ORIGINAL PAPER

Patterns of problematic cannabis use in Canada pre- and post-legalisation: Differences by neighbourhood deprivation, individual socioeconomic factors and race/ethnicity

Fathima Fataar[1] | Pete Driezen[1,2] | Akwasi Owusu-Bempah[3] | David Hammond[1]

[1]School of Public Health Sciences, University of Waterloo, Waterloo, Canada

[2]Department of Psychology, University of Waterloo, Waterloo, Canada

[3]Department of Sociology, University of Toronto, Toronto, Canada

Correspondence
Dr David Hammond, 200 University Ave W, Waterloo, ON N2L 3G1, Canada.
Email: dhammond@uwaterloo.ca

Abstract

Introduction: The legalisation of cannabis in Canada in 2018, and subsequent increase in prevalence of use, has generated interest in understanding potential changes in problematic patterns of use, including by socio-demographic factors such as race/ethnicity and neighbourhood deprivation level.

Methods: This study used repeat cross-sectional data from three waves of the International Cannabis Policy Study web-based survey. Data were collected from respondents aged 16–65 prior to cannabis legalisation in 2018 ($n = 8704$), and post-legalisation in 2019 ($n = 12,236$) and 2020 ($n = 12,815$). Respondents' postal codes were linked to the INSPQ neighbourhood deprivation index. Multinomial regression models examined differences in problematic use by socio-demographic and socio-economic factors and over time.

Results: No evidence of a change in the proportion of those aged 16–65 in Canada whose cannabis use would be classified as 'high risk' was noted from before cannabis legalisation (2018 = 1.5%) to 12 or 24 months after legalisation (2019 = 1.5%, 2020 = 1.6%; $F = 0.17$, $p = 0.96$). Problematic use differed by socio-demographic factors. For example, consumers from the most materially deprived neighbourhoods were more likely to experience 'moderate' vs 'low risk' compared to those living outside deprived neighbourhoods ($p < 0.01$ for all). Results were mixed for race/ethnicity and comparisons for high risk were limited by small sample sizes for some groups. Differences across subgroups were consistent from 2018 to 2020.

Discussion and Conclusions: The risk of problematic cannabis use does not appear to have increased in the 2 years following cannabis legalisation in Canada. Disparities in problematic use persisted, with some racial minority and marginalised groups experiencing higher risk.

1 | INTRODUCTION

Legalisation of non-medical cannabis in Canada in October 2018 was accompanied by many expectations and concerns. Proponents of legalisation argued that reducing the illicit market, as well as safer and easier access to legal cannabis, would reduce the disproportionate negative legal implications for cannabis possession, particularly for Black and Indigenous communities [1, 2]. However, there is also concern that increased accessibility and lower cost could increase cannabis use, resulting in higher incidence of problematic use [3].

Under a framework of criminal prohibition, prevalence of 'any' cannabis use is often interpreted synonymously with problematic use. As an increasing number of jurisdictions legalise cannabis, there is a need for more meaningful indicators of problematic use [4, 5]. Guidelines have been developed to identify individual indicators of problematic use, such as cannabis-impaired driving and adverse health events [6, 7], as well as aggregate measures of problematic use [4, 5]. Widely-used aggregate measures of problematic use include the Diagnostic and Statistical Manual of Mental Disorders criteria for cannabis dependence and abuse [8], the Cannabis Use Disorder Identification Test-Revised [9] and the World Health Organization Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) [10]. These scales typically assess a combination of frequent use as well as negative consequences on employment, social relationships and health.

Initial evidence from Canada suggests that the prevalence of past 3-month cannabis use increased from 14% in the first quarter of 2018, prior to legalisation, to 17% in the first quarter of 2019, following legalisation in October 2018, to 20% in the fourth quarter of 2020 [11]. Data from the Canadian Cannabis Survey found that past 12-month cannabis use increased slightly from 22% in 2018, to 25% in 2019 and 27% in 2020 [12]. It is important to understand if the increase in prevalence is also associated with an increase in problematic use.

Several studies in Canada have presented estimates of problematic cannabis use from nationally representative samples aged 15 and over. A 2013 report estimated past 12-month prevalence of problematic cannabis use, as measured by meeting criteria for cannabis dependence or abuse, at 1.3% [13], with another study estimating prevalence of 'high risk' use at 1.9% among past 3-month consumers, using the ASSIST measure [14]. The most recent nationally representative data in 2019 reported prevalence of 'high risk' for problematic use among past 12-month consumers at 1.1% [15]. In the United States, past 12-month national estimates of problematic use have primarily used Diagnostic and Statistical Manual of Mental Disorders, fourth edition, criteria for cannabis use disorders. Among adults, estimates were 1.5% in 2002 [16, 17], 2.9% in 2013 [16] and 1.4% in 2017 [17]. Among those 12 and over estimates ranged from 1.6% in 2014 [18] to 5.1% in 2020 [19]. To date, the impact of legalisation on individual and aggregate indicators of problematic cannabis use remains unclear. Preliminary evidence on cannabis-impaired driving is mixed, with some research from the United States suggesting increases post-legalisation followed by a decreasing trend; other research suggests no difference between US states that have and have not legalised [20–23]. Adverse events and health-care visits have increased in jurisdictions that have legalised cannabis, typically due to unintentional ingestion of edibles [24–28]. Further analysis is needed to determine the extent to which these changes are a result of legalisation or increased monitoring or reporting [29]. Consumers in US states that have legalised non-medical cannabis score higher on risk indices designed to measure differences in potential harms of use [30], while prevalence of cannabis use disorder increased slightly among adolescents and adults 26 and older, but not those aged 18–25, following legalisation [31]. The impact of cannabis legalisation remains unclear due to a lack of detailed longitudinal data using sufficient measures to distinguish between pre-existing secular trends and the impact of legalisation [32].

Studies have also reported differences in socio-economic and socio-demographic risk factors for problematic use. In Canada, lower household income has been associated with increased likelihood of problematic use [33]. Data from the United States suggests that, between 2001 and 2014, cannabis use substantially increased across all income and education groups, while cannabis use disorders were more likely among those with low income and those who had not completed a college degree [16, 34]. In terms of socio-demographic differences, previous work in both Canada and the United States has found that males and young adults are at greater risk for problematic cannabis use [14, 16, 34]. Differences in prevalence of problematic use based on race/ethnicity have also been reported, with some studies in the United States reporting increased odds of cannabis use disorders among Black, mixed-race and Indigenous individuals compared to White individuals [35, 36]. One study which looked at racial differences in cannabis use

disorder over time found that prevalence increased to a greater extent among Black versus White individuals [16]. While studies looking at racial/ethnic differences in problematic use in Canada are limited, a study in Ontario, Canada found that those of 'Caribbean' or 'Northern European' descent were more likely to report moderate/high problematic cannabis use compared to those who identified as 'Canadian' [37]. We are unaware of any work which looks at racial or ethnic differences in problematic cannabis use following legalisation in Canada.

