were most likely to perceive negative effects across categories. *Conclusion:* For conditions with substantial evidence suggesting cannabis is harmful, greater help-seeking behaviors and self-perceived negative effects were observed. Consumers with mental health conditions generally perceive cannabis to have a positive impact on their lives. The relationship between cannabis and mental health is disorder specific and may include a combination of perceived benefits and harms.

KEYWORDS

Cannabis; marijuana; mental health; adverse effects; health outcomes

Introduction

Cannabis use is associated with several acute and long-term effects on health. Cannabis can induce acute effects for which some consumers seek medical attention, including nausea, vomiting, cannabis hyperemesis syndrome, gastrointestinal and psychiatric complaints, and acute cardiovascular events (Bollom et al., 2018; Desai et al., 2019; Shearer et al., 2015). An increase in rates of cannabis-related emergency department (ED) visits has been observed over time in Canada and the US, especially among youth (Maloney-Hall et al., 2020; Zhu & Wu, 2016). Consumers visiting EDs for adverse effects from cannabis use are more likely to have an existing mental health diagnosis (Hall et al., 2018). In Canada, the rate of hospitalizations for cannabis-related mental and behavioral disorders doubled between 2006 and 2015, with psychotic disorder being the most common condition among hospitalizations (Maloney-Hall et al., 2020). Additionally, the proportions of patients with mental health conditions reporting cannabis use prior to admission to inpatient psychiatry in Ontario has increased between 2007 and 2017, with the greatest increases among those with psychotic disorders and non-cannabis substance use disorder (McGuckin et al., 2020).

The potential impact of cannabis on mental health may depend on a range factors, including age, sex, genes, pre-existing medical conditions, family history of mental illness, previous experience with cannabis, frequency and duration of use, and potency and type of product consumed (Lowe et al., 2019). There is extensive evidence linking chronic cannabis use to an increased risk of developing psychotic disorders and schizophrenia (Di Forti et al., 2019; Gage et al., 2016; Marconi et al., 2016; Wilkinson et al., 2014). Cannabis use can lead to earlier onset of psychosis, increased symptom severity, and poorer prognosis and quality of life among those with schizophrenia (Lowe et al., 2019). Additionally, several studies have identified links between cannabis use and psychosis in those with preexisting genetic risk factors related to certain gene variations (Di Forti et al., 2012; Morgan et al., 2016; Mané et al., 2017; Van Winkel et al., 2011). Mendelian randomization studies have provided

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some evidence of a causal role of cannabis use on psychotic disorders, though there is also some evidence that supports bidirectional effects (Gage et al., 2017; Pasman et al., 2018; Vaucher et al., 2018).

Evidence on the impact of cannabis use and the development anxiety disorders and depression is mixed (Botsford et al., 2020; Crippa et al., 2009). A systematic review and meta-analysis across 10 countries indicated the presence of a small positive association between cannabis use and anxiety, and comorbid anxiety/depression. (Kedzior & Laeber, 2014). For individuals with an earlier age of initiation, and those with a predisposition or existing vulnerability, greater cannabis use was associated with more severe symptoms of depression and an increased likelihood of reporting symptoms of anxiety (Botsford et al., 2020; Hosseini & Oremus, 2019). Furthermore, several meta-analyses and systematic reviews demonstrate that cannabis use is associated with an increased risk of developing depression, though the risk of developing either anxiety or depression among those who use cannabis regularly in the general population is relatively low after accounting for sociodemographic factors (Gobbi et al., 2019; Mammen et al., 2018; Twomey, 2017).

Limited evidence exists for the effects of cannabis on mental health conditions such as bipolar disorders and post-traumatic stress disorder (PTSD). Research shows that cannabis use has a negative impact on the course of bipolar disorder, as it typically worsens clinical outcomes and leads to greater symptom severity and duration of manic phases (APA., 2013; Lev-Ran et al., 2013; Van Rossum et al., 2009). Heavy cannabis use may also trigger the first episode of bipolar disorder (Gibbs et al., 2015). Additionally, cannabis is associated with poorer mental health outcomes and increased symptom severity among patients with PTSD (Gentes et al., 2016; Mammen et al., 2018; Wilkinson et al., 2015).

The potential positive impact of cannabis on mental health has been examined, though this literature is in the early stages. Some evidence suggests that cannabis can alleviate symptoms associated with mental health conditions, such as stress, negative mood, irritability, sleep disturbances, and the acute response to fear stimuli associated with PTSD (Abrams, 2018; Lim et al., 2017). However, a systematic review and meta analysis of the effectiveness of medicinal cannabinoids as a treatment method found little evidence to suggest that it can improve mental health conditions (Black et al., 2019).

Cannabis can produce a range of adverse outcomes that impact other areas of life, apart from mental or physical health. Common measures of "problematic cannabis use" assess the impact on areas such as social life, relationships, work, and school (APA., 2013; WHO, 2010). Overall quality of life (QoL) can also be used to assess an individual's sense of health and wellbeing. Heavy cannabis use and cannabis use disorder (CUD) are associated with reduced self-reported QoL scores, while abstinence and lower frequency of cannabis use are associated with higher QoL (Brezing et al., 2018; Goldenberg et al., 2017). Among individuals with anxiety, a lower QoL score was reported for regular, but not occasional cannabis users (Lev-Ran et al., 2012). Additionally, those with severe mental illness consistently report lower QoL scores compared to the general population (Evans et al., 2007). Research to date has focused on mental health related QoL measures, particularly for recreational users or those with anxiety, depression, and CUD. However, there is limited evidence for other mental conditions and consumer perceptions of how cannabis impacts specific areas of life such as friendships or social life, family life, physical health, work, and studies.

