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Looking back from 2020, how cannabis use and related behaviours changed in Canada

by Michelle Rotermann

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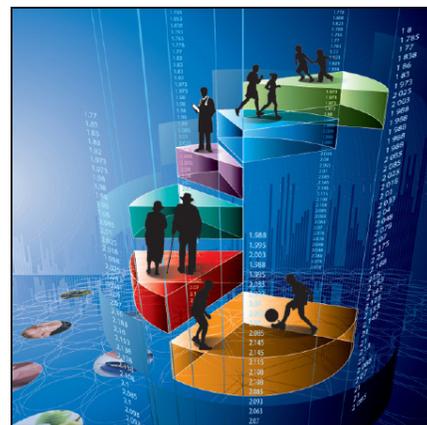
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ABSTRACT

Background
The Canadian government legalized non-medical cannabis use by adults in October 2018 to minimize associated harms and redirect profits from criminals. In October 2019, a wider array of products, including edibles, was legalized, with entry into the legal market beginning in December.

Data and methods
Three quarters (the first quarters of 2018 and 2019 and the fourth quarter of 2020) of the National Cannabis Survey were used to examine changes in cannabis use (overall use and daily or almost daily (DAD) use), consumption methods, products and sources.

Results
Cannabis use in the past three months was higher in late 2020 (20.0%) than in 2019 (17.5%) and 2018 (14.0%), and this was particularly the case among: females (for whom rates rose to equal male rates for the first time), adults aged 25 and older, and some provinces. Similarly, DAD use, at 7.9% also increased. Higher percentages of Canadians reported getting at least some of their cannabis from legal sources or growing it, and fewer were relying on friends and family or illegal sources in 2020.

Interpretation
This study spans three years—from before legalization to about two years after. It provides a more complete picture of the law's impact on cannabis use and related behaviours, given the more established legal cannabis industry better equipped to compete with the black market on price, convenience and selection. Findings demonstrate that change is continuing, and, as before, some cautions and assurances remain. The impact of the COVID-19 pandemic on cannabis use continues to be difficult to measure. Monitoring remains important, given the ever-changing provincial retail landscapes; the introduction of new products; and the pressure by the industry to remove or adjust potency limits, and allow widespread delivery, farm-gate sales and cannabis lounges.

Keywords
legalization, *Cannabis Act*, C-45, controlled and illegal drugs, marijuana, edibles, Canada

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As of October 17, 2018, Canada became the second country in the world to legalize the production, distribution, sale, and non-medical use of cannabis for adults.[1] This followed the legalization of cannabis for medical purposes about two decades earlier.[2] During the first year after non-medical cannabis was legalized in Canada, change was minimal, including generally modest increases in consumption and no increases in self-reported use before driving.[3-5] In addition, more consumers reported having obtained cannabis from legal sources.[3-5] This coincided with large increases in legal retail sales, as well as volumes sold.[6-7]

However, an important change was planned for October 2019, to allow for the legal sale of a wider array of products, including some more potent varieties (extracts) and edibles (which can pose special risks).[8-10] Entry into the legal Canadian market would start by December 2019 and would continue well into 2020, given regulatory timelines and the associated approvals required before each new product is cleared for sale. The availability of cannabis in increasingly diverse formats would allow for equally diverse methods of consumption, such as eating, drinking or vaping. Considerably less research and data are available about these less traditional and newer forms of cannabis (e.g., edibles, extracts, vape pens) and their associated methods of consumption (e.g., eating and drinking, dabbing, or vaping). [8, 10-13]

In addition to the legislative change, there were other changes too, such as the rising social acceptability of cannabis in Canada[5] and the United States,[9,14] accompanied by a growing perception that cannabis is harmless.[15] The number of legal cannabis stores in Canada also increased nearly eightfold from the fourth quarter of 2018 to the end of 2020 (Appendix Figure 1).

Research from Canada[3,4] and the United States [9,16-20] suggests that legalization affects some behaviours, cannabis-related outcomes (e.g., health care encounters and calls to poison control) and demographic groups (e.g., increased cannabis use particularly among persons aged 25 and older) more than others. Canada's legalization approach also includes commitments to regulation (e.g., advertising, marketing, access and packaging restrictions).[21]

The provinces and territories are responsible for determining how cannabis is distributed and sold within their jurisdictions.[22] Each also has the flexibility to set additional restrictions, including placing limits on possession, personal cultivation, and public use, and increasing the minimum age of use.[22] It is unclear how ongoing changes in legislation, product availability, access to legal retail stores, and more liberalized views about cannabis will impact the cannabis market and associated population health outcomes. Therefore, regular monitoring is necessary.

The primary objective of this study is to update information to reflect changes in self-reported cannabis consumption and related behaviours, as well as examine how methods of consumption and products have been changing between 2018

and 2020, and particularly since the latest 2019 *Cannabis Act* modifications.

Data

The cross-sectional, voluntary National Cannabis Survey (NCS) uses an Internet-based electronic questionnaire, and its content was developed in consultation with several government departments.[23] The survey's target population is the household population aged 15 years and older, excluding residents of institutions, people experiencing homelessness, residents of the territories and people living on Indigenous reserves. More information about the NCS is available online.[23]

NCS data from the first quarter of 2018 and 2019 NCS, as well as from the fourth quarter of 2020, were included in this study (Appendix Table A). The first-quarter surveys from 2018 and 2019 were deemed more suitable for this study because their entire three-month reference periods for cannabis use did not overlap with either the enactment of the *Cannabis Act* (Bill C-45) on October 17, 2018, or the modifications to the act that occurred one year later (October 17, 2019).[1]

Data for the first-quarter surveys were collected from about mid-February to mid-March; data for the 2020 survey were collected from about mid-November to December 31. Samples averaged 5,540 respondents and response rates of 49.4%. The majority of respondents (60.6%) completed the survey unassisted, using the secure access code sent by mail. Respondents who had not completed the first-quarter surveys by about the third week of collection were contacted by telephone and asked to participate with the aid of trained interviewers. Collection for the 2020 survey was longer and included two periods where interviewers administered the questionnaire by telephone, owing to collection interruptions related to the COVID-19 pandemic and Christmas.