Beyond 'individual level' indicators of problematic use, there is limited research on 'environmental level' indicators, such as neighbourhood deprivation. In neighbourhoods with high levels of deprivation there are often fewer social and material resources for those in the community to rely on. Deprived environments also present more life stressors, leading to substance use as a coping strategy [34, 38, 39]. Limited research has focused on the association between neighbourhood deprivation and cannabis use, and to our knowledge there is no work on problematic cannabis use and neighbourhood deprivation in Canada. Mixed results have been reported from the few US studies which have included cannabis when examining substance use within neighbourhoods, making it unclear whether neighbourhood deprivation is independently associated with problematic use after accounting for individual level socio-economic factors [38, 40, 41]. It is expected that the examination of potential differences in problematic use based on neighbourhood deprivation can provide insight into the unique challenges faced within communities and open the discussion on the need for policies to protect vulnerable populations. Based on the limited data currently available, it is unclear if problematic use of cannabis has changed overall or by sociodemographic and socioeconomic factors following legalisation and warrants further study.

The objective of the current study was to examine differences in problematic use, measured using the World Health Organization ASSIST tool, by: (i) material and social neighbourhood deprivation; (ii) individual socioeconomic factors; and (iii) race/ethnicity prior to and in the 2 years following legalisation of adult non-medical cannabis in Canada. There were four main hypotheses: (i) neighbourhood deprivation is an independent predictor of problematic use, with lower odds of 'high risk' problematic use in more privileged neighbourhoods; (ii) the odds of 'high risk' problematic use will be lower among those with higher perceived income adequacy and education; (iii) there will be greater 'high risk' problematic use among Black and Indigenous individuals compared to White individuals; and (iv) no changes will be observed in overall prevalence of problematic use in the 2 years following legalisation in Canada.

2 | METHODS

Data are from waves 1 to 3 of the Canadian arm of the International Cannabis Policy Study (ICPS). Data were collected via self-completed web-based surveys conducted in September/October 2018, 2019 and 2020 with respondents aged 16–65 years. Respondents were recruited using non-probability sampling methods through the Nielsen Consumer Insights Global Panel and their partners' panels. Email invitations (with a unique link) were sent to a random sample of eligible panellists. Surveys were conducted in English or French. Respondents provided consent prior to completing the survey and received remuneration in accordance with their panel's usual incentive structure. The cooperation rate, which was calculated based on the American Association for Public Opinion Research's Cooperation Rate #2 as the number of respondents who completed the survey divided by the total number of respondents who accessed the survey link, was 64.2% in 2018, 62.9% in 2019, and 62.0% in 2020 [42]. A full description of the study methods are available in the ICPS technical reports at http://cannabisproject.ca/methods.

The study was reviewed by and received ethics clearance through a University of Waterloo Research Ethics Committee (ORE#31330).

2.1 | Measures

Sociodemographic variables included age, sex at birth (female/male) and degree of urbanisation (rural/urban).

2.1.1 | Past 3-month cannabis use status

Past 12-month cannabis consumers were categorised into one of five mutually exclusive categories based on past 3-month cannabis use (derived from the ICPS most recent cannabis use and current cannabis use variables): never; once or twice; monthly; weekly; daily/almost daily.

2.1.2 | Problematic use

The World Health Organization ASSIST tool assesses the level of risk for developing health and other problems from cannabis use based on past 3-month cannabis use as well as five additional questions which assess desire to

use, health, social, legal or financial problems, failure to meet expectations, as well as concerns from friends/family and failure to control use [10]. The ASSIST risk assessment score ranges from 0 to 39. Respondents were categorised to one of three problematic use risk groups: low risk (0–7); moderate risk (8–26); and high risk (greater than 26). Respondents with a missing ASSIST score were excluded from further analysis. The threshold for low risk was set to 7 in line with recommendations on using the ASSIST within population surveys to capture not only frequency of use, but also at least one harm associated with use [43, 44]. The threshold for high risk categorisation was maintained at the level established in the ASSIST guidelines.

2.1.3 | Race/ethnicity

Race/ethnicity was assessed with the question for race from the Government of Ontario Data Standards for the Identification and Monitoring of Systemic Racism [45]. Respondents were categorised into the following groups: Black; East/Southeast Asian; Indigenous; Latinx; Middle Eastern; South Asian; White; Other; Do not know; and Refuse to answer. Respondents who selected more than one category were recoded to 'Mixed race'.

2.1.4 | Perceived income adequacy

Perceived income adequacy measured the extent to which family income was perceived as being sufficient make ends meet and was classified into five categories: very difficult; difficult; neither easy nor difficult; easy; very easy.

2.1.5 | Education

The highest level of formal education attained was classified into five categories: less than high school; high school diploma or equivalent; some college or technical/vocational training or certificate/diploma, or apprenticeship, or some university; bachelor's degree or higher.

For race/ethnicity, perceived income adequacy and education 'Do not know' and 'Refuse to answer' responses were recoded to 'Unstated'.

2.1.6 | Postal code and neighbourhood deprivation index

All survey respondents were asked to provide their postal code which was used to link individual respondents to a national database of neighbourhood deprivation indices from the Institut National de Santé Publique du Québec [46]. The 2016 index is based on Canadian Census dissemination areas. Where data were available, each postal code in the country was assigned two scores: (i) a material deprivation score (based on the level of education, income and employment in the population 15 and over); and (ii) a social deprivation score (based on the proportion of the population aged 15 and over living alone, who are separated, divorced or widowed as well as the proportion of single-parent families). Scores for each index were derived through principal component analysis [46]. Each index is represented in quintiles on a scale of 1–5 (most deprived/ deprived/neither deprived nor privileged/privileged/most privileged).

2.2 | Analysis

The final cross-sectional samples in Canada included 10,057 respondents in 2018, 15,256 respondents in 2019 and 15,780 in 2020 after exclusions based on data quality checks and incomplete responses; complete details regarding exclusions can be found in the ICPS technical reports (www.cannabisproject.ca/methods). A sub-sample of 8704, 12,236 and 12,815 respondents in 2018, 2019 and 2020, respectively, were included after excluding respondents with missing data for postal code ($n_{2018} = 812$; $n_{2019} = 2318$; $n_{2020} = 2244$), neighbourhood deprivation index ($n_{2018} = 504$; $n_{2019} = 689$; $n_{2020} = 708$) and urban/rural designation ($n_{2018} = 37$; $n_{2019} = 13$; $n_{2020} = 13$). Those respondents who provided a postal code were more likely to be older, of White race/ethnicity (2019 and 2020), report difficult (2018 and 2020) or very easy perceived income adequacy and report higher education level.

Post-stratification sample weights were constructed based on the Canadian Census estimates. Respondents were classified into age-by-sex-by-province, education and age-by-smoking status groups. A raking algorithm was applied to the full cross-sectional analytic samples to compute weights that were calibrated to these groupings. For each year of the survey, weights were rescaled to the sample size for Canada. A survey year variable was then defined in the data set for each year before data from 2018–2020 were combined and used for analysis. Estimates are weighted unless otherwise specified. Analyses were conducted using survey procedures in SAS version 9.4.

