

Changes in Cannabis Use Patterns in Psychiatric Populations Pre- and Post-Legalization of Recreational Cannabis Use in Canada: A Repeated Cross-Sectional Survey

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ABSTRACT

Objective: Since the federal Canadian government legalized cannabis in 2018, cannabis use in the general population has slightly increased. However, little is known about the impact of cannabis legalization on patterns of cannabis use in psychiatric populations. **Method:** We studied changes in daily/almost daily and average 30-day cannabis use amongst individuals currently using cannabis who reported past 12-month experiences of specific mental health disorders and among those without past 12-month experiences of any mental health disorder before and after Canadian legalization of recreational cannabis use ($N = 13,527$). Data came from Canadian respondents in Wave 1 (August–October 2018), Wave 2 (September–October 2019), and Wave 3 (September–November 2020) of the International Cannabis Policy Study (ICPS). **Results:** After adjustment for covariates, among individuals currently using cannabis, the odds of using cannabis daily/almost daily increased only in individuals with schizophrenia between Wave 1 and Waves 3 ($aOR = 9.19$, 95% CI: 2.46 – 34.37). Similarly, significant increases in average 30-day cannabis use between Wave 1 ($M = 12.80$, $SE = 1.65$) and Wave 3 ($M = 18.07$, $SE = 1.03$) were observed only among individuals with schizophrenia [$F(1,2) = 4.58$, $p < .05$]. No significant changes in daily/almost daily or average past 30-day cannabis use were observed in those without mental health problems or those reporting anxiety, depression, PTSD, bipolar disorder, or substance use disorders. **Conclusions:** Since legalization, cannabis use has significantly increased only among people with schizophrenia, highlighting the need for targeted public health prevention programs.

Key words: cannabis; legalization; Canada; psychiatric disorders; psychosis; schizophrenia

On October 17, 2018, Canada became the second nation after Uruguay to legalize recreational cannabis use with Bill C-45. Under this bill, the production, cultivation, processing, testing, licensing, medical sales, advertising and marketing regulations, labeling, health warnings, and shared taxation of cannabis products falls under the jurisdiction of the federal government. In contrast, provinces and territories are primarily responsible for regulating retail sales, both online and in physical stores. Provincial and territorial governments also have the ability to adjust the minimum age limit, the possession amounts, and add further regulations on personal cultivation of cannabis (Hall et al., 2022). Initially, Bill C-45 authorized the production, distribution, and sale, both wholesale and retail, of a limited range of cannabis products, which included dried cannabis, fresh cannabis, cannabis plants, cannabis plant seeds, and cannabis oil. However, one year later, amendments were made, which permitted the manufacture, distribution, and sale of three additional classes of cannabis products, including edibles, extracts, and topicals.

The primary goals of legalization were to limit underage access, reduce criminal justice system resources spent on cannabis possession and trafficking, ensure quality control of cannabis consumed to protect public health, reduce stigma associated with illegal cannabis use, and increase consumer awareness of health risks associated with cannabis use (Government of Canada, 2018). Despite these proposed benefits of legalization, the health impacts of this significant policy change in Canada, including the effects of legalization on cannabis use patterns in psychiatric populations, remain unknown.

There is a multifaceted relationship between cannabis use and psychiatric disorders. Cross-sectional and longitudinal effects of cannabis use on schizophrenia are consistently documented (D'Souza et al., 2022; Sorkhou et al., 2021), with strong evidence suggesting that frequent use of cannabis increases the risk of developing psychotic symptoms (Murray et al., 2016; Zammit et al., 2002). Comparatively, prospective studies exploring the relationship between frequency of cannabis use and other psychiatric disorders including mood (Feingold et al., 2015; Van Laar et al., 2007) and anxiety disorders (Hayatbakhsh et al., 2007), yield less consistent results. Specifically, while some studies find worsening of