The current study included up to 16,467 respondents aged 15 and older who provided non-missing information about their cannabis use (or non-use) and related behaviours.

Definitions

Data from the three survey quarters were analyzed to examine whether cannabis use or related behaviours had changed. The "before-legalization" estimates are based on data from the first quarter of 2018. Data from the first quarter of 2019 and the fourth quarter of 2020 represent the "after-legalization" period. Because the *Cannabis Act* was enacted in two main parts over 12 months, data from two survey quarters were used in an effort to capture both shorter- and longer-term changes, as well as the specific impact of the October 2019 modifications to the act that allowed for a wider variety of cannabis products to be produced, sold and legally consumed.

Outcomes

Cannabis includes marijuana, hashish, hash oil or any other preparation of the cannabis plant.

Cannabis use in the past three months and **daily or almost daily (DAD)** use were based on responses to: "During the past three months, how often did you use cannabis?" Respondents who indicated some use (i.e., once or twice, monthly, weekly, or daily or almost daily) were considered to have used cannabis. People who answered "not in the past three months" were considered to have not used cannabis.

Cannabis consumption method was based on responses to: "In the past three months, which of the following methods did you use most often?" Answer choices were smoked, vaped, consumed in food or drink, or other. This question has been asked on the NCS since the fourth quarter of 2018.

Use of eight different **cannabis products**—dried (flower or leaf), oil cartridges or vape pens, hashish or kief, liquid concentrates, solid concentrates, edibles, other liquids, or other (not specified)—was based on selecting either a quantity or a unit associated with each product. All respondents reporting cannabis use in the past three months were asked whether they had used each product and to report the amounts using a combination of units (e.g., grams) and numbers of units (e.g., 1). In total, 64 respondents who reported having used cannabis in the previous three-month period (first quarter 2018 n=17, first quarter 2019 n=31, fourth quarter 2020 n=16) were excluded from this part of the analysis because they did not select at least one unit or one unit of measure.

Because the NCS considers "edibles" and "other non-concentrated liquids" (which can include cannabis beverages) separate categories, it is possible that the impact of the 2019 act modifications may appear less than if a single edible and beverage category had been used.

Data on **source of cannabis** are based on responses to: "In the past three months, where did you get the cannabis you used?" Eleven categories were provided and reduced to five for this analysis: (1) grow (I grow my own or someone grows it for me), (2) legal (from an authorized retailer or online from a licensed producer), (3) illegal (from a compassion club, dispensary or storefront; online from another source; from an acquaintance; or from a dealer, (4) friends and family (from a family member or friend, or shared around a group of friends), (5) other (not specified). Consumers could select more than one source; therefore, column percentages exceed 100%.

Covariates

Gender was based on: "What is your gender?" Respondents could answer (1) male, (2) female, or (3) gender diverse. Results for the third category are unreportable because of the small sample size. Four **age groups** (15 to 17, 18 to 24, 25 to 44, and 45 or older) are based on answers to: "What is your age?" and "What is your age group?" **Province** was based on residence location.

Analytical techniques

Weighted frequencies and cross-tabulations were disaggregated according to whether the cannabis use or related behaviour

occurred before legalization (first quarter of 2018) or after (measured twice: first quarter of 2019 and fourth quarter of 2020), as well as by age, gender and province (if sample allows).

The selection of outcomes and covariates was guided by the literature, data availability (in particular, consistency of content across NCS quarters) and sample sizes.

Survey sampling weights were applied so that the analysis is representative of the Canadian household population in the 10 provinces. Comparisons discussed between before and after legalization and between quarters, as well as differences discussed between characteristics and the comparison groups (reference categories), are statistically significant at the p<0.05 level and were compared using t-test statistics. Bootstrap replicate weights were used to account for the survey's complex sampling design.

Analyses were performed using SAS 9.4 and SUDAAN 11.0.3.

Results

Cannabis use prevalence

By the end of 2020, nearly 6.2 million people aged 15 or older, or 20.0% of Canadians in that age group, reported having used cannabis in the past three months (Table 1). This was higher than both the 14.0% reporting use before legalization and the 17.5% reporting use in the first months after the *Cannabis Act* was enacted.

Rates of overall consumption were comparable by gender in 2020, for the first time, with about one in five males and females each reporting having used cannabis in the past three months.

In 2020, over one-third (35.6%) of 18- to 24-year-olds reported having consumed cannabis in the past three months, unchanged from 2018 and 2019. The percentages of people in the other age groups reporting use in the past three months tended to be lower than those of 18- to 24-year-olds in each year. For example, in 2020, 10.5% of people aged 45 and older reported cannabis use in the past three months, while this was the case for 30.3% of ages 25- to 44-year-olds, and 19.2% of 15- to 17-year-olds.

While the prevalence of use in the past three months remained unchanged for 18- to 24-year-olds from 2018 to 2020, rates for those aged 25 and older tended to rise—consistently for those aged 25 to 44 (Table 1).