A main effects multinomial logistic regression model was estimated with three levels of the ASSIST score: (i) low risk; (ii) moderate risk; (iii) high risk. A multinomial regression model was selected over an ordinal logistic regression model as the proportional odds assumption was not met. Respondents with 'Unstated' responses for

TABLE 1 Weighted sample characteristics of respondents by survey wave.

	2018 ($n = 8704$) % (SE)	2019 ($n = 12{,}236$) % (SE)	2020 ($n = 12{,}815$) % (SE)
Age, years			
16–25	17.9 (0.6)	16.6 (0.5)	16.6 (0.4)
26–35	20.0 (0.7)	19.5 (0.5)	19.7 (0.5)
36–45	19.5 (0.6)	19.9 (0.4)	20.2 (0.5)
46–55	21.5 (0.6)	21.2 (0.4)	20.4 (0.5)
56–65	21.1 (0.5)	22.8 (0.4)	23.1 (0.4)
Sex			
Female	49.8 (0.8)	50.2 (0.6)	49.6 (0.6)
Male	50.2 (0.8)	49.8 (0.6)	50.4 (0.6)
Race/ethnicity			
Black	1.6 (0.2)	3.3 (0.2)	3.0 (0.2)
East/Southeast Asian	7.9 (0.4)	7.3 (0.3)	8.8 (0.3)
Indigenous	3.7 (0.3)	2.2 (0.2)	1.9 (0.1)
Latinx	0.9 (0.2)	1.4 (0.1)	1.5 (0.2)
Middle Eastern	1.0 (0.2)	1.0 (0.1)	1.7 (0.1)
Mixed race	2.0 (0.2)	2.9 (0.2)	3.0 (0.2)
South Asian	2.9 (0.3)	3.1 (0.2)	3.5 (0.2)
White	78.5 (0.6)	76.1 (0.5)	73.8 (0.5)
Other	2.0 (0.2)	1.3 (0.1)	1.3 (0.1)
Unstated	0.7 (0.1)	1.4 (0.1)	1.6 (0.1)
Perceived income adequacy			
Very difficult	8.1 (0.4)	9.6 (0.3)	7.6 (0.3)
Difficult	20.6 (0.6)	23.0 (0.5)	18.8 (0.5)
Not easy or difficult	36.1 (0.7)	35.4 (0.5)	37.5 (0.6)
Easy	21.7 (0.6)	20.0 (0.4)	22.8 (0.5)
Very easy	11.1 (0.5)	10.0 (0.3)	11.3 (0.4)
Unstated	2.4 (0.2)	2.0 (0.2)	2.0 (0.2)
Education			
Less than high school	15.1 (0.6)	15.0 (0.5)	14.2 (0.4)
High school diploma or equivalent	26.7 (0.8)	26.5 (0.6)	26.2 (0.6)
Some college or technical/vocational training[a]	33.1 (0.7)	33.3 (0.5)	33.7 (0.5)
Bachelor's degree or higher	24.7 (0.6)	24.9 (0.4)	25.4 (0.4)
Unstated	0.4 (0.1)	0.3 (0.1)	0.5 (0.1)
Neighbourhood material deprivation			
Most deprived	20.5 (0.6)	20.4 (0.5)	19.9 (0.5)
Deprived	20.7 (0.6)	21.2 (0.5)	20.8 (0.5)
Not deprived or privileged	20.6 (0.6)	20.6 (0.5)	20.5 (0.5)
Privileged	19.6 (0.6)	19.5 (0.4)	19.8 (0.4)
Most privileged	18.6 (0.6)	18.2 (0.4)	19.0 (0.4)
Neighbourhood social deprivation			
Most deprived	28.0 (0.7)	27.8 (0.5)	26.8 (0.5)
Deprived	21.9 (0.6)	21.6 (0.5)	21.9 (0.5)

(Continues)

TABLE 1 (Continued)

	2018 ($n = 8704$) % (SE)	2019 ($n = 12,236$) % (SE)	2020 ($n = 12,815$) % (SE)
Not deprived or privileged	18.6 (0.6)	19.2 (0.4)	19.1 (0.4)
Privileged	16.6 (0.6)	16.8 (0.4)	16.6 (0.4)
Most privileged	14.9 (0.5)	14.6 (0.4)	15.6 (0.4)
Cannabis use status			
Never	42.4 (0.7)	36.9 (0.5)	38.2 (0.6)
More than 12 months ago	30.2 (0.7)	28.1 (0.5)	27.9 (0.5)
Past 12-month use	8.4 (0.4)	11.7 (0.4)	10.3 (0.3)
Monthly use	4.8 (0.3)	6.8 (0.3)	6.2 (0.3)
Weekly use	5.0 (0.4)	5.4 (0.3)	5.6 (0.3)
Daily use	9.2 (0.5)	11.0 (0.4)	11.7 (0.4)

[a]This category includes some college, college certificate/diploma, technical/vocational training, apprenticeship, or some university.

race/ethnicity, perceived income adequacy and education were excluded from the analyses due to small cell counts and model convergence issues. Potential clustering based on dissemination area was accounted for using the cluster option in the survey routines analysis and the model was adjusted for age, sex at birth, urbanicity, survey year and whether the survey was completed on a smartphone, tablet or computer. All variance inflation factors were less than 5 which suggests multicollinearity was not a concern, so all variables were retained in the final model (output available upon request). The overall comparison between years was examined using the survey year variable, and separate multinomial models were used to examine interactions between year and each of the main predictor variables (material and social neighbourhood deprivation, education, perceived income adequacy and race/ethnicity), to test for differences across time.

3 | RESULTS

3.1 | Sample characteristics

Table 1 presents the characteristics of respondents in 2018, 2019 and 2020. Overall, 27.4% of respondents in 2018 reported past 12-month cannabis use compared to 34.9% in 2019 and 33.8% in 2020.

3.2 | Problematic cannabis use

Overall, less than 2% of respondents were classified as 'high risk' for problematic use based on the ASSIST measure. Most respondents were 'low risk', with around 10% considered to be at 'moderate risk' (Figure 1).

The distribution of problematic use scores were consistent between 2018–2020 ($F = 0.17$; $p = 0.96$).

3.3 | Neighbourhood deprivation

No consistent patterns in 'high risk' scores were noted based on level of neighbourhood deprivation (Table 2). As Table 3 shows, compared to those living in the *most materially deprived neighbourhoods*, those in 'not deprived or privileged', 'privileged' and 'most privileged' were less likely to be at 'moderate risk' compared to 'low risk'. Similarly, compared to those living in the *most socially deprived neighbourhoods*, those in 'deprived', 'not deprived or privileged', 'privileged' and 'most privileged' were less likely to be at 'moderate risk' compared to 'low risk'. Two-way interactions with *material and social deprivation* and year did not support any changes over time ($F = 1.23$, $p = 0.32$; $F = 1.16$, $p = 0.21$).