The current study sought to: (1) examine the rate of cannabis consumers who seek medical help for adverse outcomes from cannabis, including the rate of specific adverse health effects experienced; (2) examine perceptions of positive and negative effects of cannabis use among cannabis consumers on seven outcomes: friendships or social life, physical and mental health, family life, work, studies, and general quality of life; and (3) examine differences in adverse outcomes and perceived effects by past 12-month experience of specific mental health conditions.

Methods

Cross-sectional data were examined from Wave 1 of the International Cannabis Policy Study (ICPS), conducted in Canada and the US in 2018. Data were collected prior to the legalization of non-medical cannabis in Canada. Data were collected via self-completed web-based surveys conducted from August 27- October 7, 2018. Participants were recruited through the Nielsen Consumer Insights Global Panel and their partners' panels, which consist of non-probability based commercial panels. Email invitations (with a unique link) were sent to a random sample of panelists (after targeting for age and country criteria); panelists known to be ineligible were not invited (Goodman & Hammond, 2020). Surveys were conducted in English in the US, and English or French in Canada. The AAPOR cooperation rate was 62.4%, calculated as the percentage of respondents who completed the survey (28,471) out of those eligible who accessed the survey link (44,364)(AAPOR, 2016). Respondents received remuneration in accordance with their panel's usual incentive structure (e.g., points-based, or monetary rewards, chances to win prizes). The ICPS study has been reviewed by and received ethics clearance through a University of Waterloo Research Ethics Committee (ORE#22392).

Participants

The study included participants aged 16–65 years living in Canada (excluding territories) (n = 10,057) and the US (n = 17,112). For the current analysis, respondents were excluded if they refused to answer the questions of interest, did not provide valid responses, or did not use cannabis in the past 12-months (n = 20,756). The final analytic sample included 6,413 respondents. A full profile of the ICPS sample and comparisons with national benchmark surveys is available in the ICPS Technical Report – Wave 1 (2018)

and ICPS methodology paper (Goodman & Hammond, 2018; Hammond et al., 2020b).

Study measures

Past 12-month experience of mental health condition

Participants were first asked "Have you ever experienced any of the following mental health problems (regardless of whether you were diagnosed)?", and selected from the following options: anxiety (including phobia, obsessive-compulsive disorder or panic disorder)/depression (including dysthymia)/post-traumatic stress disorder (PTSD or traumatic event (e.g., abuse or loss)/bipolar disorder or mania/psychotic disorder (including schizophrenia)/substance use disorder/other/never received a mental health diagnosis/don't know/refuse to answer. Those who selected "yes" for any of the conditions were then asked, "Have you experienced this/these mental health problem(s) in the past 12 months?" where the same list of conditions was presented. For the purpose of this study, "substance use disorder" and "other" were excluded from the list of disorders being examined, as it was not possible to discern the type of substance consumed by those who reported experiencing "substance use disorder" in the ICPS survey.

An index variable for past 12-month experience of a mental condition was also created, where responses were recoded to "experienced no condition", "experienced one condition" and "experienced >1 condition".

Sought medical help for adverse effects of cannabis use

Those who reported using cannabis in the past 12 months were asked "In the past 12 months, did you seek medical help for any adverse or negative health effects?" Response options included: yes/no/don't know/refuse to answer.

Adverse effects of cannabis use

Consumers who sought medical help for adverse or negative effects of cannabis were asked "In the past 12 months, which negative health effect(s) from marijuana use did you seek medical help for?" and selected from the following list: nausea or vomiting/heart or blood pressure/feeling faint or dizzy/panic reactions/hallucinations/flashbacks/depression/dissociation or depersonalization/other/never experienced any negative health effects from using marijuana/don't know/refuse to answer.

Perceived impact of cannabis use

To measure the perceived impact of cannabis use, past 12-month cannabis consumers were asked "In the past 12 months, what effect did your marijuana use have on your: friendships or social life, physical health, mental health, family life, work, studies, quality of life?". For each option, respondents were asked to identify the perceived impact by selecting from the following: negative effect/no effect/positive effect/not applicable/don't know/refuse to answer. A response of "not applicable" was recoded as "missing".

Ever used cannabis to manage/improve symptoms of a mental condition

Participants were asked "Have you ever used marijuana to improve or manage symptoms for any of the following?" and were presented with the same list of mental health conditions as the "past 12-month" measure.

Covariates

Cannabis use frequency was analyzed as "less than monthly use", "weekly/monthly use" and "daily use". Other covariates included sex at birth (male/female), age group (16-25/26-35/36-45/46-55/56-65), ethnicity (white/other), education (less than high school, high school diploma or equivalent/some college or technical training/bachelor's degree or higher), and country (Canada/USA).