By 2020, about one-quarter of residents of Nova Scotia (27.3%), British Columbia (24.8%) and Ontario (23.1%) reported having used cannabis in the previous three months, higher than the estimates for the rest of Canada. At 10.6% and 13.9%, Quebec and Saskatchewan residents had lower-than-average use. In 2020, prevalence was at its highest level in three years for Prince Edward Island, and British Columbia, while rates in Ontario were higher than in 2018 only, whereas rates in Nova Scotia and Manitoba were higher than those from 2019

Table 1

Prevalence of cannabis use in the past three months, by time relative to legalization and quarter, and selected demographics, household population aged 15 and older, Canada (provinces only), first quarters of 2018 and 2019, and fourth quarter of 2020

| | Before legalization | | | | After legalization | | | | | | | |
| | First quarter of 2018 | | | | First quarter of 2019 | | | | Fourth quarter of 2020 | | | |
Cannabis use (any) in the past three months	'000	%	95% confidence interval from	to	'000	%	95% confidence interval from	to	'000	%	95% confidence interval from	to
Total	4,178.8	14.0 ‡	12.7	15.4	5,306.0	17.5 ‡	16.1	19.0	6,184.3	20.0	18.3	21.8
Gender												
Female	1,842.2	12.2 *‡	10.6	14.1	1,937.7	12.7 *‡	11.0	14.5	2,876.2	18.4	16.1	21.0
Male†	2,319.8	15.8 ‡	13.9	17.9	3,321.0	22.3	20.0	24.8	3,210.7	21.1	18.8	23.5
Age group												
15 to 17	F	F	…	…	F	F	…	…	F	19.2 E*	10.0	33.6
18 to 24†	734.1	28.1	20.7	37.0	958.2	34.8	27.4	43.1	1,042.1	35.6	27.1	45.1
25 to 44	2,252.1	21.4 ‡	19.0	24.1	2,592.1	24.2 *‡	21.5	27.1	3,232.5	30.3	26.8	34.0
45 and older	1,111.1	7.0 *‡	6.0	8.2	1,641.9	10.3 *	8.9	11.8	1,711.7	10.5 *	9.2	11.9
Province												
Newfoundland and Labrador	72.3	16.4	12.6	21.1	81.0	18.5	14.6	23.2	84.9	19.5	15.2	24.7
Prince Edward Island	17.4	14.1 ‡	10.3	18.9	19.5	15.4 ‡	11.7	19.9	29.3	22.3	17.9	27.5
Nova Scotia	158.1	20.0 *	15.5	25.5	144.3	18.2 ‡	13.9	23.4	223.2	27.3 *	22.0	33.3
New Brunswick	88.9	14.3	10.3	19.5	113.9	18.2	14.2	23.1	115.3	18.2	14.0	23.4
Quebec	712.0	10.4 *	8.2	13.0	770.5	11.0 *	8.8	13.8	748.9	10.6 *	8.3	13.4
Ontario	1,583.3	13.5 ‡	11.2	16.3	2,388.9	20.0 *	17.2	23.2	2,828.0	23.1 *	19.8	26.7
Manitoba	168.5	16.6	13.0	21.0	132.6	13.0 *‡	9.7	17.2	233.6	22.4	17.9	27.7
Saskatchewan	132.4	15.1	11.8	19.2	138.2	15.7	12.5	19.4	124.3	13.9 *	10.2	18.7
Alberta	570.9	16.6	13.2	20.6	749.8	21.5 *	17.6	26.0	766.8	21.7	17.5	26.6
British Columbia	675.0	17.1 ‡	13.9	20.9	767.4	19.1 ‡	15.6	23.1	1,030.2	24.8 *	20.9	29.1
Daily or almost daily use in the past three months												
Total	1,620.0	5.4 ‡	4.6	6.3	1,838.1	6.1 ‡	5.2	7.1	2,446.9	7.9	6.8	9.2
Gender												
Female	703.5	4.7 ‡	3.6	6.0	694.9	4.5 *‡	3.6	5.8	1,152.6	7.4	5.9	9.2
Male†	900.5	6.1	5.0	7.5	1,136.7	7.6	6.2	9.3	1,227.0	8.1	6.5	10.0
Age group												
15 to 17	F	F	…	…	F	F	…	…	F	F	…	…
18 to 24†	257.1	9.9 E	6.0	15.8	343.2	12.5 E	8.1	18.7	477.7 E	16.3 E	10.6	24.3
25 to 44	795.8	7.6 ‡	6.1	9.4	882.1	8.2	6.6	10.3	1,153.8	10.8	8.5	13.6
45 and older	555.9	3.5 *	2.8	4.4	599.1	3.8 *	3.0	4.7	747.4	4.6 *	3.8	5.5
Province												
Newfoundland and Labrador	32.4 E	7.4 E	4.9	10.9	25.8 E	5.9 E	3.7	9.3	32.3 E	7.4 E	4.7	11.6
Prince Edward Island	7.8 E	6.3 E	3.9	10.0	6.9 E	5.4 E	3.4	8.6	10.9 E	8.3 E	5.6	12.0
Nova Scotia	57.4 E	7.3 E	4.8	10.8	53.2 E	6.7 E‡	4.7	9.5	101.1 E	12.4 E*	8.8	17.1
New Brunswick	28.4 E	4.6 E	2.5	8.3	48.3 E	7.7 E	5.2	11.3	55.3 E	8.7 E	5.6	13.4
Quebec	258.2 E	3.8 E*	2.3	6.0	237.5 E	3.4 E*	2.3	5.1	179.2 E	2.5 E*	1.5	4.2
Ontario	576.1	4.9 ‡	3.6	6.6	766.3	6.4	4.8	8.6	1,136.1	9.3	7.0	12.1
Manitoba	69.6 E	6.9 E	4.6	10.1	41.6 E	4.1 E‡	2.5	6.5	100.1 E	9.6 E	6.6	13.8
Saskatchewan	56.4 E	6.4 E	4.4	9.4	64.4 E	7.3 E	5.1	10.4	42.1 E	4.7 E*	2.7	8.0
Alberta	320.6	9.3 *	6.9	12.5	255.9 E	7.3 E	5.1	10.5	324.4 E	9.2 E	6.5	12.9
British Columbia	213.0 E	5.4 E‡	3.7	7.8	338.1	8.4	6.1	11.5	465.3	11.2 *	8.3	14.8

… not applicable

* significantly different from reference category or rest of Canada for provincial comparisons (e.g., Ontario compared against other nine provinces combined) (p < 0.05)

E use with caution

F too unreliable to be published

† reference category

‡ significantly different from corresponding estimate for the fourth quarter of 2020 (after legalization) (p < 0.05)

Source: National Cannabis Survey, first quarter of 2018, first quarter of 2019 and fourth quarter of 2020.