3.4 | Individual socioeconomic indicators

The proportion of 'high risk' scores was consistently high among those respondents reporting finding it 'very difficult' to make ends meet. Compared to respondents who found it 'very difficult' to make ends meet those who found it 'not easy or difficult', 'easy' or 'very easy' had lower odds of reporting 'moderate risk' vs 'low risk'. Those who found making ends meet 'very difficult' were also more likely to be at 'high risk' compared to those who found it 'difficult', 'not easy or difficult' or 'easy' (Table 3). The two-way interaction between perceived income adequacy and year suggested no changes in risk
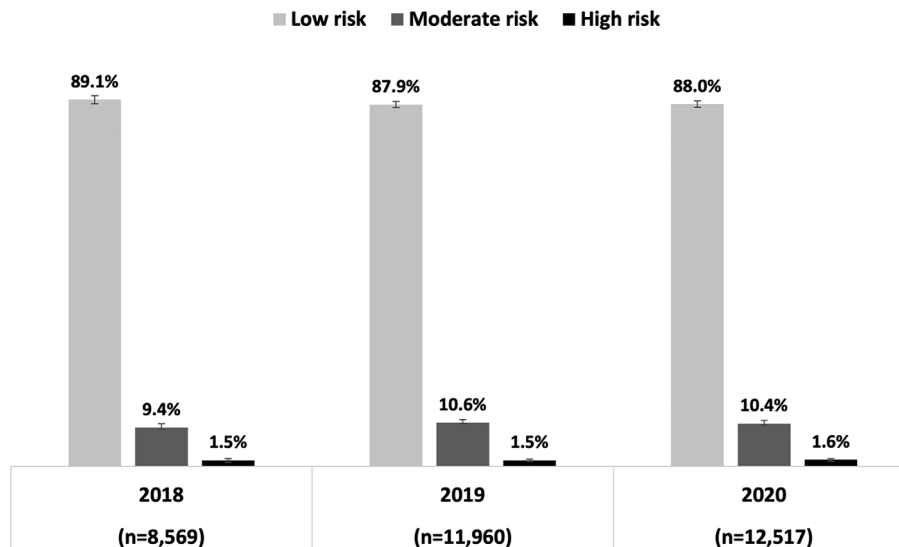
Low risk ▪ **Moderate risk** ▪ **High risk**

FIGURE 1 Overall prevalence and 95% confidence intervals for Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) scores for problematic cannabis use from 2018–2020 (All estimates are unweighted frequencies and weighted percentage. Missing values for ASSIST score are excluded [$n_{2018} = 135$; $n_{2019} = 276$; $n_{2020} = 298$]).

category over time at any level of income adequacy ($F = 1.41$, $p = 0.56$).

For level of education, compared to those with 'less than high school', respondents with 'some college/ vocational training' and those with a 'bachelor's degree or higher' were less likely to have 'moderate risk' compared to 'low risk' (Table 3). In addition, those with 'bachelor's degree or higher' were more likely to be 'high risk' compared to 'moderate risk' compared to those with 'less than high school'. Analysis of the education-by-year interaction did not suggest changes in ASSIST scores within each level of education over time ($F = 1.07$; $p = 0.30$).

3.5 | Race and ethnicity

The proportion of 'high risk' scores varied across racial groups, although sample sizes were small for some groups (Table 2). Overall, Indigenous respondents were more likely to fall into the moderate versus low risk category compared to White respondents, while 'East/ Southeast Asian' respondents were less likely (Table 3). The race/ethnicity-by-year interaction suggests that ASSIST scores within racial/ethnic groups between 2018 and 2020 did not substantially change ($F = 1.20$, $p = 0.06$).

4 | DISCUSSION

While prevalence of cannabis use did increase between 2018 and 2020, the prevalence of high risk for

problematic cannabis use overall was not marked by substantial change from 1.5% pre-legalisation in 2018 to 1.5% and 1.6% in the 12- and 24-months following non-medical cannabis legalisation in Canada. To the best of our knowledge this is the first study to look at estimates of prevalence of high risk for problematic cannabis use before and after legalisation, however, given the short follow-up period it will be crucial to continue to monitor problematic use trends into the future.

Some differences in risk were noted based on race/ ethnicity, as well as by individual and neighbourhood level socioeconomic factors. However, at least in the early stages of legalisation, no evidence was found for differences pre- and post-legalisation.

Although cannabis use has increased moderately since legalisation [47, 48], data on problematic use indicators from Canada post-legalisation remain limited, with mixed findings. Research on cannabis-impaired driving suggests that self-reported rates have remained stable or decreased [6, 48], while there has been no significant increase in traffic-injury emergency department visits in Ontario and Quebec post-legalisation [49]. However, a recent report found that there was an 8% increase in cannabis-related emergency department visits and a 5% increase in hospitalisations across Canada, from 2019 to 2020, and 14% increase in both from 2020 to 2021 [50]. This was attributed to the impact of the COVID-19 pandemic on substance use, including using as a coping mechanism, as well as changes in availability of services making it more challenging to receive assistance outside the hospital setting [50]. The current study adds to the literature by providing pre- and post-legalisation estimates

TABLE 2 Alcohol, Smoking and Substance Involvement Screening Test score distribution by neighbourhood deprivation, individual socioeconomic indicators, and race/ethnicity from 2018 to 2020.[a]