mood and depressive symptoms, other have failed to replicate such findings (for a review see, (Sorkhou et al., 2024)). Nonetheless, there is considerable evidence that frequent, non-medical cannabis use may impede treatment recovery and treatment engagement in people with psychiatric disorders, constituting a negative effect of cannabis use on mental health. In patients with major depressive disorder, for example, frequent cannabis use may lead to a worsening of symptoms, more frequent depressive episodes, and poorer psychosocial functioning (Bahorik et al., 2017; Bricker et al., 2007). Similar findings are demonstrated in bipolar disorder (Lev-Ran et al., 2013), post-traumatic stress disorder (PTSD) (Johnson et al., 2016; Rodas et al., 2024), anxiety (Buckner et al., 2017; Tepe et al., 2012), substance use disorders (Subbaraman et al., 2017), and psychotic-spectrum disorders (Schoeler et al., 2016), where those using cannabis report more severe symptoms, longer duration of active illness, poorer functional ability, and higher rates of hospitalization.

Despite potential adverse effects of cannabis use in psychiatric populations, the perception of risks related to its use may be lower in individuals with a mental health disorder compared to those without a mental illness (Pacek et al., 2020). For example, in a recent nationally representative American study examining trends in the prevalence and risk perceptions of cannabis use between 2005 and 2017, individuals with depression experienced a greater decline in perception of risk than nondepressed controls (Pacek et al., 2020). Coinciding with these changes in risk perceptions, cannabis use rates were twice as high among participants with depression than those without depression.

As the legal landscape surrounding cannabis use continues to change globally, concerns have been raised that if not properly implemented, cannabis decriminalization and legalization may impact the general population's perceptions regarding the health risks of cannabis use, potentially increasing consumption (Zvonarev et al., 2019). This is of significant concern in individuals with a mental health disorder, as a growing body of literature indicates potential harms of frequent cannabis use in this vulnerable population (George et al., 2018). Thus, the goal of this investigation is to examine changes in daily or almost daily and average 30-day cannabis use

after Canadian cannabis legalization (October, 2018) specifically among individuals reporting past 12-month experiences of specific mental health disorders and reporting a 12-month history of current cannabis use. The current study is based on data from annual large, cross-sectional surveys conducted among respondents aged 16 – 65 across Canada and the United States since 2018 (International Cannabis Policy Study [ICPS]). Here, we focus on Canadian data between 2018 and 2020 which provides a unique opportunity to study national-level changes in recreational cannabis use among psychiatric populations pre- and post-legalization. We tested two primary hypotheses: Following the legalization of cannabis in Canada in October 2018, individuals with any mental health disorder who reported a history of cannabis use in the past 12 months will demonstrate a significant increase in their (1) daily/almost daily and, (2) average 30-day cannabis use rates.

METHODS

We analyzed repeated cross-sectional data from Waves 1, 2, and 3 of the ICPS conducted in Canada. Data were collected via self-completed web-based surveys conducted in August 27 - October 7, 2018 (immediately before cannabis legalization in Canada), September 13 – October 31, 2019 (1 year post-legalization), and September 3 – November 2, 2020 (2 years post-legalization). Respondents aged 16–65 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 panellists (after targeting for age and country criteria); panellists known to be ineligible were not invited. The survey had a response rate of 1.3% in 2018, 3.7% in 2019, and 1.5% in 2020. Surveys were conducted in English or French in Canada. Median survey times were 20, 25, and 21 minutes, in 2018, 2019, and 2020, respectively. Respondents provided consent prior to completing the survey and received remuneration in accordance with their panel's usual incentive structure (e.g., points-based or monetary rewards, chances to win prizes). The study was reviewed by and received ethics clearance through the University of Waterloo Research Ethics Committee (ORE#31330).

The final cross-sectional Canadian sample comprised 41,093 respondents ($n = 10,057$ in 2018, 15,256 in 2019, 15,780 in 2020). The current analyses were based on the subsample of 13,527 respondents who had reported that they had consumed cannabis within the past 12-months ($n = 2,768$ in 2018, $n = 5,381$ in 2019, $n = 5,378$ in 2020). Post-stratification sample weights were constructed using population estimates from Statistics Canada. Respondents from Canada were classified into age-by-sex-by-province, education, and, except in 2018, age-by-smoking status groups. These sample weights were used throughout the analyses to mitigate the effects of non-response and selection bias and return the sample to population representativeness. A full description of the ICPS methods, sample, and comparisons with national benchmark surveys are available in the ICPS methodology paper (Hammond et al., 2020) and Technical Reports – Wave 1 (2018), Wave 2 (2019), and Wave 3 (2020) (Goodman et al., 2018; 2019; 2020).