(just after legalization) but no different from pre-legalization levels (Table 1).

Daily or almost daily use

By the end of 2020, 7.9% of Canadians aged 15 and older reported using cannabis DAD, higher than the percentages in the first quarters of both previous years (Table 1). The prevalence of DAD use in 2020 was similar for males and females, but was higher for people aged 18 to 44 than those aged 45 and older.

The percentages of Canadians reporting DAD cannabis use also varied across the country in 2020. In general, provincial DAD

Table 2

Method of consumption most often used in the past three months by selected demographics and quarter after legalization, Canada (provinces only), first quarter of 2019 and fourth quarter of 2020

	After legalization					
	First quarter of 2019			Fourth quarter of 2020		
		95% confidence interval			95% confidence interval	
	%	from	to	%	from	to
Total						
Smoked	65.3 ‡	60.6	69.8	58.3	53.3	63.2
Vaped	12.9	9.9	16.6	11.9	9.0	15.4
Consumed in food or drink	13.2	10.1	17.1	18.6	14.8	23.2
Other (unspecified)	8.5	6.4	11.3	11.2	8.9	14.0
Gender						
Female						
Smoked	64.2 ‡	56.7	71.1	52.5 *	44.6	60.2
Vaped	8.6 E*	5.6	13.1	9.0 E	5.9	13.6
Consumed in food or drink	15.0 E	10.1	21.7	21.5 E	15.0	29.7
Other (unspecified)	12.2 E*	8.1	17.9	17.1 *	12.9	22.2
Male†						
Smoked	66.5	60.3	72.2	63.6	57.0	69.7
Vaped	15.6	11.4	20.9	13.5 E	9.5	18.9
Consumed in food or drink	12.0 E	8.1	17.3	16.7	12.4	21.9
Other (unspecified)	6.0 E	3.9	8.9	6.2 E	4.1	9.3
Age group						
15 to 17						
Smoked	94.9 *	54.8	99.6	89.6 *	52.7	98.5
Vaped	F	…	…	F	…	…
Consumed in food or drink	F	…	…	F	…	…
Other (unspecified)	F	…	…	F	…	…
18 to 24†						
Smoked	73.8	58.9	84.7	62.7	46.1	76.8
Vaped	F	…	…	18.4 E	9.3	33.2
Consumed in food or drink	F	…	…	F	…	…
Other (unspecified)	F	…	…	F	…	…
25 to 44						
Smoked	68.8	62.1	74.8	60.1	52.9	66.8
Vaped	13.6 E	9.6	18.9	12.1 E	8.6	16.9
Consumed in food or drink	11.2 E‡	7.5	16.4	18.9	13.5	25.7
Other (unspecified)	6.4 E	3.7	11.0	8.9 E	6.0	13.1
45 and older						
Smoked	52.8 *	45.0	60.4	48.8	42.1	55.6
Vaped	12.5 E	8.2	18.6	7.6 E	5.0	11.3
Consumed in food or drink	19.2 E	13.1	27.2	21.5	16.6	27.3
Other (unspecified)	15.5	11.5	20.7	22.2	17.1	28.3

… not applicable

* significantly different from reference category (p < 0.05)

E use with caution

F too unreliable to be published

† reference category

‡ significantly different from corresponding estimate for the fourth quarter of 2020 (after legalization) (p < 0.05)

Source: National Cannabis Survey, first quarter of 2019 and fourth quarter of 2020.

use in 2020 reflected overall regional cannabis use trends, with rates being higher than the national average in Nova Scotia and British Columbia and lower in Quebec and Saskatchewan.

Mode of consumption and products

Smoking remained the most common method of consumption in 2020, at 63.6% for males and 52.5% for females (Table 2). Whereas the percentage of males who reported smoking as their main method was unchanged from 2019, the percentage of females who reported smoking cannabis in 2020 decreased significantly from 64.2% in 2019.

About 7 in 10 Canadians who reported using cannabis in 2020 consumed dried flower or leaf (70.9%), while 41.4% consumed edibles (Table 3). Canadians also reported using other types of products, including cannabis oil cartridges or vape pens (23.2%), liquid concentrates (18.9%), and hashish or kief (15.9%).

During the first year of legalization, a limited number of products were legal, such as dried cannabis or cannabis oil, which had been available under the Access to Cannabis for Medical Purposes Regulations.[2] While edible products could

not be purchased legally during the first year, people could make their own at home, with some conditions.[1]

A year after legalization, three new classes of products could also legally be sold, and this may have affected the use of some products over time, although not necessarily consistently by gender or age. According to the 2020 NCS, fewer females were using dried flower or leaf (63.3%) than in 2018 (73.5%), and more females reported having consumed edibles compared with 2019 (42.5% versus 28.0%). Use of edibles by males and those aged 25 to 44 was also more prevalent than in the two previous years (Table 3).

Sources of cannabis

According to the 2020 NCS, an estimated 68.4% of cannabis users reported having obtained at least some of the cannabis they consumed from a legal source—nearly three times higher than before legalization in 2018 (22.9%) and also higher than

just after legalization in 2019 (47.4%) (Table 4). Obtaining cannabis from other sources was also common in 2020, but generally less so than before legalization. For example, in 2020, roughly one-third (35.4%) of consumers reported having obtained cannabis from an illegal supplier, and 28.6% had obtained it from (or had shared it with) friends and family. The corresponding 2018 estimates were significantly higher (51.3% and 47.0%), as was the percentage of consumers who reported getting it from friends and family in 2019 (37.0%). Growing cannabis (either growing their own or having it grown for them by someone else) was a supply-source for 14.2% of consumers in 2020, higher than in 2018 or 2019.