	2018 (n = 8569)			2019 (n = 11,960)			2020 (n = 12,517)		
	Low risk (0–7) % (SE)	Moderate risk (8–26) % (SE)	High risk (≥27) % (SE)	Low risk (0–7) % (SE)	Moderate risk (8–26) % (SE)	High risk (≥27) % (SE)	Low risk (0–7) % (SE)	Moderate risk (8–26) % (SE)	High risk (≥27) % (SE)
Neighbourhood deprivation									
Material deprivation									
Most deprived	84.3 (1.4)	13.8 (1.3)	1.9 (0.6)	85.4 (1.0)	13.0 (1.0)	1.6 (0.3)	84.4 (1.1)	13.7 (1.0)	1.8 (0.4)
Deprived	87.9 (1.2)	10.7 (1.1)	1.5 (0.5)c	86.0 (0.9)	12.0 (0.9)	2.0 (0.4)	86.5 (1.0)	11.8 (0.9)	1.8 (0.4)
Not deprived or privileged	89.8 (1.1)	9.4 (1.1)	0.8 (0.3)c	89.5 (0.8)	9.7 (0.8)	0.9 (0.2)	89.0 (0.8)	9.5 (0.8)	1.5 (0.3)
Privileged	92.2 (1.0)	5.6 (0.1)	2.1 (0.7)c	90.5 (0.8)	8.2 (0.7)	1.3 (0.3)	91.3 (0.8)	7.8 (0.7)	0.9 (0.3)c
Most privileged	91.9 (1.0)	6.9 (0.89)	1.1 (0.4)c	88.5 (0.9)	9.8 (0.8)	1.7 (0.4)	88.8 (0.9)	9.2 (0.8)	1.9 (0.4)
Social deprivation									
Most deprived	85.5 (1.1)	12.2 (1.1)	1.3 (0.3)	83.9 (0.9)	14.5 (0.8)	1.6 (0.3)	84.1 (0.9)	14.2 (0.9)	1.7 (0.4)
Deprived	89.8 (1.0)	8.4 (0.9)	1.8 (0.5)	88.5 (0.8)	9.6 (0.8)	2.0 (0.4)	88.0 (0.9)	10.2 (0.8)	1.8 (0.3)
Not deprived or privileged	89.6 (1.2)	8.4 (1.0)	2.1 (0.8)c	88.3 (0.9)	10.3 (0.9)	1.4 (0.3)	89.9 (0.8)	8.5 (0.7)	1.6 (0.4)
Privileged	90.6 (1.2)	8.5 (1.2)	0.9 (0.4)c	90.6 (0.9)	8.3 (0.8)	1.1 (0.3)	89.9 (0.8)	8.4 (0.8)	1.6 (0.4)
Most privileged	92.8 (1.2)	5.9 (1.1)	1.3 (0.5)c	91.2 (0.9)	7.5 (0.8)	1.3 (0.3)	90.2 (1.0)	8.6 (0.9)	1.2 (0.3)
Individual socioeconomic indicators									
Perceived income adequacy									
Very difficult	87.3 (1.8)	10.2 (1.5)	2.5 (1.1)c	83.4 (1.4)	13.8 (1.3)	2.8 (0.6)	80.5 (1.9)	16.0 (1.7)	3.5 (1.0)c
Difficult	87.3 (1.3)	11.8 (1.2)	1.0 (0.4)c	85.9 (0.9)	13.1 (0.9)	1.0 (0.3)	83.9 (1.0)	13.8 (1.0)	2.3 (0.5)
Not easy or difficult	88.5 (0.9)	10.4 (0.8)	1.1 (0.3)	88.9 (0.7)	10.2 (0.6)	0.9 (0.2)	89.4 (0.6)	9.4 (0.6)	1.1 (0.2)
Easy	91.7 (1.0)	6.8 (0.9)	1.5 (0.4)	89.8 (0.8)	8.4 (0.7)	1.9 (0.4)	89.6 (0.8)	9.1 (0.8)	1.3 (0.3)
Very easy	90.1 (1.7)	7.0 (1.3)	2.9 (1.1)c	88.7 (1.2)	8.6 (1.1)	2.6 (0.6)	91.0 (1.1)	7.6 (1.0)	1.4 (0.4)
Unstated	94.1 (2.2)	4.9 (2.1)	0.9 (0.9)c	93.6 (2.6)	5.5 (2.4)c	0.8 (0.8)c	92.6 (2.1)	6.3 (2.0)c	1.1 (0.8)c
Education									
Less than high school	86.0 (1.6)	12.0 (1.6)	2.0 (0.6)c	85.0 (1.4)	12.9 (1.3)	2.2 (0.6)	86.0 (1.2)	12.2 (1.1)	1.9 (0.4)
High school diploma or equivalent	87.1 (1.3)	10.5 (1.2)	2.4 (0.7)	85.4 (1.0)	13.4 (0.9)	1.2 (0.3)	85.3 (1.0)	12.9 (1.0)	1.7 (0.4)
Some college/vocational training[b]	88.4 (0.8)	10.4 (0.7)	1.2 (0.3)	88.7 (0.5)	10.0 (0.5)	1.3 (0.2)	88.5 (0.6)	10.5 (0.6)	1.0 (0.2)
Bachelor's degree or higher	94.1 (0.6)	5.3 (0.6)	0.6 (0.2)c	91.2 (0.6)	7.2 (0.5)	1.7 (0.3)	91.0 (0.6)	6.9 (0.5)	2.1 (0.4)
Unstated	100	0	0	95.9 (4.0)	4.1 (4.0)c	0	98.0 (2.0)	0	2.0 (2.0)c

TABLE 2 (Continued)

Race/ethnicity	2018 (n = 8569)			2019 (n = 11,960)			2020 (n = 12,517)		
	Low risk (0–7) % (SE)	Moderate risk (8–26) % (SE)	High risk (≥27) % (SE)	Low risk (0–7) % (SE)	Moderate risk (8–26) % (SE)	High risk (≥27) % (SE)	Low risk (0–7) % (SE)	Moderate risk (8–26) % (SE)	High risk (≥27) % (SE)
Black	77.2 (6.2)	20.5 (6.1)	2.3 (1.8)[c]	80.3 (3.0)	14.0 (2.6)	5.7 (1.8)[c]	82.5 (3.0)	15.7 (2.9)	1.8 (0.5)[c]
East/Southeast Asian	95.9 (1.3)	2.0 (0.8)[c]	2.1 (1.1)[c]	93.1 (1.0)	6.5 (1.0)	0.4 (0.2)[c]	93.9 (1.0)	4.6 (0.9)	1.5 (0.5)[c]
Indigenous	75.7 (3.5)	21.9 (3.4)	2.4 (1.1)[c]	69.9 (3.7)	27.2 (3.7)	2.9 (1.3)[c]	76.0 (3.4)	20.6 (3.2)	3.4 (1.4)[c]
Latinx	87.7 (7.6)	9.8 (7.4)	2.5 (2.5)[c]	84.7 (4.6)	14.3 (4.6)[c]	1.0 (0.7)[c]	87.7 (3.6)	11.1 (3.6)[c]	1.3 (0.8)[c]
Middle Eastern	89.4 (6.9)	7.5 (6.7)[c]	3.2 (2.4)[c]	95.2 (1.9)	2.1 (1.1)[c]	2.7 (1.6)[c]	86.7 (3.4)	8.3 (2.7)[c]	5.1 (2.4)[c]
Mixed race	84.5 (3.8)	15.1 (3.7)	0.4 (0.4)[c]	80.3 (3.2)	16.9 (3.0)	2.8 (1.3)[c]	84.6 (2.5)	11.4 (2.3)	4.1 (1.3)[c]
South Asian	91.8 (2.3)	7.8 (2.3)	0.4 (0.4)[c]	86.9 (2.2)	8.4 (1.8)	4.7 (1.5)[c]	86.3 (2.4)	10.1 (2.0)	3.5 (1.6)[c]
White	89.2 (0.6)	9.3 (0.5)	1.4 (0.3)	88.4 (0.4)	10.4 (0.4)	1.2 (0.1)	88.0 (0.5)	10.7 (0.5)	1.3 (0.2)
Other	91.6 (5.3)	8.4 (5.3)[c]	0	90.3 (2.8)	9.7 (2.8)	0	83.2 (4.2)	13.7 (3.8)	3.1 (2.0)[c]
Unstated	99.1 (0.7)	0.9 (0.7)[c]	0	95.2 (2.1)	4.1 (2.0)[c]	0.7 (0.6)[c]	94.7 (2.1)	5.3 (2.1)[c]	0

[a] All estimates are weighted frequencies and percentages.
[b] This category includes some college, college certificate/diploma, technical/vocational training, apprenticeship or some university.
[c] High sampling variability-coefficient of variation >0.30-interpret with caution.