Measures

Sociodemographic Variables. Gender identity, age, ethnicity/race, education, perceived income adequacy, and province of residence were collected. Briefly, perceived income adequacy was assessed with a measure that is associated with objective measures of income and wealth (Litwin & Sapir, 2009). Ethnicity/race was assessed with country-specific measures drawn from the Canadian census.

Past 12-month experience of a mental health condition. Participants were asked “Have you experienced this/these mental health problem(s) in the past 12 months?” and were asked to select yes or no from the following list: anxiety (including phobia, obsessive-compulsive disorder or panic disorder); depression (including dysthymia); PTSD; bipolar disorder or mania; psychotic disorder (including schizophrenia); and an alcohol or substance use disorder. Individuals selecting “no” for every mental health condition were recoded to individuals without any mental health problems.

Frequency of cannabis use. Dependent variables included daily/almost daily cannabis use and average number of days of cannabis use in the past month (i.e., average 30-day cannabis use). Daily/almost daily cannabis use was obtained

using the following measure: “How often do you use marijuana?”. Potential responses included, never, more than 12 months ago, less than once per month, one or two times per month, one or more times per week, every day or almost every day. Afterwards, this original variable was recalculated into a binary variable where respondents who reported “every day or almost every day” for cannabis use were coded as 1 (e.g., daily/almost daily cannabis use), and respondents who reported one or more times per week, one or two times per month, less than once per month, more than 12 months ago, or never were coded as 0 (e.g., non-daily/almost daily cannabis use). Similarly, average 30-day cannabis use was obtained using the following measure: “How often do you use marijuana?”. Potential responses included, never, more than 12 months ago, less than once per month, one or two times per month, one or more times per week, every day or almost every day. Respondents who had used cannabis at least once within the previous 12 months were subsequently asked to freely report their frequency of use per week, month, or year, depending on their initial response. Using the numerical free-text responses provided, we calculated a latent variable representing participants' average 30-day cannabis use.

Statistical Analysis

First, descriptive statistics were used to describe the prevalence of individuals without mental health problems, each of the 12-month mental health conditions, average 30-day cannabis use, and frequency of cannabis use. To measure the changes in risk of using cannabis daily/almost daily for each psychiatric condition

and among individuals without mental health problems between Waves 1 (Reference Group), 2, and 3, binary logistic odds ratios were computed where individuals reporting either “(1) less than monthly use,” “(2) one or two times per month,” “(3) one or two times per week,” and “(4) daily or almost daily use” were dichotomized to (1)-(2)-(3) versus (4). Unless otherwise indicated, adjusted odds ratios (aORs) are reported with 95% confidence intervals. To measure changes in average 30-day cannabis use between 2018 – 2020, univariate analyses of covariance (ANCOVAs) were performed for each psychiatric condition. When significant main effects were observed, Bonferroni-corrected post-hoc testing was performed to identify between which time-points a significant change in average 30-day cannabis use occurred. The level of significance for all statistical tests was set at $p < .05$. All models were run in SPSS v.26, and adjusted for the following covariates: age group, gender identity, education, ethnicity/race, region, and income adequacy.

RESULTS

Demographics

Table 1 presents the weighted sample characteristics included in the current analyses from Waves 1, 2, and 3 of the ICPS survey. On average, 34.7% of respondents who used cannabis did so daily at Wave 3, as compared to 32.2% at Wave 1. The most frequent 12-month experience of a psychiatric condition in Waves 1, 2, and 3, was anxiety, with 36.1%, 38.9%, and 40.1% of respondents reporting this condition, respectively.