Discussion

Cannabis is one of the most widely used substances in Canada, with close to half of all Canadians aged 15 or older reporting having ever tried it.[24] When cannabis use is measured over

Table 3

Percentage reporting use of each cannabis product in the past three months by selected demographics and time relative to legalization and quarter, household population aged 15 years and older, Canada (provinces only), first quarters of 2018 and 2019, and fourth quarter of 2020

	Before legalization			After legalization					
	First quarter of 2018			First quarter of 2019			Fourth quarter of 2020		
		95% confidence interval			95% confidence interval			95% confidence interval	
	%	from	to	%	from	to	%	from	to
Total									
Dried flower or leaf	79.2 ‡	74.8	83.0	77.6 ‡	73.9	80.9	70.9	66.4	75.0
Edibles	31.8 ‡	27.1	36.9	29.1 ‡	24.6	34.0	41.4	36.5	46.4
Hashish or kief	19.5	15.5	24.2	17.9	14.3	22.2	15.9	12.5	20.0
Cannabis oil cartridges or vape pens	19.5	15.3	24.4	18.4	14.9	22.6	23.2	19.3	27.5
Liquid concentrate	19.6	15.7	24.2	20.1	16.4	24.3	18.9	15.7	22.7
Solid concentrate	17.5 ‡	13.8	22.0	14.3	11.0	18.3	12.1	9.1	16.0
Liquids (non-concentrate)	11.7	8.5	15.8	10.5	7.5	14.4	13.6	10.4	17.6
Other (unspecified)	15.0	11.5	19.2	14.0	10.7	18.1	13.4	10.5	16.9
Gender									
Female									
Dried flower or leaf	73.5 *‡	66.2	79.8	70.1 *	63.6	75.9	63.3 *	56.2	69.9
Edibles	35.0	28.0	42.7	28.0 ‡	21.5	35.5	42.5	35.3	50.1
Hashish or kief	16.3 ᴱ	11.1	23.4	14.8 ᴱ	9.7	21.9	9.6 ᴱ*	6.5	13.9
Cannabis oil cartridges or vape pens	18.3 ᴱ	12.5	26.0	18.1	12.9	24.7	19.1	14.6	24.7
Liquid concentrate	18.9 ᴱ	13.4	26.1	16.0 ᴱ	11.1	22.6	16.7	12.6	21.8
Solid concentrate	16.8 ᴱ‡	11.7	23.5	13.6 ᴱ	8.9	20.1	8.5 ᴱ	5.7	12.6
Liquids (non-concentrate)	12.8 ᴱ	8.1	19.7	9.4 ᴱ	5.3	16.1	9.3 ᴱ*	6.2	13.7
Other (unspecified)	15.3 ᴱ	10.3	22.0	15.3 ᴱ	10.2	22.2	12.7	9.2	17.3
Male†									
Dried flower or leaf	83.8	78.2	88.2	81.9	77.4	85.7	77.0	71.3	81.8
Edibles	29.2 ‡	23.0	36.2	29.7 ‡	24.0	36.1	39.1	32.6	46.0
Hashish or kief	21.6	16.0	28.4	20.0	15.2	26.0	21.4	16.0	28.0
Cannabis oil cartridges or vape pens	20.6	15.0	27.5	18.8	14.2	24.5	25.9	20.2	32.6
Liquid concentrate	20.3	14.9	27.0	22.8	17.9	28.5	20.7	16.1	26.3
Solid concentrate	18.1	13.0	24.7	14.9	10.7	20.4	15.0 ᴱ	10.2	21.6
Liquids (non-concentrate)	10.8 ᴱ	7.0	16.2	11.1 ᴱ	7.4	16.4	17.2 ᴱ	12.0	23.9
Other (unspecified)	14.8 ᴱ	10.4	20.7	12.9 ᴱ	8.9	18.4	13.6 ᴱ	9.5	19.0

… not applicable

* significantly different from reference category (p < 0.05)

ᴱ use with caution

F too unreliable to be published

† reference category

‡ significantly different from corresponding estimate for the fourth quarter of 2020 (after legalization) (p < 0.05)

Note: Because of the small sample, estimates pertaining to 15- to 17-year-olds were too unreliable to be published, i.e., each had a coefficient of variation over 33.3% or fewer than 10 records in the cell, requiring suppression to meet confidentiality requirements.

Source: National Cannabis Survey, first quarter of 2018, first quarter of 2019 and fourth quarter of 2020.

Table 3
Percentage reporting use of each cannabis product in the past three months by selected demographics and time relative to legalization and quarter, household population aged 15 years and older, Canada (provinces only), first quarters of 2018 and 2019, and fourth quarter of 2020 - (continued)