Analysis

All analyses were conducted using SAS Studio 9.4 and reported estimates are weighted. Post-stratification sample weights were constructed for respondents from Canada (age-by-sex-by-province and education groups) and the US (age-by-sex-by-legal state, education, and region-by-race groups), using population estimates from Statistics Canada and the US Census Bureau (Statistics Canada, 2016, 2017; U.S. Census Bureau, 2018a, 2018b) A raking algorithm was applied to the full sample (n = 27,169) to compute weights that were calibrated to these groupings, and weights were rescaled to the final analytic sample.

Binary logistic regression models were fitted to examine medical help-seeking for adverse effects in the past 12-months (e.g., 0= Did not seek help, 1= Sought help). First, models were run with the index variable (0= No condition, 1= One condition, 2= More than one condition), and then separate models were run for each mental health condition (0= No experience, 1= Past 12-month experience). The same approach was used to examine the "used cannabis to manage/improve symptoms of mental health" outcome (e.g., 0= Did not use cannabis to manage symptoms, 1= Used cannabis to manage symptoms), as well as prevalence of "help-seeking for specific health effects", with separate models for each of the 8 health effects (e.g., 0= Did not seek help for effect, 1= Sought help for effect).

Multinomial logistic regression models were also fitted to examine the 7 outcomes related to self-perceived impact of cannabis use, each with 3 levels (0 = No effect, 1 = Negative effect, 2 = Positive effect). Models were run with the index variable (0= No condition, 1= One condition, 2= More than one condition), and then separate models were run for each mental health condition (0= No experience, 1= Past 12-month experience).

All models were adjusted for sex, age, ethnicity, country, education, and cannabis use frequency. Unless otherwise

indicated, adjusted odds ratios (AORs) are reported with 95% confidence intervals.

Results

Table 1 presents the weighted sample characteristics included in the current analyses from the ICPS 2018 (Wave 1) survey.

Medical help-seeking for adverse health effects

As Table 2 shows, 7% of all past 12-month cannabis consumers sought medical help for an adverse event (including 9% of monthly users and 7% of daily/near daily users). For specific mental health conditions and medical help-seeking, the association was strongest for psychosis (13.8%: AOR = 1.78; 1.11–2.87), followed by depression (8.9%: AOR = 1.57; 1.28–1.93), and bipolar disorder (10.1%: AOR = 1.53; 1.44–2.74), compared to those without each condition, whereas there were no significant differences for anxiety or PTSD (Table 2). In addition, consumers who reported experiencing one mental health condition (12.7%), and >1 condition (6.1%) were more likely to seek medical help for adverse effects compared to those who did not experience a condition (5.0%) (Table 2).

As Figure 1 shows, panic, dizziness, and nausea/vomiting were the most commonly reported adverse effects. Compared to consumers with "no mental health condition", those who experienced one condition were more likely to seek medical help for heart problems, dizziness and flashbacks ($p < .05$ for all), and respondents reporting >1 condition had higher odds of seeking help for nausea/vomiting, dizziness, panic reactions, flashbacks, and depression ($p < .05$ for all).

Supplemental tables S1 to S8 show the results of binary logistic regression models for each specific adverse health effect and the mental health conditions of interest. Briefly, consumers with anxiety were more likely to seek medical help for depression (24.7%: AOR = 2.32; 1.07–5.06), while consumers with depression were more likely to seek help for panic reactions (36.1%: AOR = 4.69; 2.13–10.29). Neither condition showed significant differences for any other adverse effects. Consumers with PTSD in the past 12-months were more likely to seek medical help for heart problems (39.1%: AOR = 2.67; 1.01–7.03), panic reactions (50.0%: AOR = 3.44; 1.28–9.25), flashbacks (26.4%: AOR = 4.49; 1.45–13.92), and depression (37.7%: AOR = 4.46; 1.56–12.75). Bipolar disorder was associated with seeking medical help for dizziness (53.3%: AOR = 4.76; 1.74–12.97), hallucinations (28.8%: AOR = 3.69; 1.15–11.86), and flashbacks (35.1%: AOR = 7.53; 2.30–24.70). Finally, psychosis was associated with seeking medical help for flashbacks (30.5%: AOR = 3.98; 1.30–12.21), and dissociation (24.6%: AOR = 7.65; 1.90–30.75).

Perceived impact of cannabis use

Figure 2 shows the prevalence of perceived effects of past 12-month cannabis use. For all categories, the prevalence of negative and positive perceived effects of cannabis were generally lower among all past 12-month cannabis consumers, and those with no mental health conditions (Figure 2). Results of the multinomial logistic regression models examining the perceived effects of cannabis by specific condition are presented in Supplemental tables S9-S15.

Friendships/social life

Among all past 12-month consumers, 21.2% reported positive effects of cannabis use on friendships/social life, and 4.0% reported negative effects. Consumers who experienced each mental health condition in the past 12-months were more likely to report positive effects of cannabis on friendships/social life vs. no effect, compared to those with no experience of each condition: anxiety (28.8%: AOR = 1.65; 1.42–1.92), depression (27.3%: AOR = 1.44; 1.23–1.68, PTSD (29.2%: AOR = 1.46; 1.16–1.84), bipolar disorder (35.4%: AOR= 1.76; 1.30–2.38), and psychosis (32.0%: AOR = 1.66; 1.02–2.72). In addition, past 12-month experience of psychosis was associated with higher odds of reporting negative effects on friendships/social life vs. no effect (16.2%: AOR = 5.24; 2.77–9.89).