Table 1. *Weighted Sample Characteristics of Individuals Reporting Past 12-Month Cannabis Use by Year*

Characteristic	Wave 1 (<i>n</i> = 2,768) Weighted % (<i>n</i>)	Wave 2 (<i>n</i> = 5,381) Weighted % (<i>n</i>)	Wave 3 (<i>n</i> = 5,378) Weighted % (<i>n</i>)
Gender Identity			
Female	44.7 (1237)	45.0 (2419)	46.2 (2484)
Male	53.8 (1489)	53.0 (2854)	51.5 (2768)
Transgender/Other	1.5 (33)	2.1 (108)	2.3 (126)
Age Group			
16 – 25	20.5 (567)	19.8 (1063)	18.1 (975)
26 – 35	29.2 (809)	28.3 (1525)	28.3 (1523)
36 – 45	20.5 (567)	20.9 (1126)	21.4 (1152)

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46 – 55	15.9 (441)	17.1 (920)	17.1 (922)
56 – 65	13.9 (384)	13.9 (747)	15.0 (805)
Ethnicity			
White	80.3 (2223)	74.8 (4023)	75.5 (4060)
Black	1.9 (52)	4.0 (214)	4.0 (215)
Asian	4.3 (110)	8.0 (487)	8.8 (471)
Indigenous	7.0 (193)	3.9 (209)	2.7 (146)
Other/Mixed	6.5 (181)	8.3 (408)	9.0 (484)
Education			
Less than high school	17.7 (490)	15.6 (840)	14.5 (778)
High school diploma	27.9 (772)	27.8 (1495)	29.3 (1576)
Some college or technical vocation	35.5 (983)	34.2 (1841)	33.5 (1803)
Bachelor's degree or higher	18.3 (507)	21.3 (1145)	21.8 (1172)
Not stated	.6 (15)	.11 (50)	.9 (49)
Income Adequacy			
Very difficult	9.1 (253)	10.6 (569)	8.9 (480)
Difficult	22.2 (615)	24.5 (1319)	20.5 (1105)
Neither easy nor difficult	36.0 (996)	33.6 (1807)	36.4 (1959)
Easy	19.4 (538)	18.6 (1002)	21.5 (1154)
Very easy	11.1 (307)	9.4 (508)	9.4 (504)
Not stated	2.1 (59)	3.3 (176)	3.3 (176)
Province of Residence			
British Columbia	16.7 (464)	14.3 (770)	14.5 (781)
Alberta	12.5 (347)	12.5 (675)	12.0 (643)
Saskatchewan	3.0 (84)	3.1 (165)	3.4 (180)
Manitoba	3.3 (91)	3.7 (198)	3.4 (184)
Ontario	37.6 (1040)	41.7 (2243)	41.4 (2227)
Quebec	19.5 (541)	17.7 (951)	18.3 (984)
New Brunswick	2.4 (66)	2.3 (122)	2.3 (121)
Nova Scotia	3.0 (83)	3.0 (160)	2.9 (158)
Prince Edward Island	.5 (13)	.4 (21)	.4 (20)
Newfoundland & Labrador	1.5 (40)	1.4 (74)	1.5 (79)
Cannabis Use Frequency			
Past-year but less than monthly	31.2 (863)	32.1 (1729)	29.9 (1610)
Monthly	17.7 (491)	19.8 (1064)	18.7 (1008)
Weekly	18.8 (522)	16.0 (863)	16.7 (896)
Daily/Almost daily	32.2 (893)	32.0 (1724)	34.7 (1863)
Past 12-Month Experience of a Psychiatric Conditions			
Anxiety	36.1 (1000)	38.9 (2094)	40.1 (2159)
Bipolar	3.7 (103)	4.8 (259)	5.3 (285)
Depression	29.3 (812)	32.1 (1727)	32.7 (1760)
Individuals Without Mental Health Problems	53.5 (1481)	51.4 (2767)	49.4 (2655)
PTSD	8.3 (229)	10.4 (558)	10.7 (575)
SCZ	2.3 (64)	1.8 (97)	2.7 (147)
SUD	8.1 (225)	6.7 (363)	6.4 (345)

Note. PTSD: post-traumatic stress disorder; SCZ: schizophrenia; SUD: substance use disorder.