	Before legalization			After legalization					
	First quarter of 2018			First quarter of 2019			Fourth quarter of 2020		
		95% confidence interval			95% confidence interval			95% confidence interval	
	%	from	to	%	from	to	%	from	to
Age group									
18 to 24 [†]									
Dried flower or leaf	94.9 [‡]	85.0	98.4	92.0 [‡]	81.1	96.8	75.0	58.8	86.3
Edibles	58.1	43.0	71.8	40.9 [E]	27.9	55.3	52.1	36.5	67.3
Hashish or kief	43.8 [E]	29.3	59.3	24.6 [E]	14.5	38.4	23.6 [E]	12.3	40.4
Cannabis oil cartridges or vape pens	37.1 [E]	23.3	53.3	23.8 [E]	14.2	37.1	37.3 [E]	23.6	53.5
Liquid concentrate	44.4 [E‡]	30.1	59.7	21.9 [E]	12.6	35.5	18.3 [E]	10.0	31.1
Solid concentrate	41.1 [E]	27.1	56.8	20.2 [E]	11.7	32.7	21.6 [E]	10.8	38.4
Liquids (non-concentrate)	26.6 [E]	15.1	42.5	19.5 [E]	10.7	32.8	F	…	…
Other (unspecified)	29.4 [E]	17.2	45.3	20.0 [E]	10.9	33.7	F	…	…
25 to 44									
Dried flower or leaf	83.4 [*]	77.2	88.2	85.0	79.6	89.1	79.7	74.1	84.3
Edibles	28.8 [*‡]	23.2	35.1	32.0 [‡]	25.6	39.1	46.1	39.0	53.2
Hashish or kief	19.7 [*]	14.7	25.8	19.5	14.5	25.8	14.9	10.9	20.1
Cannabis oil cartridges or vape pens	21.7	16.1	28.7	19.7	14.6	25.9	22.5	17.6	28.3
Liquid concentrate	17.6 [*]	13.1	23.3	19.3	14.3	25.4	19.4	14.8	24.9
Solid concentrate	16.7 [*]	12.1	22.7	16.2	11.6	22.2	10.7 [E]	7.4	15.4
Liquids (non-concentrate)	11.1 [E*]	7.3	16.6	10.0 [E]	6.3	15.7	15.4	11.0	21.0
Other (unspecified)	16.0	11.6	21.8	15.0 [E]	10.4	20.9	14.5 [E]	10.3	19.9
45 and older									
Dried flower or leaf	64.7 [*‡]	56.9	71.7	60.1 [*]	53.3	66.5	54.1 [*]	47.6	60.5
Edibles	24.5 [*]	17.8	32.7	18.4 [*‡]	13.5	24.7	28.4 [*]	22.9	34.7
Hashish or kief	7.1 [E*]	4.0	12.0	11.3 [E*]	7.0	17.8	10.8 [E]	7.2	15.9
Cannabis oil cartridges or vape pens	7.2 [E*‡]	4.3	11.6	14.1 [E]	9.6	20.4	14.3 [*]	10.3	19.4
Liquid concentrate	10.8 [E*‡]	6.7	17.1	20.5	15.1	27.3	18.6	14.3	23.7
Solid concentrate	7.0 [E*]	4.1	12.0	8.4 [E*]	4.8	14.3	7.4 [E*]	4.7	11.5
Liquids (non-concentrate)	F	…	…	F	…	…	7.3 [E]	4.7	11.2
Other (unspecified)	F	…	…	8.5 [E]	5.2	13.6	13.7	9.9	18.8

… not applicable

* significantly different from reference category (p < 0.05)

[E] use with caution

F too unreliable to be published

[†] reference category

[‡] significantly different from corresponding estimate for the fourth quarter of 2020 (after legalization) (p < 0.05)

Note: Because of the small sample, estimates pertaining to 15- to 17-year-olds were too unreliable to be published, i.e., each had a coefficient of variation over 33.3% or fewer than 10 records in the cell, requiring suppression to meet confidentiality requirements.

Source: National Cannabis Survey, first quarter of 2018, first quarter of 2019 and fourth quarter of 2020.

shorter periods of time (e.g., quarterly) rates of use tend to be lower because of the more limited-time interval. For the vast majority of consumers, occasional use will be without consequence. More frequent users, however, are at higher risk of experiencing cannabis-related harms.[25,26] According to the 2020 NCS, more Canadians are reporting at least some cannabis use in the past three months, and the proportion reporting DAD use is also higher.

Continued growth in consumption rates after the 2019 act modifications are not unexpected for several reasons. Firstly, Canada-wide access to legal cannabis stores (in addition to online legal suppliers) has increased nearly eightfold since the fourth quarter of 2018 (legalization),making cannabis easier to purchase legally (Appendix Figure 1).[27] Ontario and British Columbia experienced the largest increases in the number of legal stores, from no (or almost no) stores in October 2018 to hundreds of locations in about two years (Appendix Figure 1).[27] Secondly, rates of overall cannabis use increased modestly during the first year after legalization, and past behaviour, coupled with easier access and more legal product choices, among other factors, can be predictive of future actions.[3,5] Thirdly, in most U.S. jurisdictions with legalized recreational use and commercial retail, consumption increased.[17,18]

Higher-frequency cannabis use, such as DAD use, has been associated with a risk of cannabis dependence,[25,26] use of other substances,[28,29] and poor mental health.[25,29,30] Some studies have also found that when overall prevalence increases, so does the risk for cannabis use disorder, characterized by continuing use despite major negative impacts on one's life and ability to function.[26,28] With more Canadians reporting DAD use in 2020, this finding may be of interest for public health and further study, particularly if this pattern persists.

Table 4

Number and percentage of consumers who accessed cannabis from each source, by selected demographics, time relative to legalization and quarter, Canada (provinces only), first quarters of 2018 and 2019, and fourth quarter of 2020