Physical health

Among all past 12-month consumers, 32.7% reported positive effects of cannabis use on physical health, and 4.3% reported negative effects. For each condition, those with a past 12-month experience were more likely to report positive effects of cannabis on physical health vs. no effect, compared to those with no experience of each condition: anxiety (43.1%: AOR = 1.88; 1.63–2.17), depression (43.1%: AOR = 1.76; 1.53–2.03), PTSD (53.0%: AOR = 1.93; 1.56–2.40), bipolar disorder (40.2%: AOR= 1.50; 1.12–2.00). Psychosis was not significantly associated with positive effect; however, it was associated with higher odds of reporting negative effects on physical health vs. no effect (3.2%: AOR = 3.35; 1.65–6.81).

Mental health

For all conditions, those with a past 12-month experience were more likely to report positive effects of cannabis use on mental health ($p < .001$) vs. no effect. The association was strongest for anxiety (64%: AOR= 4.83; 4.16–5.61) and weakest for psychosis (58.8%: AOR= 2.97; 1.71–5.15). The odds of reporting negative perceived effects vs. no effect were also higher for those who experienced each condition ($p < .001$) compared to those who did not, and conversely, the association was strongest for psychosis (19.1%: AOR= 11.44; 5.74–22.78) and weakest for anxiety (5.0%: AOR= 3.42; 2.48–4.73).

Family life

Among all past 12-month consumers, 17.0% reported positive effects of cannabis on family life, and 5.2% reported negative effects. Those who reported a past 12-month experience of each condition were more likely to report positive

Table 1. Weighted sample characteristics of past 12-month cannabis consumers, by past 12-month experience of mental health condition (n = 6,413).

	Total sample	Anxiety		Depression		PTSD		Bipolar		Psychosis	
		Yes 38.6% (n = 2,474)	**No** 61.4% (n = 3,939)	**Yes** 32.3% (n = 2,069)	**No** 67.7% (n = 4,344)	**Yes** 9.0% (n = 580)	**No** 91.0% (n = 5,833)	**Yes** 5.6% (n = 358)	**No** 94.4% (n = 6,055)	**Yes** 2.6% (n = 164)	**No** 97.4% (n = 6,249)
	(n = 6,413)										
	% (n)	% (n)	% (n)	% (n)	% (n)	% (n)	% (n)	% (n)	% (n)	% (n)	% (n)
Age group											
16-25	21.4 (1,373)	42.6 (585)	57.4 (788)	32.2 (442)	67.8 (931)	6.9 (94)	93.2 (1,279)	5.6 (76)	94.5 (1,297)	2.4 (33)	97.6 (1,340)
26-35	28.0 (1,791)	42.7 (765)	57.3 (1,026)	34.7 (621)	65.3 (1,170)	10.3 (185)	90.0 (1,606)	5.9 (106)	94.1 (1,685)	3.5 (62)	96.5 (1,729)
36-45	18.6 (1,193)	42.7 (509)	57.3 (684)	35.9 (428)	64.1 (765)	11.0 (131)	89.0 (1,062)	6.4 (76)	93.6 (1, 117)	2.8 (33)	97.2 (1,160)
46-55	17.9 (1,146)	35.2 (404)	64.7 (742)	31.5 (361)	68.5 (785)	9.4 (107)	90.7 (1,039)	6.8 (78)	93.2 (1,068)	2.3 (27)	97.6 (1, 119)
56-65	14.2 (910)	23.2 (211)	76.8 (699)	24.0 (218)	76.0 (692)	6.8 (62)	93.2 (848)	2.4 (22)	97.6 (888)	0.9 (9)	99.0 (901)
Sex											
Female	45.6 (2,922)	49.9 (1,458)	50.1 (1,464)	39.1 (1,142)	60.9 (1,780)	12.6 (369)	86.6 (2,529)	6.0 (174)	94.0 (2,748)	1.7 (51)	98.3 (2,871)
Male	54.4 (3,491)	29.1 (1,016)	70.9 (2,475)	26.6 (928)	73.4 (2,563)	6.0 (211)	94.0 (3,280)	5.3 (184)	94.7 (3,307)	3.2 (113)	96.8 (3,378)
Ethnicity											
White	78.2 (5,014)	40.3 (2,022)	59.7 (2,992)	32.3 (1,621)	67.7 (3,393)	8.7 (437)	91.3 (4,577)	5.7 (286)	94.3 (4,728)	2.4 (118)	97.6 (4,896)
Other	21.8 (1,399)	32.3 (452)	67.7 (947)	32.1 (448)	68.0 (951)	10.2 (142)	89.8 (1,257)	5.2 (73)	94.8 (1,326)	3.3 (46)	96.7 (1,326)
Education											
Less than high school	15.1 (967)	33.9 (328)	66.1 (639)	24.3 (236)	75.7 (731)	5.8 (57)	94.1 (910)	3.7 (36)	96.3 (931)	3.7 (36)	96.3 (931)
High school or equivalent	23.4 (1,492)	41.1 (613)	58.9 (879)	37.3 (557)	62.7 (935)	9.6 (143)	90.4 (1,349)	7.9 (118)	92.1 (1,374)	3.0 (44)	97.1 (1,448)
Some college, tech. training	40.5 (2,600)	40.8 (1,061)	59.2 (1,539)	35.2 (916)	64.8 (1,684)	10.8 (281)	89.2 (2,319)	6.4 (167)	93.6 (2,433)	2.2 (58)	97.8 (2,542)
Bachelor's or higher	21.1 (1,353)	34.9 (471)	65.2 (882)	26.6 (360)	73.4 (993)	7.3 (99)	92.7 (1,254)	2.7 (37)	7.3 (99)	1.9 (25)	98.2 (1,328)
Country											
Canada	37.9 (2,432)	39.0 (948)	61.0 (1,484)	31.7 (770)	68.3 (1,662)	8.9 (218)	91.0 (2,214)	4.0 (98)	96.0 (2,334)	2.5 (61)	97.5 (2,371)
US	62.1 (3,981)	38.3 (1,526)	61.7 (2,455)	32.6 (1,299)	67.4 (2,682)	9.1 (362)	90.9 (3,619)	6.5 (260)	94.5 (3,721)	2.6 (103)	97.4 (3,878)
Cannabis use frequency											
Less than monthly	30.0 (1,927)	35.6 (686)	64.3 (1,241)	29.0 (558)	70.4 (1,369)	6.1 (117)	93.9 (1,810)	3.1 (59)	96.9 (1,868)	1.9 (37)	98.1 (1,890)
Weekly/monthly	37.7 (2,420)	36.0 (872)	64.0 (1,548)	28.3 (686)	71.7 (1,734)	8.1 (196)	91.9 (2,224)	5.4 (130)	94.6 (2,290)	2.1 (51)	97.9 (2,369)
Daily	32.2 (2,066)	44.3 (916)	55.7 (1,150)	40.0 (825)	60.0 (1,241)	12.9 (267)	87.1 (1,799)	8.2 (169)	91.8 (1,897)	3.7 (76)	96.3 (1,990)