Changes in Daily/Almost Daily Cannabis Use. After adjusting for covariates, between Waves 1 and 3, among those currently using cannabis, the odds of using cannabis

daily/almost daily increased only among individuals with a 12-month experience of schizophrenia from Wave 1 to Waves 2 (aOR = 8.18, 95% CI: 2.65 – 25.71) and 3 (aOR = 9.19,

95% CI: 2.46 – 34.37; Tables 2 and 3). The prevalence of daily/almost daily cannabis use in individuals reporting 12-month schizophrenia was 43.8% in Wave 1, 55.7% in Wave 2, and 48.3% in Wave 3. Among other current cannabis

users, the change in risk of using cannabis daily/almost daily from Waves 1 to Waves 2 and 3 did not significantly change for all other mental health groups or among individuals without a mental health disorder.

Table 2. *Prevalence of Daily/Almost Daily Cannabis Use Between 2018 (Pre-legalization) – 2020 (Post-Legalization) in Canadians Reporting a Mental Health Condition in the Past 12 Months*

Mental Health Disorder	2018 (Wave 1) % (n)	2019 (Wave 2) % (n)	2020 (Wave 3) % (n)
Anxiety	39.8 (398)	38.1 (797)	39.9 (861)
Bipolar Disorder	51.5 (53)	49.8 (129)	43.9 (125)
Depression	41.6 (338)	40.2 (694)	42.7 (751)
Individuals Without Mental Health Problems	26.7 (395)	27.1 (750)	28.7 (763)
PTSD	49.8 (114)	49.3 (275)	45.6 (262)
SCZ	43.8 (28)	55.7 (54)	48.3 (71)
SUD	45.3 (102)	49.3 (179)	47.5 (164)

Note. PTSD: post-traumatic stress disorder; SCZ: schizophrenia; SUD: substance use disorder.

Table 3. *Binary Logistic Regression Model of Adjusted Odds of Using Cannabis Daily/Almost Daily Between 2018 (Pre-legalization) – 2020 (Post-Legalization) in Canadians Reporting a Mental Health Condition in the Past 12 Months*

Mental Health Disorder	Year	Daily Use aOR (95% CI)	p-value
Anxiety	2018	Reference	
	2019	.92 (.79 – 1.08)	.32
	2020	1.02 (.87 – 1.19)	.84
Bipolar Disorder	2018	Reference	
	2019	1.08 (.67 – 1.74)	.76
	2020	.86 (.53 – 1.39)	.54
Depression	2018	Reference	
	2019	.93 (.78 – 1.10)	.40
	2020	1.06 (.89 – 1.26)	.50
Individuals Without Mental Health Problems	2018	Reference	
	2019	.95 (.82 – 1.09)	.44
	2020	1.11 (.96 – 1.27)	.16
PTSD	2018	Reference	
	2019	.99 (.72 – 1.36)	.94
	2020	.89 (.65 – 1.22)	.47
SCZ	2018	Reference	
	2019	8.18 (2.6 – 25.71)	<.01
	2020	9.19 (2.46 – 34.37)	<.01
SUD	2018	Reference	
	2019	1.13 (.80 – 1.60)	.48
	2020	1.17 (.83 – 1.66)	.37

Note. All models have been adjusted for age group, gender identity, education, ethnicity/race, region, and income adequacy. Abbreviations; aOR, Adjusted Odds Ratio; CI, confidence interval.

PTSD: post-traumatic stress disorder; SCZ: schizophrenia; SUD: substance use disorder.

Changes in Average 30-Day Cannabis Use Frequency. After adjusting for covariates, we observed a significant increase in average frequency of 30-day cannabis use among individuals currently using cannabis between Wave 1 (M = 12.80, SE = 1.65) and Wave 3 (M = 18.07, SE = 1.03) in individuals with a 12-month experience of schizophrenia (Table 4; [$F(1,2)=4.58, p =.01$]). Post-hoc analyses revealed

that an increase in frequency of 30-day cannabis use occurred between 2018 and 2019 ($p = .01$) and this was sustained in 2020 ($p = .01$), with no further significant increases between 2019 and 2020. There was no significant change in average 30-day cannabis use among other psychiatric groups or individuals without a mental health disorder.