	Before legalization			After legalization					
	First quarter of 2018			First quarter of 2019			Fourth quarter of 2020		
		95% confidence interval			95% confidence interval			95% confidence interval	
	%	from	to	%	from	to	%	from	to
Total									
Grown by the user or another person	8.0 E‡	5.6	11.3	9.0 E‡	6.4	12.6	14.2	10.7	18.6
Illegal	51.3 ‡	46.1	56.5	38.1	33.7	42.7	35.4	30.6	40.5
Legal	22.9 ‡	18.8	27.6	47.4 ‡	42.6	52.2	68.4	63.8	72.7
Friends and family	47.0 ‡	41.8	52.4	37.0 ‡	32.4	41.9	28.6	24.0	33.6
Other (unspecified)	3.6 E	2.4	5.5	3.6 E	2.2	6.0	2.1 E	1.1	3.9
Gender									
Female									
Grown by the user or another person	9.0 E	5.1	15.6	9.0 E	5.4	14.5	13.6 E	8.7	20.7
Illegal	45.4	37.6	53.4	34.7	27.8	42.2	36.1	28.5	44.5
Legal	25.5 ‡	18.7	33.8	42.4 ‡	35.6	49.5	69.3	62.0	75.7
Friends and family	57.1 *‡	49.3	64.5	42.9 *‡	35.7	50.5	28.4	21.7	36.2
Other (unspecified)	4.6 E	2.5	8.2	F	…	…	F	…	…
Male†									
Grown by the user or another person	7.2 E‡	4.9	10.5	8.9 E	5.5	14.0	15.2 E	10.4	21.6
Illegal	55.6 ‡	48.6	62.5	40.1	34.2	46.3	32.8	26.8	39.5
Legal	20.3 ‡	15.5	26.1	50.4 ‡	44.1	56.8	67.5	61.0	73.3
Friends and family	39.4 ‡	32.5	46.7	32.8	27.1	39.0	26.6	20.6	33.6
Other (unspecified)	2.9 E	1.6	5.0	5.1 E	2.9	8.8	F	…	…
Age group									
18 to 24†									
Grown by the user or another person	F	…	…	F	…	…	F	…	…
Illegal	50.1 E	34.3	65.9	49.7	35.8	63.7	56.6	41.2	70.8
Legal	18.3 E‡	9.2	33.2	39.8 E	26.6	54.8	52.8	37.4	67.7
Friends and family	56.4	40.8	70.9	46.3	33.1	60.1	45.8 E	31.5	60.9
Other (unspecified)	F	…	…	F	…	…	F	…	…
25 to 44									
Grown by the user or another person	4.8 E‡	2.8	8.1	8.2 E	4.8	13.9	12.6 E	8.2	18.9
Illegal	53.0 ‡	46.1	59.9	35.3	29.3	41.8	35.6 *	28.8	43.0
Legal	25.5 ‡	19.6	32.5	52.1 ‡	45.2	59.0	76.2 *	70.4	81.1
Friends and family	49.7 ‡	42.7	56.7	34.6	28.6	41.2	29.4	23.0	36.7
Other (unspecified)	F	…	…	F	…	…	F	…	…
45 and older									
Grown by the user or another person	17.6 E	11.5	26.1	8.9 E	5.3	14.7	15.0	10.9	20.3
Illegal	52.3 ‡	44.2	60.3	35.7 ‡	29.0	43.1	19.5 *	14.8	25.2
Legal	22.3 ‡	16.3	29.8	46.9 ‡	39.7	54.2	68.1	61.6	74.0
Friends and family	32.6 *‡	25.3	40.8	31.5 ‡	24.5	39.5	18.0 *	13.3	23.8
Other (unspecified)	F	…	…	5.3 E	3.0	9.3	4.1 E	2.2	7.5

… not applicable

* significantly different from reference category (p < 0.05)

E use with caution

F too unreliable to be published

‡ significantly different from corresponding estimate for the fourth quarter of 2020 (after legalization) (p < 0.05)

† reference category

Notes: Because of the small sample, nearly all estimates pertaining to 15- to 17-year-olds were too unreliable to be published, i.e., each had a coefficient of variation over 33.3%. The exception was the 2019 estimate for friends and family: 91.8% (46.9% to 99.3%), which was significantly higher than the reference category (p < 0.05).

Source: National Cannabis Survey, first quarter of 2018, first quarter of 2019 and fourth quarter of 2020.

Historically, drug use has been strongly related to male gender or sex, with males more likely than females to use most types of drugs, including cannabis.[5,9,31] The elimination of the gender gap in overall use as well as DAD use, is almost without precedent. It seems to be the result not of reduced use among males, but rather of increased use by females, and this has perhaps been facilitated by the introduction of a wider variety of cannabis products that appeal to women.[32] Of course, more studies from jurisdictions with data collected after legalization will be required to determine the veracity and permanence of this new finding.

One of the goals of legalization was the elimination (or substantial reduction) of the cannabis black (illegal) market and consequently keeping profits from criminals and organized crime.[33] With the 2019 act modifications, adults were able to legally purchase a broader range of cannabis products. According to this study, there is some evidence that this may be working, as more Canadians reported obtaining cannabis legally in 2020 than in 2018 and 2019, and fewer were also using illegally sourced cannabis than before legalization in October 2018. Reports from provincial cannabis regulators also suggest that these new product classes are responsible for substantial

portions of their profits, sales and quantities sold.[34,35] Data from national sources tell a similar story.[4-7]

However, different products are associated with different risks, as are different modes of consumption [8,11,36,37] The availability of more legal products may make it easier to consume and to consume more, and this can be detrimental to one's health.[38,39]

Every form of cannabis consumption poses some health risks.[28,40] Choosing not to use cannabis remains the only way to avoid them. Smoking cannabis is often regarded as the most harmful way to consume, while vaping (using a vaporizer or vape pen) and consuming products containing cannabis by either eating or drinking are sometimes presented as less harmful.[40] However, these recommendations were published before the emergence of vaping-associated lung injury.[41]

Edible cannabis products, while gaining in popularity, are increasingly regarded as inherently dangerous, sometimes unpredictable, and prone to overconsumption (because of delayed drug effects) and accidental ingestion.[8,10,20,39,42]

According to the NCS, dried flower and leaf remains the most popular product and smoking the most common method of consumption, although both are in decline. By contrast, use of edibles is rising which might be because of impressions that it is healthier and more discreet, or because psychoactive effects last longer.[8] Other research shows that product preferences can be influenced by legalization[16-17,43] and, by extension, commercial legal availability, and this appears to be the case in Canada as well.

Strengths and limitations

This study has a number of strengths, including the fact that data were collected before the *Cannabis Act* was passed, just after, and again after modifications to the act that allowed more diverse products to be legally produced and sold. With much of the NCS's content consistent, it is possible to examine changes in several cannabis-use behaviours, enabling a more complete picture of how the impacts of legalization are affecting use in conjunction with a more established cannabis industry. This is also one of the first studies to include data collected after the COVID-19 pandemic was declared and after wide-ranging public health measures were implemented, dramatically changing daily routines and possibly affecting cannabis use behaviours, as well as access, although this is difficult to measure.