Table 2. Binary logistic regression results examining the association between medical help seeking for adverse health effects among past 12-month cannabis consumers, by past 12-month experience of mental condition* (n = 6,344).

	Sought medical help in past 12 months			
	% (n)	**AOR**	**95% CI**	***p* value**
No anxiety	7.8 (304)	Ref		
Anxiety	5.8 (142)	1.17	(0.87-1.58)	0.296
No depression	6.1 (263)	Ref		
Depression	8.9 (183)	1.57	(1.28-1.93)	<0.001
No PTSD	6.9 (400)	Ref		
PTSD	8.0 (47)	1.19	(0.86-1.66)	0.294
No bipolar	6.8 (410)	Ref		
Bipolar	10.1 (36)	1.53	(1.44-2.74)	0.001
No psychosis	6.9 (424)	Ref		
Psychosis	13.8 (22)	1.78	(1.11-2.87)	<0.001
No conditions	5.0 (161)	Ref		
One condition	12.7 (181)	2.51	(1.99-3.16)	<0.001
>1 condition	6.1 (144)	1.52	(1.36-2.72)	<0.001
All past 12-month consumers	7.0 (446)			

* Models adjusted for age, sex at birth, ethnicity, cannabis use frequency, education, country. Separate models run for each condition and index variable.

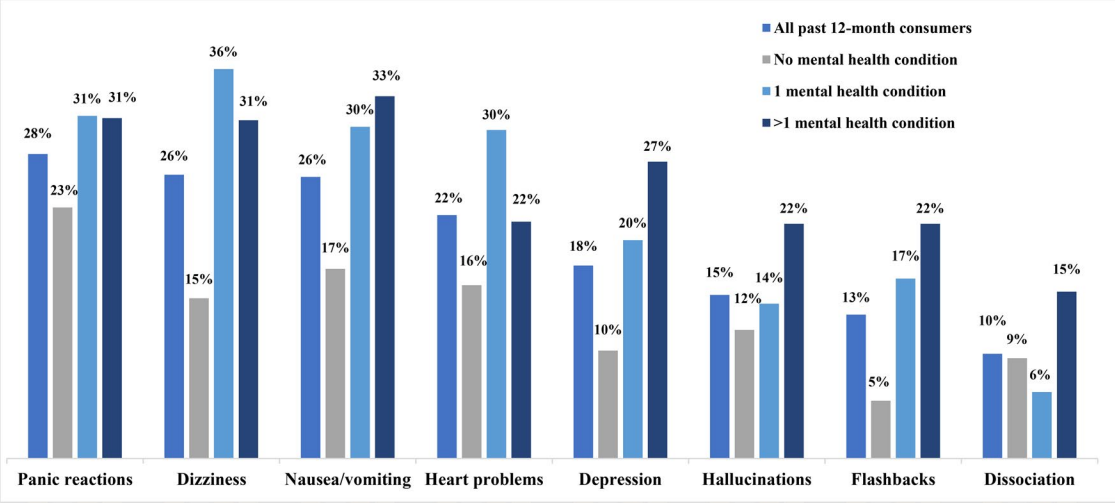

Figure 1. Medical help-seeking in past 12-months for specific adverse effects from cannabis use among all past 12-month consumers, and by experience of mental health conditions in the past 12-months (n = 446).

effects on family life vs. no effect, compared to those with no experience of each condition: anxiety (24.3%: AOR = 1.74; 1.47–2.06), depression (24.7%: AOR = 1.75; 1.48–2.07), PTSD (33.2%: AOR = 2.09; 1.64–2.65), bipolar disorder (29.9%: AOR= 1.69; 1.22–2.35), psychosis (33.3%: AOR= 2.48; 1.48–4.16). Past 12-month experience of bipolar disorder (8.8%: AOR = 1.86; 1.10–3.13), and psychosis (17.4%: AOR = 4.70; 2.48–8.92) were also associated with higher odds of reporting negative effects on family life vs. no effect.