Table 4. *Changes in Average 30-Day Cannabis Use Frequency Between 2018 – 2020 in Canadians Reporting a Mental Health Condition in the Past 12-Months*

Diagnostic Group	2018 30-Day Cannabis Use Mean (SE)	2019 30-Day Cannabis Use Mean (SE)	2020 30-Day Cannabis Use Mean (SE)	F	p-value
Anxiety	14.11 (.42)	14.35 (.29)	15.11 (.28)	2.69	.07
Bipolar Disorder	16.73 (1.29)	16.83 (.82)	16.71 (.76)	.01	.99
Depression	14.83 (.47)	15.07 (.32)	15.57 (.31)	1.09	.34
Individuals Without Mental Health Problems	11.07 (.32)	10.85 (.23)	11.53 (.24)	2.19	.11
PTSD	17.40 (.89)	17.18 (.56)	16.77 (.54)	.24	.79
Schizophrenia	12.80 (1.65) ^{ab}	18.83 (1.3) ^a	18.07 (1.03) ^b	4.58	.01
SUD	17.01 (.87)	16.74 (.69)	16.67 (.70)	.05	.95

Note. All models have been adjusted for age group, gender identity, education, ethnicity/race, region, and income adequacy. Post-hoc comparisons: ^a significant difference between 2018 and 2019 ($p < .05$) ^b significant difference between 2018 and 2020 ($p < .05$).

SE: standard error; PTSD: post-traumatic stress disorder; SCZ: schizophrenia; SUD: substance use disorder.

DISCUSSION

Using nationally representative data from the ICPS, we investigated changes in cannabis use patterns following cannabis legalization in Canada amongst individuals with a 12-month history of cannabis who are reporting a mental health condition in comparison to those without any mental health problems. Results indicated that changes in cannabis use patterns only occurred amongst individuals reporting symptoms of schizophrenia, with increases occurring in both rates of daily/almost daily cannabis use and average frequency of cannabis use in the past 30 days.

There are several hypotheses that may explain the selective increase in cannabis use amongst people with a past year experience of psychotic symptoms or schizophrenia. One possibility is that these persons had poorer access to the series of health warnings and public education

campaigns regarding safe cannabis use and risks of use implemented after cannabis legalization (Hammond et al., 2020). These campaigns include warnings about the health risks of prolonged cannabis use, knowledge of Δ -9-tetrahydrocannabinol (THC) or cannabidiol (CBD) content, along with recommended limits on dosing (Hammond et al., 2020). Individuals with schizophrenia or psychotic disorders may not have ready access to this public health information. For example, public health campaigns may not be sufficiently: 1) outlining specific risks associated with using cannabis for individuals at high risk for schizophrenia or who have a psychotic disorder; 2) presenting information in a manner that it appears relevant and interesting; 3) appearing in places (e.g., social media versus television) that target populations are likely to see and attend to it; 4) employing fear-based tactics, which may paradoxically reduce campaign efficacy (Atkin, 2001). A comparable example is

Canadian public health messaging related to tobacco use, which coincided with a significant decrease in tobacco consumption in the general population [31% in 1989 (Eliany & Courtemanche, 1989) versus 11.9% in 2019 (East et al., 2021)]. Comparatively, in individuals with schizophrenia, tobacco prevalence has remained staggeringly high at approximately 60-70%, with studies showing no significant changes from 1991 (Dickerson et al., 2013; Tidey & Miller, 2015). These findings suggest that the approaches employed by regulatory frameworks to reduce tobacco use may not have been as effective among individuals with schizophrenia in comparison to the general population. If similar challenges exist in reaching and resonating with individuals with schizophrenia regarding tobacco use, it is conceivable that analogous barriers could hinder the impact of public health campaigns about cannabis use. Our findings underscore the need for targeted and innovative approaches in developing public health campaigns that can effectively communicate the risks associated with cannabis use to individuals with schizophrenia and psychotic disorders.

Second, cannabis legalization has made cannabis easier to access by adults and notably, it has substantially reduced the price of cannabis products (Mahamad et al., 2020). This has made daily/almost daily cannabis much more affordable to persons with schizophrenia, many of whom have incomes that are much lower than their peers because of lower rates of paid employment and greater reliance on social welfare for income (Aro et al., 1995). Given the increased affordability and accessibility of cannabis following legalization, individuals with schizophrenia may find it more financially feasible to engage in frequent cannabis use. This may lead to a disproportionate impact on this population of cannabis users, underscoring the importance of closely evaluating the implications of cannabis legalization on individuals with schizophrenia.