TABLE 3 Multinomial regression main effects model of problematic cannabis use ASSIST score by neighbourhood deprivation, individual socioeconomic indicators, and race/ethnicity ($n = 31,781$).[a][b]

	ASSIST moderate risk vs low risk (ref)	ASISIST high risk vs low risk (ref)	ASSIST high risk vs moderate risk (ref)
	AOR (95% CI), *p*-value	AOR (95% CI), *p*-value	AOR (95% CI), *p*-value
Neighbourhood deprivation			
Material deprivation			
Most deprived	Ref	Ref	Ref
Deprived	0.92 (0.78, 1.09), 0.340	1.03 (0.66, 1.61), 0.890	1.12 (0.71, 1.78), 0.631
Not deprived or privileged	0.78 (0.65, 0.93), 0.005	0.65 (0.40, 1.04), 0.075	0.83 (0.51, 1.37), 0.466
Privileged	0.61 (0.51, 0.73), <0.001	0.83 (0.51, 1.35), 0.452	1.37 (0.82, 2.27), 0.230
Most privileged	0.72 (0.60, 0.86), <0.001	0.93 (0.57, 1.52), 0.778	1.29 (0.78, 2.15), 0.322
Social deprivation			
Most deprived	Ref	Ref	Ref
Deprived	0.70 (0.60, 0.82), <0.001	1.29 (0.88, 1.89), 0.189	1.85 (1.25, 2.74), 0.002
Not deprived or privileged	0.71 (0.60, 0.84), <0.001	1.26 (0.80, 1.97), 0.325	1.77 (1.10, 2.83), 0.018
Privileged	0.69 (0.58, 0.83), <0.001	0.93 (0.59, 1.46), 0.754	1.35 (0.84, 2.17), 0.217
Most privileged	0.62 (0.51, 0.76), <0.001	0.83 (0.52, 1.33), 0.446	1.34 (0.81, 2.22), 0.259
Individual socioeconomic indicators			
Perceived income adequacy			
Very difficult	Ref	Ref	Ref
Difficult	0.95 (0.78, 1.16), 0.605	0.46 (0.29, 0.73), 0.001	0.49 (0.30, 0.79), 0.004
Not easy or difficult	0.79 (0.65, 0.96), 0.017	0.31 (0.20, 0.48), <0.001	0.39 (0.24, 0.62), <0.001
Easy	0.68 (0.55, 0.84), <0.001	0.41 (0.26, 0.65), <0.001	0.61 (0.37, 1.00), 0.048
Very easy	0.70 (0.55, 0.90), 0.005	0.64 (0.37, 1.12), 0.117	0.92 (0.51, 1.66), 0.781
Education			
Less than high school	Ref	Ref	Ref
High school diploma or equivalent	1.10 (0.90, 1.35), 0.344	1.36 (0.85, 2.17), 0.206	1.23 (0.74, 2.03), 0.423
Some college/vocational training[c]	0.88 (0.72, 1.07), 0.200	1.01 (0.63, 1.61), 0.978	1.15 (0.70, 1.88), 0.582
Bachelor's degree or higher	0.58 (0.46, 0.72), <0.001	1.10 (0.64, 1.87), 0.740	1.90 (1.08, 3.35), 0.026
Race/ethnicity			
White	Ref	Ref	Ref
Black	1.24 (0.91, 1.69), 0.175	1.87 (0.95, 3.68), 0.072[d]	1.51 (0.77, 2.94), 0.231[d]
East/Southeast Asian	0.41 (0.31, 0.53), <0.001	0.62 (0.33, 1.16), 0.133[d]	1.53 (0.78, 2.98), 0.214[d]
Indigenous	1.96 (1.52, 2.51), <0.001	1.75 (0.92, 3.32), 0.088[d]	0.89 (0.46, 1.72), 0.735[d]
Latinx	0.80 (0.47, 1.35), 0.401	0.54 (0.19, 1.51), 0.243[d]	0.68 (0.22, 2.08), 0.500[d]
Middle Eastern	0.49 (0.25, 0.93), 0.029	1.94 (0.94, 4.01), 0.074[d]	4.00 (1.55, 10.29), 0.004[d]
Mixed race	1.12 (0.83, 1.49), 0.462	1.41 (0.80, 2.48), 0.239[d]	1.26 (0.69, 2.32), 0.456[d]
South Asian	0.72 (0.52, 0.99), 0.046	1.43 (0.75, 2.75), 0.282[d]	1.99 (0.99, 3.99), 0.054[d]
Survey year			
2018	Ref	Ref	Ref
2019	1.01 (0.87, 1.18), 0.878	1.04 (0.70 1.55), 0.838	1.03 (0.68, 1.56), 0.889
2020	1.04 (0.89, 1.22), 0.584	1.06 (0.77, 1.45), 0.709	1.06 (0.69–1.63), 0.793

Abbreviations: AOR, adjusted odds ratio; ASSIST, Alcohol, Smoking and Substance Involvement Screening Test; CI, confidence interval.

[a]All estimates are weighted.

[b]Model is adjusted for age, sex at birth, region, survey year and type of device used to complete survey.

[c]This category includes some college, college certificate/diploma, technical/vocational training, apprenticeship or some university.

[d]Estimates should be interpreted with caution due to small sample sizes.

of level of risk of problematic use via an aggregate measure.

Looking more closely at the socio-economic indicators of problematic use, some similar patterns emerged for material and social neighbourhood deprivation, perceived income adequacy and level of education. Within neighbourhood deprivation categories, there was minimal change in patterns of risk scores across time. People from more deprived neighbourhoods were no more likely to report high risk, but they were more likely to report moderate risk compared to people from more privileged neighbourhoods. Similarly, those with 'less than high school' education were more likely to report moderate risk compared to those with at least some post-secondary education, as were those with the lowest perceived income adequacy. This is consistent with previous studies which have found an association between lower income and education and problematic cannabis use [16, 33, 34]. It may be the environmental and life stressors associated with financial hardship, social isolation and limited opportunities to improve outcomes influence decisions to use cannabis, potentially as a form of relaxation or a coping mechanism, and negatively impact well-being and relationships [34, 38]. Unlike neighbourhood deprivation and education, where differences were only noted in moderate risk, those who found it very difficult to make ends meet were also more likely to be at high risk for problematic use. Previous work has found that heavy cannabis use was associated with long-term declines in socioeconomic outcomes and increased unemployment [34]. Thus, the more frequent and disruptive use of cannabis may be interfering with the ability to find and maintain employment [51]. Alternately, it may be that those suffering from physical or mental health issues may not be able to work, and cannabis may be used for medicinal purposes, increasing the likelihood of more frequent use [52]. The findings support the inclusion of measures of neighbourhood deprivation as independent measures in addition to individual socioeconomic indicators when examining patterns of problematic cannabis use in future research.