Work

Among all past 12-month consumers, 12.9% reported positive effects of cannabis on work, and 4.3% reported negative effects. Compared to those with no experience of each condition, those with a past 12-month experience were more likely to report positive effects of cannabis on work vs. no effect: anxiety (17.7%: AOR = 1.49; 1.22–1.82), depression (18.1%: AOR = 1.51; 1.24–1.85), PTSD (22.5%: AOR = 1.63; 1.22–2.19), bipolar disorder (22.4%: AOR= 1.49; 1.03–2.16), psychosis (35.9%: AOR = 2.95; 1.74–5.00). Compared to no experience of each condition, a past 12-month experience of bipolar disorder (9.0%: AOR = 2.13; 1.25–3.65), and psychosis (9.8%: AOR = 2.94; 1.29–6.69) were associated with higher odds of reporting negative effects on work vs. no effect, while the other conditions presented no significant differences for negative effect.

Studies

Among all past 12-month consumers, 12.4% reported positive effects of cannabis on physical health, and 5.4% reported negative effects. Respondents with a past 12-month experience of each condition were more likely to report positive effects of cannabis on studies vs. no effect, compared to those with no experience of each condition: anxiety (17.2%: AOR = 1.62; 1.31–2.00), depression (16.5%: AOR = 1.41; 1.15–1.75), PTSD (23.7%: AOR = 2.13; 1.58–2.87), bipolar disorder (24.9%: AOR= 1.79; 1.23–2.61), psychosis (32.8%: AOR = 2.67; 1.57–4.55). Compared to no experience of each condition, a past 12-month experience of anxiety (6.7%: AOR = 1.52; 1.12–2.04), PTSD (7.6%: AOR = 1.89;

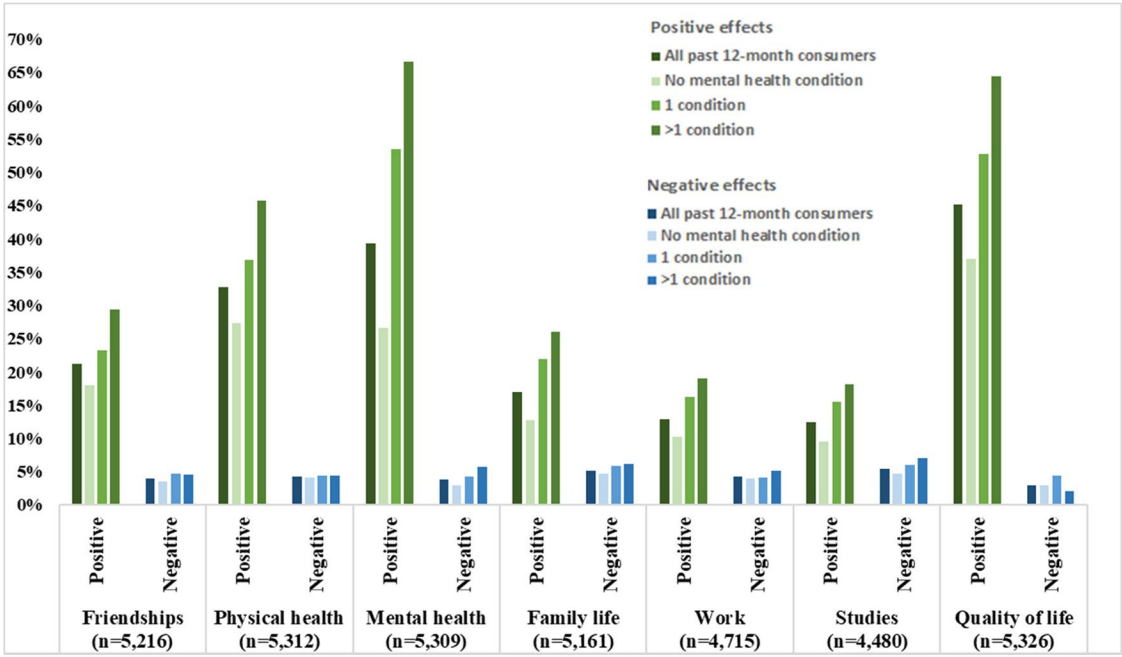

Figure 2. Perceived impact of past 12-month cannabis use among all past 12-month consumers, and by experience of mental health condition in the past 12-months.

1.20–2.99), bipolar disorder (10.0%: AOR = 1.94; 1.14–3.31), and psychosis (12.3%: AOR = 2.90; 1.39–6.06) were associated with higher odds of reporting negative effects on studies vs. no effect.