A third possible explanation for the selective increase in daily/almost daily and average 30-day cannabis use rates pre- and post-legalization amongst individuals experiencing schizophrenia or psychotic-related symptoms is that cannabis has been used for self-medication purposes. Legalization has increased access to cannabis, thus people with psychosis may now increasingly

use cannabis to self-medicate, including remediation of feelings of boredom, isolation, and negative affect (Lowe et al., 2019). However, the specificity of the finding in individuals with psychotic disorders is unclear because self-medication using cannabis has also been proposed to occur for other disorders, including depression and anxiety (Wallis et al., 2022). Further, there are few empirical findings that support the self-medication hypothesis (Mustonen et al., 2018; Sideli et al., 2020). Longitudinal studies evaluating clinical outcomes in individuals with psychotic-spectrum disorders who reduce or abstain from cannabis after receiving a diagnosis have inconsistent findings with respect to perceived benefits in cannabis use. In a recent meta-analysis examining outcomes of patients with schizophrenia who either continued or discontinued cannabis use after receiving a diagnosis, Schoeler et al. (2016) found that individuals who discontinued cannabis use were significantly more likely than continuing users to experience decreases in positive symptoms and demonstrate improvements in psychosocial functioning.

Specific increases in cannabis use amongst individuals with psychotic-spectrum disorders is an important public health concern. Relative to other mental health disorders, including mood and anxiety disorders, there is consistent observational evidence demonstrating that regular cannabis use is associated with an elevated risk of developing psychotic symptoms or disorders, in those who are at risk. Recently, Di Forti and colleagues observed a significant increase in the incidence of psychotic disorders among five European countries, which was positively correlated with an increase in the prevalence of daily cannabis use (Di Forti et al., 2019). Namely, the odds of developing a psychotic disorder among those using cannabis daily were 3.2 times higher than those not using cannabis. Moreover, the authors found that availability of high-potency cannabis corresponded with a higher incidence for psychotic disorders across the five countries. Other research has similarly indicated that adults who use cannabis daily or almost daily are significantly more likely than infrequent- and non-users to be later diagnosed with a psychotic-spectrum disorder (Giordano et al., 2015; Van Os et al., 2002). Thus, increasing use of cannabis in individuals at risk for psychosis

or with early psychosis may have serious adverse effects on disease progression and prognosis.

The current study's findings need to be interpreted in light of several limitations. First, due to the cross-sectional nature of our repeated surveys, causal inferences between cannabis use and mental health conditions cannot be made. Therefore, while our findings indicate an increase in daily/almost daily and average 30-day cannabis use amongst individuals with schizophrenia, it remains unknown whether frequent cannabis use precipitates the development of such symptoms or increases the severity of such symptoms. Moreover, the study is limited in determining whether an increase in cannabis use prevalence amongst mental health populations increased overall, as we only examined usage patterns among individuals reporting current cannabis use. Thus, it remains unknown whether legalization has increased cannabis use prevalence amongst individuals with mental health conditions. A third limitation concerns the tool employed to evaluate mental health status, which composed of a single-item self-report question for each diagnostic group. The categorization of mental health conditions in the ICPS measure may have impacted the responses. For example, the option for past 12-month experience of anxiety included generalized anxiety, phobia, obsessive-compulsive disorder, or a panic disorder. Moreover, the ICPS estimates for prevalence of mental health diagnoses are higher in comparison to nationally representative surveys (Smetanin et al., 2015), which may have arisen due to self-report bias. Compared to in-person surveys or telephone interviews, the online survey mode of the ICPS may offer greater anonymity and promote more truthful reporting on sensitive subjects such as cannabis and mental health. However, the ICPS sample exhibits comparable rates of cannabis use to those found in national benchmark surveys conducted in Canada (Hammond et al., 2020). For instance, the 2018 ICPS reported a prevalence of 11.3% for daily/almost daily cannabis use, closely aligned with the National Cannabis Survey's (NCS) estimate of 7.9% (Rotermann, 2019). Furthermore, respondents were recruited using non-probability-based sampling. As such, the findings do not provide nationally representative estimates, and were subsequently weighted by age group, gender identity, education,