Previous research in the United States has found stable levels of cannabis use within racial/ethnic groups between 2005 and 2013, with higher rates among Black, Indigenous and mixed-race individuals than White individuals [35]. Although the current study did not find evidence to support a difference in moderate compared to low risk use for Black and mixed-race groups, Indigenous individuals were more likely to report moderate risk. Interpretation of high-risk scores associated with racial/ethnic groups in the current study is limited due to the small sample sizes for some groups. As it stands, there do appear to be differences among groups although the

relationship remains unclear and warrants further research to examine any potential differences. Given the low proportion of high-risk scores overall, over-sampling minority groups in future research can help detect if there are differences. It will also be important to consider what factors may be accounting for any differences to determine if targeted interventions may be beneficial.

4.1 | Limitations

This study is subject to limitations common to survey research, such as social desirability and self-selection bias [53]. Respondents were recruited using non-probability-based sampling; therefore, the findings do not provide nationally representative estimates. Due to the cross-sectional nature of the design, this research cannot establish a temporal association between socioeconomic indicators and neighbourhood deprivation and problematic use. For example, it cannot be established whether a person's socioeconomic circumstances preceded problematic use or vice versa. In addition, data were limited to only 2 years following legalisation which may not reflect changes which may only emerge many years after legalisation.

Respondents with missing postal code data were excluded from the current analyses. The subset of those included differed on some sociodemographic characteristics which may have introduced bias. In addition, those who consumed cannabis more frequently in the past 3 months were more likely to have missing ASSIST scores which may bias the results. However, only 1.6% of respondents in 2018, and 2.3% in 2019 and 2020, were missing ASSIST scores, and sensitivity analysis suggests that estimates of high risk would differ by less than 2% if all missing were considered high risk.

The Institut National de Santé Publique du Québec material and social deprivation index also has some limitations. It is based on 2016 data which may have changed over the course of the past several years. However, it is not expected that the distribution of socioeconomic resources would shift dramatically in this time frame. An additional limitation is the assumption that the deprivation indices are representative of a neighbourhood. Dissemination areas may not align exactly with how neighbourhoods are viewed by those living in them.

5 | CONCLUSION

Overall, in the initial period following legalisation in Canada, levels of problematic use have changed very little at the population level. Modest differences in problematic

use risk scores were observed based on various socioeconomic indicators as well as race/ethnicity. Future research should continue to monitor the prevalence of problematic cannabis use indicators keeping these factors in mind to ensure that any potential drawbacks of legalisation are not disproportionately impacting marginalised populations.

AUTHOR CONTRIBUTIONS

Each author certifies that their contribution to this work meets the standards of the International Committee of Medical Journal Editors.

ACKNOWLEDGMENTS

CONFLICT OF INTEREST STATEMENT

None to declare.

ORCID

David Hammond https://orcid.org/0000-0001-8197-6010

REFERENCES

1. Owusu-Bempah A, Luscombe A. Race, cannabis and the Canadian war on drugs: an examination of cannabis arrest data by race in five cities. Int J Drug Policy. 2020;91:102937.
2. Khenti A. The Canadian war on drugs: structural violence and unequal treatment of black Canadians. Int J Drug Policy. 2014;25:190–5.
3. Hall W, Lynskey M. Evaluating the public health impacts of legalizing recreational cannabis use in the United States. Addiction. 2016;111:1764–73.
4. Hall W, Degenhardt L. The adverse health effects of chronic cannabis use. Drug Test Anal. 2014;6:39–45.
5. Fischer B, Russell C, Rehm J, Leece P. Assessing the public health impact of cannabis legalization in Canada: core outcome indicators towards an 'index' for monitoring and evaluation. J Public Health (Oxf). 2019;41:412–21.
6. Fischer B, Lee A, Robinson T, Hall W. An overview of select cannabis use and supply indicators pre- and post-legalization in Canada. Subst Abuse Treat Prev Policy. 2021;16:77.
7. Fischer B, Russell C, Sabioni P, van den Brink W, Le Foll B, Hall W, et al. Lower-risk cannabis use guidelines: a comprehensive update of evidence and recommendations. Am J Public Health. 2017;107:e1–12.
8. Hasin DS, O'Brien CP, Auriacombe M, Borges G, Bucholz K, Budney A, et al. DSM-5 criteria for substance use disorders: recommendations and rationale. Am J Psychiatry. 2013;170:834–51.
9. Adamson SJ, Kay-Lambkin FJ, Baker AL, Lewin TJ, Thornton L, Kelly BJ, et al. An improved brief measure of cannabis misuse: the cannabis use disorders identification test – revised (CUDIT-R). Drug Alcohol Depend. 2010;110:137–43.
10. Humeniuk R, Henry-Edwards S, Ali R, Poznyak V, Monteiro M. The Alcohol, Smoking and Substance Involvement Screening Test (ASSIST): manual for use in primary care. Geneva: World Health Organization; 2010. Available from: https://apps.who.int/iris/handle/10665/44320
11. Rotermann M. Looking back from 2020, how cannabis use and related behaviours changed in Canada. Health Rep. 2021;32:3–14.
12. Government of Canada. Canadian cannabis survey 2021: summary. Ottawa, ON: Health Canada; 2021.
13. Pearson C, Janz T, Ali J. Mental and substance use disorders in Canada. Ottawa, ON: Statistics Canada; 2013. Available from: https://www150.statcan.gc.ca/n1/en/pub/82-624-x/2013001/article/11855-eng.pdf?st=FTR7vTXM
14. Leos-Toro C, Rynard V, Hammond D. Prevalence of problematic cannabis use in Canada: cross-sectional findings from the 2013 Canadian tobacco, alcohol and drugs survey. Can J Public Health. 2017;108:e516–22.
15. Government of Canada. Canadian Alcohol and Drugs Survey (CADS): 2019 detailed tables (Table 7). 2019. Available from: https://www.canada.ca/en/health-canada/services/canadian-alcohol-drugs-survey/2019-summary/detailed-tables.html#t7. Accessed 3 January 2022
16. Hasin DS, Tulshi SD, Kerridge BT, Goldstein RB, Chou SP, Zhang H, et al. Prevalence of marijuana use disorders in the United States between 2001–2002 and 2012–2013. JAMA Psychiatry. 2015;72:1235–42.
17. Compton WM, Han B, Jones CM, Blanco C. Cannabis use disorders among adults in the United States during a time of increasing use of cannabis. Drug Alcohol Depend. 2019;204:107468.
18. Azofeifa A, Mattson ME, Schauer G, McAfee T, Grant A, Lyerla R. National estimates of marijuana use and related indicators—National Survey on Drug Use and Health, United States, 2002–2014. MMWR Surveill Summ. 2016;65:1–28.
19. Substance Abuse and Mental Health Services Administration (SAMHSA). Key substance use and mental health indicators in the United States: Results from the 2020 National Survey on Drug Use and Health (HHS Publication No. PEP21-07-01-003, NSDUH Series H-56). Rockville, MD: Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration;. Available from: https://www.samhsa.gov/data/sites/default/files/reports/rpt35325/NSDUHFFRPDFWHTMLFiles2020/2020NSDUHFFR1PDFW102121.pdf
20. Couper F, Peterson B. The prevalence of marijuana in suspected impaired driving cases in Washington state. J Anal Toxicol. 2014;38:569–74.
21. Lane T, Hall W. Traffic fatalities within US states that have legalized recreational cannabis sales and their neighbours. Addiction. 2019;114:847–56.
22. Aydelotte J, Brown L, Luftman K, Mardock AL, Teixeira PGR, Coopwood B, et al. Crash fatality rates after recreational marijuana legalization in Washington and Colorado. Am J Public Health. 2017;107:1329–31.
23. Rocky Mountain High Density Trafficking Area Strategic Intelligence Unit. The legalization of marijuana in Colorado:

the impact. Englewood, CO: Rocky Mountain HIDTA; Vol 5; 2018.