Quality of life

Among all past 12-month consumers, 45.2% reported positive effects of cannabis on physical health, and 3.0% reported negative effects. Those who reported a past 12-month experience of each condition were more likely to report positive effects of cannabis on quality of life vs. no effect, compared to those with no experience of each condition: anxiety (61.8%: AOR = 2.74; 2.37–3.16), depression (61.0%: AOR = 2.40; 2.08–2.77), PTSD (68.4%: AOR = 2.32; 1.83–2.92), bipolar disorder (66.8%: AOR= 2.01; 1.48–2.73), psychosis (57.8%: AOR = 2.00; 1.19–3.37). In addition, past 12-month experience of psychosis was strongly associated with higher odds of reporting negative effects on quality of life vs. no effect (13.9%: AOR = 6.85; 3.27–14.33).

Used cannabis to improve or manage symptoms

As Table 3 shows, 54% of all past 12-month consumers reported using cannabis to improve or manage any symptoms of condition. Consumers who reported experiencing >1 mental health condition—as well as each of the 5 specific conditions—were significantly more likely to use cannabis to manage symptoms compared to those with one condition or no condition ($p < .001$), and the use of cannabis to manage symptoms of mental health was highest amongst consumers who experienced PTSD and bipolar disorder (Table 3).

Discussion

The results from this study indicated that approximately 7% of all past 12-month cannabis consumers sought medical help for adverse effects from cannabis use. To our knowledge, this is the first survey conducted among national samples of respondents in Canada and the US, to examine the rate of medical help seeking for adverse events from cannabis, as most previous research comes from hospitalization records or health administrative data. Medical help-seeking was more prevalent among those who experienced one or more mental health conditions, consistent with existing evidence on increased rates cannabis-related ED visits and hospitalizations among those with mental health diagnoses (Hall et al., 2018; Maloney-Hall et al., 2020; NASEM, 2017). Particularly, consumers who experienced psychosis, bipolar disorder, and depression were more likely to seek medical help for cannabis use. This is unsurprising given the negative effect that cannabis may have on these conditions, especially among those with psychosis and bipolar disorder (S. Lev-Ran et al., 2014; Lev-Ran et al., 2013; Moore et al., 2007). For example, evidence has shown an increased risk of relapse to psychosis and longer hospital admissions following continued cannabis use after onset of psychosis (Schoeler et al., 2016).

Consumers with PTSD were more likely to report a greater number of adverse health effects (heart problems, panic reactions, flashbacks, depression), followed by bipolar disorder (panic reactions, hallucinations, flashbacks), and psychosis (flashbacks, dissociations). For these conditions, there is evidence indicating cannabis use is associated with increased symptom severity and negative symptomatic outcomes (Gibbs et al., 2015; Lev-Ran et al., 2013; Moore et al., 2007; Wilkinson et al., 2015). However, it is unclear whether

Table 3. Correlates of past 12-month cannabis use to improve/manage any mental health symptoms, by past 12-month experience of mental condition* (n = 6,291).

	Used cannabis to manage/ improve any symptoms			
	% (n)	AOR	95% CI	*p* value
No anxiety	35.2 (1,348)	Ref		
Anxiety	83.1 (2,053)	9.92	(8.63, 11.40)	<0.001
No depression	40.3 (1,706)	Ref		
Depression	82.4 (1,695)	7.00	(6.09, 8.03)	<0.001
No PTSD	50.3 (2,872)	Ref		
PTSD	90.7 (529)	8.86	(6.61, 11.89)	<0.001
No bipolar	51.9 (3,084)	Ref		
Bipolar	90.8 (317)	7.64	(5.24, 11.14)	<0.001
No psychosis	53.2 (3,362)	Ref		
Psychosis	85.4 (139)	4.91	(3.12, 7.74)	<0.001
No conditions	26.5 (834)	Ref		
One condition	75.9 (1,090)	10.14	(8.66, 11.88)	<0.001
>1 condition	86.1 (1,477)	18.74	(15.75, 22.28)	<0.001
All past 12-month consumers	54.1 (3,401)			

* Binary logistic models adjusted for age, sex at birth, ethnicity, cannabis use frequency, education, country. Separate models run for each condition and index variable.

the adverse effects reported by consumers were elicited by cannabis use, or if the reactions were symptoms resulting from an existing mental condition. The comorbid nature of mental health conditions is also reflected in the fact that a proportion of respondents who experienced >1 mental health condition sought help for specific adverse health effects related to cannabis use (ranging from 15% for dissociation to 33% for nausea/vomiting).

Over half (54%) of past year consumers reported using cannabis to manage or improve mental health. This rate is higher than other surveys such as the Canadian Tobacco Alcohol and Drugs Survey, in which 37% of past year cannabis users reported using cannabis for medical purposes. Dissimilar patterns could be a result of differences in the terminology of the questions asked (e.g., reporting "medical use of cannabis" vs. "use of cannabis for mental health") (Government of Canada, 2017).

Consumers who experienced mental health conditions consistently reported higher self-perceived positive effects of cannabis use across all seven categories. Interestingly, the perceived positive effects of cannabis were greatest for the mental health (67%) and quality of life (64%) categories. The findings also indicate that a high proportion of consumers who experienced a mental health condition reported using cannabis to manage symptoms of a condition. This may reflect the increased sensitivity those with mental health conditions possess with regard to the benefits and harms of cannabis use (Cousijn et al., 2018). A plausible explanation for the high prevalence of self-perceived positive effects could be that those with mental conditions use cannabis to manage symptoms that would otherwise impede on specific areas of their lives, and thus symptom alleviation would be viewed as a positive experience. For example, if one experiences difficulties with interpersonal relationships, stress, concentration, negative mood or irritability, cannabis may be used as a form of self-medication, as its acute effects may seemingly provide relief in these areas depending on the dose and concentration (THC/CBD levels) consumed (Abrams, 2018; Black et al., 2019).