Nonetheless, results of this study should be interpreted in light of several limitations.

Information from the surveys was self-reported and has not been verified or validated. The 2020 NCS was not able to ask specifically about pandemic-related changes in cannabis use, unlike some other surveys.[5,44]

As explained previously, a higher-than-expected number of cannabis users reported having accessed cannabis from a legal source prior to official legalization (the *Cannabis Act*).[3] Consequently, the NCS overestimated the percentage of Canadians who obtained cannabis from a legal source. In addition, the cannabis sources "friends and family" and "grown" (by themselves or for them by another person) remain difficult to classify as legal or illegal. Despite consumers being asked to provide detailed information about the cannabis products they have used, there is some evidence that consumers have difficulty providing this information.[31,45] Product identification, on the other hand, is believed to be easier than specifying quantities and plausible units.

Changes over time in respondents' willingness to admit drug use, in their definition of what constitutes drug use, and in the perceived or real risk of legal consequences could be neither controlled for nor detected, but could affect results. In Canada, as in many other countries, legal access to medical and— most recently—non-medical cannabis may also have influenced willingness to report use. Data from Health Canada's Canadian Cannabis Surveys for 2018 and 2019 provide some support for this, with more Canadians acknowledging this newfound willingness.[5] The month (or season) of data collection may also affect cannabis use, although this is difficult to measure.

The cross-sectional nature of the data does not allow for causal inferences.

Analyses are limited to household respondents. Therefore, some groups known to be at higher risk for drug use (e.g. people experiencing homelessness) are excluded.

Concluding remarks

This study spans three years—from before legalization to about two years after. It provides a picture of the law's impact on cannabis use and related behaviours given the more established legal cannabis industry better equipped to compete with the black market on price, convenience and selection. Findings demonstrated that change is continuing, and, as before, some cautions and some assurances remain. The impact of the COVID-19 pandemic on cannabis use continues to be difficult to measure. Monitoring remains important, given the ever-changing provincial retail landscapes; the introduction of new products for legal sale; and the pressures by the industry to remove or adjust potency limits and allow widespread delivery, farm-gate sales and cannabis lounges.

Appendix Figure 1
Number of legal cannabis stores added each quarter and by jurisdiction, Canada, fourth quarter of 2018 to fourth quarter of 2020

number of locations
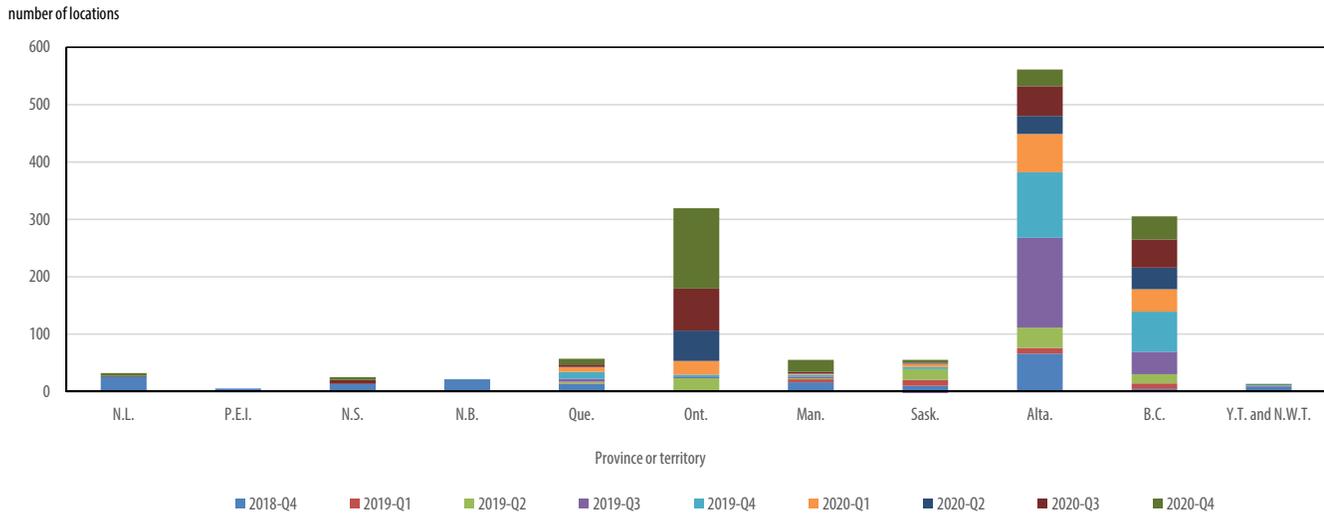
Notes: The data presented were the most complete available at the time of analysis. Counts are subject to multiple revisions at monthly, quarterly and annual intervals. Some provincial and territorial counts include e-commerce-only entities. There are no retail stores operating in Nunavut. Between the fourth quarters of 2018 and 2020 the number of legal cannabis stores increased nearly eightfold from 182 to 1,445. The corresponding data table is available in the HTML version of this article.
Source: Statistics Canada, Business Register.

Appendix Table A
Collection days, sample sizes, response rates and respondent electronic questionnaire use by National Cannabis Survey quarters

	Collection periods			
	2018	2019	2020	
	First quarter	First quarter	Fourth quarter	
	Feb. 19 to Mar. 18	Feb. 11 to Mar. 11	Nov. 10 to Dec. 31	Average
	number			
Collection days	28	29	52	36
Sample sizes	5,817	5,686	5,116	5,540
	percent			
Response rates	51.2	50.6	46.4	49.4
Questionnaires completed using rEQ	54.2	63.0	64.6	60.6

Notes: Collection for the fourth-quarter 2020 survey was extended owing to some COVID-19-related collection disruptions and Christmas. Electronic questionnaires were completed either by respondents (rEQ) or with assistance from a trained interviewer.
Source: National Cannabis Survey, first quarter of 2018, first quarter of 2019 and fourth quarter of 2020.

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