24. Wang G, Le Lait M, Deakyne S, Bronstein A, Bajaj L, Roosevelt G. Unintentional pediatric exposures to marijuana in Colorado, 2009-2015. JAMA Pediatr. 2016;170:e160971.

25. Cao D, Srisuma S, Bronstein A, Hoyte C. Characterization of edible marijuana product exposures reported to United States poison centers. Clin Toxicol. 2016;54:840–6.

26. Davis J, Mendelson B, Berkes J, Suleta K, Corsi K, Booth R. Public health effects of medical marijuana legalization in Colorado. Am J Prev Med. 2016;50:373–9.

27. Reed J. Impacts of Marijuana legalization in Colorado: A report pursuant to senate Bill 13–283. 2019. Available from: http://cdpsdocs.state.co.us/ors/docs/reports/2018-SB-13-283_report.pdf

28. Vigil D, Van Dyke M, Hall K, Contreras A, Ghosh T, Wolk L. Marijuana use and related health care encounters in Colorado before and after retail legalization. Int J Ment Heal Addict. 2018;16:806–12.

29. Bull SS, Brooks-Russell A, Davis JM, Roppolo R, Corsi K. Awareness, perception of risk and behaviors related to retail marijuana among a sample of Colorado youth. J Community Health. 2017;42:278–86.

30. Goodman S, Fischer B, Hammond D. Lower-risk cannabis use guidelines: adherence in Canada and the U.S. Am J Prev Med. 2020;59:e211–20.

31. Cerdá M, Mauro C, Hamilton A, Levy NS, Santaella-Tenorio J, Hasin D, et al. Association between recreational marijuana legalization in the United States and changes in marijuana use and cannabis use disorder from 2008 to 2016. JAMA Psychiat. 2020;77:165–71.

32. Pacula R, Smart R. Medical marijuana and marijuana legalization. Annu Rev Clin Psychol. 2017;13:397–419.

33. Bonner WIA, Andkhoie M, Thompson C, Farag M, Szafron M. Patterns and factors of problematic marijuana use in the Canadian population: evidence from three cross-sectional surveys. Can J Public Health. 2017;108:e110–6.

34. Hasin DS, Shmulewitz D, Sarvet AL. Time trends in US cannabis use and cannabis use disorders overall and by sociodemographic subgroups : a narrative review and new findings. Am J Drug Alcohol Abuse. 2019;45:623–43.

35. Wu L, Zhu H, Swartz MS. Trends in cannabis use disorders among racial/ethnic population groups in the United States. Drug Alcohol Depend. 2016;165:181–90.

36. Wu LT, Brady KT, Mannelli P, Killeen TK. Cannabis use disorders are comparatively prevalent among nonwhite racial/ethnic groups and adolescents: a national study. J Psychiatr Res. 2014;50:26–35.

37. Tuck A, Hamilton HA, Agic B, Ialomiteanu AR, Mann RE. Past year cannabis use and problematic cannabis use among adults by ethnicity in Ontario. Drug Alcohol Depend. 2017;179:93–9.

38. Galea S, Ahren J, Tracy M, Vlahov D. Neighborhood income and income distribution and the use of cigarettes, alcohol, and marijuana. Am J Prev Med. 2007;32:S195–202.

39. Chan GCK, Leung J, Quinn C, Weier M, Hall W. Socioeconomic differentials in cannabis use trends in Australia. Addiction. 2018;113:454–61.

40. Karriker-Jaffe KJ. Neighborhood socioeconomic status and substance use by U.S. adults. Drug Alcohol Depend. 2013;133:212–21.

41. Boardman JD, Finch BK, Ellison CG, Williams DR, Jackson JS. Neighborhood disadvantage, stress, and drug use among adults. J Health Soc Behav. 2001;42:151–65.

42. American Association for Public Opinion Research. Standard definitions: final dispositions of case codes and outcome rates for surveys. Alexandria, VA: AAPOR; 9th ed.; 2016. Available from: https://www.aapor.org/aapor_main/media/publications/standard-definitions20169theditionfinal.pdf

43. Asbridge M, Marsh DC, Erickson G. Problems with the identification of 'problematic' cannabis use: examining the issues of frequency, quantity, and drug use environment. Eur Addict Res. 2014;7:254–67.

44. Thake J, Davis CG. Assessing problematic cannabis use. Addict Res Theory. 2011;19:448–58.

45. Government of Ontario Anti-Racism Directorate. Data Standards for the Identification and Monitoring of Systemic Racism. 2020. Available from: https://www.ontario.ca/document/data-standards-identification-and-monitoring-systemic-racism/collection-personal-information. Accessed 16 February 2021

46. Gamache P, Hamel D, Blaser C. The material and social deprivation index: a summary. Quebec: INSPQ; 2019 Available from: www.inspq.qc.ca/en/publications/2639

47. Rotermann M. Analysis of trends in the prevalence of cannabis use and related metrics in Canada. Health Rep. 2019;30:3–13.

48. Statistics Canada. National cannabis survey, second quarter. 2019 Available from: https://www150.statcan.gc.ca/n1/daily-quotidien/190815/dq190815a-eng.htm

49. Callaghan RC, Sanches M, Vander Heiden J, Asbridge M, Stockwell T, Macdonald S, et al. Canada's cannabis legalization and drivers' traffic-injury presentations to emergency departments in Ontario and Alberta, 2015-2019. Drug Alcohol Depend. 2021;228:109008.

50. Canadian Institute for Health Information. Unintended consequences of COVID-19: impact on harms caused by substance use. Ottawa, ON: CIHI; 2021. Available from: https://www.cihi.ca/sites/default/files/document/unintended-consequences-covid-19-substance-use-report-en.pdf

51. Maggs JL, Staff J, Kloska DD, Patrick ME, O'Malley PM, Schulenberg J. Predicting young adult degree attainment by late adolescent marijuana use. J Adolesc Health. 2015;57:205–11.

52. Hango D, LaRochelle-Cote S. Association between the frequency of cannabis use and selected social indicators. Ottawa, ON: Statistics Canada; 2018.

53. Gordis L. Epidemiology. Philadelphia: Third Edition; 2004.

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.