ethnicity/race, region, and income adequacy in Canada. While our study detected statistically significant increases in cannabis use following legalization amongst individuals diagnosed with schizophrenia, it is crucial to recognize the limited representation of this particular psychiatric population within our study sample. This limitation necessitates caution in interpreting and generalizing these findings. Larger, more inclusive studies are needed to validate these results and better understand the complex relationship between cannabis use patterns and legalization in individuals with schizophrenia. Furthermore, although our study sought to control for age in our analyses, it is important to note that the youngest age range included in our study spans from 16 to 25 years old. This range does not differentiate the legal age for purchasing cannabis. Additionally, these age groups encompass a significant period of brain developmental and behavioral changes, during which substance use is commonly initiated and mental disorders may emerge years later. In addition, the COVID-19 pandemic arose during Wave 3 of the study, which may have confounded our observed findings. The COVID-19 pandemic and associated public health measures implemented to reduce transmission of the virus has yielded both direct and indirect effects on cannabis use patterns (Imtiaz et al., 2021; MacKillop et al., 2021). During the initial lockdowns triggered by the pandemic, most regions classified non-medical cannabis retail as essential or treated it as such (CCSA, 2022). Across Canada, cannabis retail stores experienced a surge in sales, except for Prince Edward Island after the initial pandemic waves (Myran et al., 2020). In the early stages of the pandemic, one study observed that cannabis consumption in Canada remained steady (Imtiaz et al., 2021), while another revealed that among Canadians using cannabis, more than one third of the sample reported that their cannabis consumption had increased during the pandemic (Statistics Canada, 2021). Consistent with previous findings, we observed that in our total sample, daily/almost daily cannabis use and average 30-day cannabis use slightly increased between 2019 – 2020, with significant increases occurring amongst individuals with schizophrenia. A final limitation is that the true depiction of the consequences of cannabis legalization may require many years to

develop (Hall et al., 2019). In Canada, only dried flower and some cannabis oils were available for legal purchase during the first year of legalization (Health Canada, 2019). Additionally, the legal cannabis market in Canada exhibits disparities across provinces in key domains, including the structure of retail operations, the minimum age for purchasing cannabis (e.g., 18 in Quebec and Alberta, 19 in the rest of Canada), pricing dynamics, and product standards (Government of Canada, 2018; Hall et al., 2022; Mahamad et al., 2020). Considering these factors, a two-year follow-up period post-legalization in Canada may not capture the full spectrum of effects associated with changes in cannabis use patterns among individuals with mental health disorders.

In conclusion, our findings are the first to suggest that since the legalization of recreational cannabis use in Canada in 2018, the frequency of cannabis use has selectively increased amongst individuals with schizophrenia and psychotic symptoms. These results clearly necessitate further investigation in subsequent waves of the ICPS, including explorations of reasons for cannabis use, potency of THC, and concurrent substance use. These findings may have notable adverse public health consequences, as this population is vulnerable to significant harms associated with frequent cannabis use, including more severe symptom profiles, more frequent psychotic relapse rates and reduced psychosocial functioning (Athanassiou et al., 2021; Murray et al., 2016). As other nations and American states consider legalizing cannabis, prioritizing effective public health interventions for at-risk populations, including those with mental health disorders, is crucial. Tailored prevention programs should offer early education and accurate information concerning the potential risks associated with cannabis use. Moreover, regulatory frameworks can be designed with a focus on safeguarding individuals with mental health disorders by enforcing clearer product labels and considering stricter potency limits. Finally, better collaboration between mental health and addictions professionals, along with enhanced screening of cannabis use in mental health settings, are essential to address the intricate interplay between cannabis use and mental health. Moving forward, future longitudinal research collecting similar population-based cannabis use patterns and

mental health-outcome data over longer periods will be necessary to draw firmer conclusions regarding the potential consequences of cannabis legalization on mental health outcomes.

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