In contrast to self-reported "positive" effects of cannabis use, perceptions of negative effects were substantially lower across all categories (3–7%), with fewer differences among consumers with and without experience of a mental health condition. Notably, consumers with psychosis were more likely to report negative effects of cannabis use across all seven categories. Overall, these results present a strong case that the risks related to cannabis use are worse for those who experience psychosis compared to other mental health conditions. Consumers who experienced bipolar disorder had negative self-perceived effects of cannabis on family life, work and studies, and those with anxiety and PTSD were more likely to report negative self-perceived effect on studies. This potentially adds to previous evidence which suggests links between heavy cannabis use and reduced educational attainment, lower income, and adverse consequences in the workplace (Brook et al., 2013; MacDonald et al., 2010). For each specific condition, consumers were also more likely to report negative perceived effects of cannabis on mental health. These findings are consistent with previous studies which demonstrated lower self-reported mental health related QoL scores among regular cannabis users with anxiety and depression (Feingold et al., 2017; Lev-Ran et al., 2012). The negative effects could be attributed to the fact that although cannabis may be initially used for immediate relief of symptoms, its effects are only short-term. Over time, consumers might be left with an increased inability to regulate symptoms of distress, leading to an increased vulnerability to negative mental health related outcomes (Koob & Le Moal, 2001; Lowe et al., 2019; McGuckin et al., 2020).

Some limitations of the study should be noted. The ICPS sample is not recruited using probability-based sampling, therefore, it cannot be assumed to be nationally representative, and all survey findings may not translate to the general Canadian or American cannabis consumer experience. However, the 2018 ICPS sample has similar prevalence of cannabis use to national benchmark surveys in Canada and the US (Hammond et al., 2020a). For example, in Canada, the 2018 ICPS prevalence for "ever use" was 56.5% vs. 58.8% for the Canadian Cannabis Survey, and 8.9% for daily prevalence vs. 9.1% for the NCS for the corresponding age groups (CCS, 2018). Additionally, the patterns of cannabis use among consumers (e.g., frequency of use and types of

products used) are very similar to national benchmark studies (Goodman et al., 2020).

This study is subject to common limitations of survey research including potential bias due to non-response and social desirability. Specifically, the measure used for mental health status (past 12-month experience of a mental health condition) is based on self-report, thus different results could be anticipated if the analysis were instead based on clinical interview or diagnosis. It is possible that beliefs or expectancies about the potential benefits related to cannabis use, or even a placebo effect, could have influenced the perception and reporting of positive impacts (Bon-Miller et al., 2014) (Metrik et al., 2009). The categorization of mental health conditions in the survey measure could have affected the responses and prevalence estimates, due to certain mental health problems being grouped together. For example, the option for past 12-month experience of PTSD asks about the experience of "PTSD or traumatic event (e.g., abuse/loss)" when these problems can occur independent of each other. In addition, the inclusion of only those who have consumed cannabis in the past 12-months could have contributed to more favorable responses, as those with negative experiences are less likely to continue cannabis use, and thus less likely to make their way into the analysis.

The ICPS survey also included a measure for self-reported diagnosis of a mental health condition. Preliminary analyses were conducted to examine bivariate associations between these measures with the primary outcome variables, and the patterns were highly consistent for both mental health measures. Given that mental health conditions can often go undiagnosed, the "past 12-month experience" measure was selected as the primary independent variable for this study. This measure also better aligns with our outcome measures, which were based on perceived effects and adverse effects of cannabis in the past 12-months. Some sub-group analyses in this study had limited statistical power due to smaller sample sizes, such as analyses of specific adverse events by mental health condition.

The ICPS estimates for prevalence of mental health diagnoses are generally higher compared to nationally representative surveys (CCHS, 2018; SAMHSA, 2018). Furthermore, compared to in-person surveys or telephone-assisted interviews, the online survey mode of the ICPS may provide greater anonymity and promote more truthful reporting on sensitive topics such as cannabis use or mental health (Grucza et al., 2016). The cross-sectional design of this study does not allow conclusions to be drawn about the existence or direction of causality. Thus, it is not possible to infer the temporal association between mental health diagnosis and cannabis use or adverse events experienced.

Conclusion

Over half of past-year consumers reported using cannabis to manage or improve mental health. Additionally, consumers with mental health conditions were more likely to perceive that cannabis has a positive impact in most areas of their life, including mental health. For conditions with more substantial evidence suggesting harmful effects of cannabis use (e.g., psychosis, bipolar disorder), greater self-reported use of cannabis to manage symptoms of mental health was observed, as well as greater help-seeking behaviors and self-perceived negative effects of cannabis. Reports of negative effects from cannabis use were substantially lower than positive effects; nevertheless, approximately 7% of past 12-month cannabis users reported seeking medical help for adverse effects from cannabis, including 7% of daily/near daily users. Overall, the relationship between cannabis use and mental health is complex, disorder specific, and may include a combination of perceived benefits as well as harms.

Declaration of interest

The authors report no conflict of interest.

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